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Ecological wisdom as benchmark in planning and design

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HIGHLIGHTS

- Proposed ecological wisdom as benchmark in making and assessing planning and design.
- Built ecological wisdom evaluation system.
- Developed Ecological Wisdom Inspired Planning Support System assisting decision making.
- Generated baseline scenario, conventional plan scenario and conservative plan scenario.

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ABSTRACT

This paper sets ecological wisdom as benchmark in landscape and urban planning to develop socio-ecologically just plans. It proposes an Ecological Wisdom Inspired Planning Support System (EWIPSS) that incorporates functions of scenario development, simulation and evaluation under a wisdom-guidance framework to facilitate planners' plan-making and public's decision-making activities. Through a case study in the City of Wilmington, Ohio, USA, in which EWIPSS was implemented, we demonstrate that ecological wisdom can be an effective benchmark in planning practice.

1. Introduction

This paper is in response to the calling of attention to ecological wisdom in an editorial by Xiang (2014). The first International Symposium on Ecological Wisdom for Urban Sustainability: Doing real and permanent good in landscape and urban planning was held in October 2014 in Chongqing, China. The goal of the symposium is to foster international scholarship on ecological wisdom and its applications to the practice of landscape and urban planning. Presented at the symposium, this paper focuses on one of the symposium topics: Ecological wisdom as a benchmark for landscape and urban planning. In particular, we present an Ecological Wisdom Inspired Planning Support System (EWIPSS) to assess planning scenarios with an ecological wisdom index compiled from traditional ecological and socioeconomics indicators and indicators reflecting the ecological wisdom measures. Through the comparison of scenarios, we demonstrate that including ecological wisdom in the decision-making process would support actions that aim to do real and permanent good in practice.

Many scholars have realized the importance of ecology in guiding landscape and urban planning practice (Steiner, 2011). Ecological planning offers a theoretical framework and method that can help encourage efficient use of natural resources and protection of environment (Clini, Muse, & Gullino, 2008; Steiner & Brooks, 1981). For example, development decisions may set a priority to environmental protection by starting with the delineation of areas of protection to exclude them from consideration for development (Yu, Li, & Han, 2005). McHarg (1969) in his classical book, *Design with Nature*, illustrated methods for and results of delineating areas not suitable for development. Scholars in human ecology extend ecology from natural science to social science. They treat human beings as a component of ecosystem and study interactions between organisms and environment in order to find the fittest environment and ecological adaptation (Gross,

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2004; McHarg, 1981). For decades, sustainable developments have been concerned with long-term carrying and supporting abilities of the environment by paying attention to technical improvement of development to reach environmental integrity, social well-being and economic feasibility (Linehan & Gross, 1998). As an international organization, the United Nations is leading the effort to include world heritage (Rodes & van Oers, 2011; UNESCO, 1998) and ecology (biosphere reserves) in sustainable development (Coetzer, Witkowski, & Erasmus, 2014; UNESCO, 1996). More recently, scholars make the direct connection between nature and human quality of life by arguing that cities can be more sustainable and resilient through the enhancement of nature with green infrastructure, pattern and lifestyle (Beatley, 2010; Beatley & Newman, 2013). Residents in Biophilic cities directly and actively engage in learning about, enjoying, and caring for the nature around them and develop important emotional connections with nature (Beatley & Newman, 2013). Some also state that staying close to nature can have a positive influence on psychological, physical and social well-being (Windhager, Atzwanger, Bookstein, & Schaefer, 2011).

These theories and practices share a common practical wisdom that is to balance the desire for development with the desire for ecological and environmental protection. "Balance" here can be understood as a trade-off or compromise process between environmental protection and development. Evidence has shown that such a balanced approach, while adhering to a restricted vision of growth and economic progress, will lead to a "condition of unsettlement" (Fry 2011, p. 434). As an example, Superstorm Sandy in 2012 caused the most severe damage to houses built in areas deemed not suitable for development by McHarg in 1969 (Steiner, Simmons, Gallagher, Ranganathan, & Robertson, 2013). Environmental protection is likely to be compromised when it is competing with development, which shows that having knowledge alone may not be sufficient. Based on the belief that the environment has innate emotional affiliation with human beings (Wilson, 1993) and the good life is often viewed in terms of a relationship to nature called human beings' enlightened self-interest (Cafaro, 2001), we propose to use ecological wisdom to recognize the importance of both ecological knowledge and the ability to apply this knowledge in practice. In particular, we propose to use ecological wisdom to guide planning and design in order to inspire and empower people to figure out "the right way to do the right thing" for the human settlement (Schwartz & Sharpe, 2010, p. 5; Xiang, 2014, p. 68).

