Environmental Decision Making to Support the Sustainable Development Planning

Dimas Wisnu Adrianto and Fauzul Rizal Sutikno

Department of Urban and Regional Planning, Faculty of Engineering, Brawijaya University Indonesia.

ABSTRACT

Planning and decision-making are encouraged to improve their performance to support the goals of sustainable development. This paper will discuss the nature of planning as a tool to support a better decision making. The greatest challenge towards environmental planning and decision making is the level of uncertainty, while integrating scientific approach is yet considerably the answer to minimize the uncertainty. Somehow, scientific approaches are often difficult to cope with a political framework of decision making for being less adaptive to practical matters. This paper will discuss further the issues and develop a conceptual framework to elaborate scientific and political structures for decision-making.

Key words: Decision-making, Environmental Planning, Sustainable development

Introduction

Sustainable Development has been a popular terminology since promoted in 1980 by the World Conservation Strategy to deal with the challenge of intergenerational threats of the environment and natural resources (Kozlowski, 2005). As stated in the Brundtland report, the main goal of sustainable development is to establish equity to the human well-being for neither the present nor the future generation.

Although social, economic and environmental sustainability have an equal urgency, the past development theories and practices, especially in developing countries had neglected the environmental issues by focusing more on economic and social matters (Basiago, 1999). Therefore, the need to integrate environmental sustainability together with social and economic sustainability is emerging.

Regarding the goals of sustainable development, planning which is a guide for sustainable development is obliged to strengthen its performance as the impact of planning decisions may affect in a great range of aspects and time. The importance to perform an accurate decision-making has been a great challenge for a planning process, especially to achieve the goals of sustainable development. Planning is defined as a representation of a decision making process through the definition of goals and strategies of achievement and should be more to a consultative process rather than a technocratic practice (Hall, 1999; Kozlowski, 2005).

In terms of fostering a better decision making framework, the major problem towards planning is the level of uncertainty to define accurate goals and the ineffective implementation due to the weakness of decision-making processes (Hall, 1999; Briassoulis, 2004). The goals determined by planning are essential to guide a further practical decision-making; therefore, the better the goals are determined, the more effective it is to problem solving (Edvardsson, 2006).

This paper will discuss a topic of decision-making, especially in the field of environmental planning and its sensitivity to support a better sustainable development. The discussion is based on the fundamental principles of environmental decision-making and sustainable development supported with some relevant case studies to review the practice of planning.

The case studies this paper will discuss are the sustainable land use evaluation and scenario analysis in the Loess Plateau in China and the biodiversity landscape planning in Nottinghamshire, UK.

Materials and methods

Most of the data to support this paper gained from an intensified literature research, which include a
synthesis of the most relevant and recent findings related to environmental planning and decision-making. This research investigated through a simplified content analysis to particularly discover and explore different strategies for environmental planning and decision-making. A case study method was done to foster a collaborative framework to develop propositions, logic linking data to the propositions and criteria for interpreting the findings from the case studies represented in this paper.

Results and discussion

Environmental Planning and Decision Making for Sustainable Development:
Planning and Decision Making:

The early method adopted in the planning process was the rational comprehensive planning (Kozlowski, 2005), which consists of three general steps:
1. Identifying the problem, which includes data collection and interpretation, problem diagnosis and data analysis
2. Arranging alternative goals at the early stage for problem solving
3. Plan implementation and monitoring

Although the rational and comprehensive model was simple, it has been a flexible platform to guide a more complex and detailed planning. Placing problem identification as the first step of planning indicates that any planning process should start with a comprehensive diagnosis and assumptions and accurately set the target of what problems are about to be solved. Therefore, further steps in the planning process must refer to the particular problems identified.

The third step in the rational comprehensive planning model, the plan implementation is considerably the most essential. The actual value to measure the success of planning is on how effective the plan implemented. At this stage, problems determined at the earlier step should indicate a better state and closer to salvation, while the monitoring process aims to guide the ongoing implementation with useful feedbacks. This explanation clearly argues of how important to link the means of problem solving consistently to the fundamental problems. Although particular problems defined might solve through the process of planning as explained above, newer problems may possibly occur. This is the challenge of an uncertain future that a planning must deal. Therefore, working with forecasting urgently needed, especially to anticipate several unexpected problems.

As planning is challenged to improve its performance to guide the development and the improvement of the social well being, while the process itself deals with a large scope of problems, planning needs an interdisciplinary approach (