Fan (2008, p. 23) described ecological wisdom as a kind of "wisdom of civilization" that is an organic unity of science and ethics. This wisdom is based on abundant experience to make a wise decision or judgment for natural or social matters. Li, Fu, Xiang, and Zhou (2015, p. 87) also defined ecological wisdom as the ideological essence that presents "the best way for harmonious coexistence between human beings and the environment" based on "a profound knowledge and a rich practical experience". In Chinese traditional culture, seeking harmony between man and nature is seen as the highest ecological wisdom, which means that nature may be modified for meeting human desire, however, such alteration must follow the laws of nature and do not destroy the ecological balance (Liu, Tian, Yuan, & Sun, 2016). In this context, we define ecological wisdom as a sensible wisdom, based on ecological knowledge and planning ethics, aiming to avoid catastrophic over development of the earth. It aims at achieving a harmonious human-environmental relationship and proposing an ecologically stable, economically profitable, and aesthetically rewarding and favorable society (Dubos, 1973). It also aims at the ability to communicate with diverse groups through "integrating", rather than "balancing" the seemly competing goals of environmental protection and development. "Balancing" commonly works as a way to settle controversies in planning practice by giving up things desired in order to reach an agreement between environmental protection and development. "Integrating" is an alternative strategy that asks all members work together to find a solution that includes their respective interests (Graham, 1998; Jackson & Holden, 2013) under a more inclusive goal – enhancing human experience (Wang & Cheng, 2011), which is linked to both the quality of environment and the quality of development. The meaning of "human experience" here refers to the exploration and appreciation of quality of life as it relates to the interaction between humans and the environment. Specifically, we develop a benchmark (indicator system) based on an ecological wisdom integration principle to assess various development scenarios.

Indicators are quantitative measures in planning and decision-making to assess the current condition or the impacts of planned actions. For instance, SITES, a sustainable sites initiative rating system (http://www.sustainablesites.org), applies indicators to assess the quality of the ecosystem services of a site development. Researchers and authorities also use an index, which includes a combination of indicators, to represent the condition of the complex human environment system (Niemeijer, 2002). The existing approach of using indicators is to group them into different categories, such as natural, physical, social, economic and services – then to balance the individual goals (Ruiz, Romero, Perez, & Fernandez, 2012; Schernewski, Schonwald, & Katarzyte, 2014). A major constraint of the approach is the lack of agreement in combining economic, environmental, and social considerations (Blaschke, 2006). Guided by ecological wisdom, we integrate indicators in EWIPSS into one benchmark – sustenance of quality of life.

We developed EWIPSS following the GeoDesign concept, the convention of scenario planning and planning support system method, which includes scenario generation, model development and visualization, and scenario evaluation and comparison. We used Geographic Information System (GIS) tools, in particular, ArcGIS, and its CommunityViz extension and CityEngine, a standalone GIS product with the ability of turning 2D GIS data into 3D models, to satisfy the need to support decision-making with the visualization of alternative spatial resolutions (Eikeboom, Janssen, & Stewart, 2015; Wilson, 2015). In the end, we used a case to demonstrate the EWIPSS application. The paper is an example of using ecological wisdom index as a benchmark in assisting planning decision-making in sustainable development.

2. Ecological wisdom inspired planning support system (EWIPSS)

2.1. Ecological wisdom indicators

Traditionally, planning approach often assesses development proposals with indicators grouped in various dimensions such as ecological service or economics. Assessments of individual dimension are conducted and then compared. Final decision is derived by balancing or compromising the benefits of different dimensions. To represent this approach we have compiled indicators that are commonly used in ecological evaluation of planning (Table 1). They reflect ecological impacts from human activities in climate, air quality, structures and functions of landscape, and ecosystem service (Feng, He, Yang, & He, 2014; Hiremath, Balachandra, Kumar, Bansode, & Murali, 2013; Leitao & Ahern, 2002; Venturelli & Galli, 2006). By considering these indicators, we are able to consider the ecological system cost in making development decisions. For example, CO and CO_2 automobile emissions are computed from household automobile usage.

Table 2 shows indicators that are commonly used in economic evaluations in planning. These indicators represent economic benefits and opportunities, as well as resource consumptions induced by

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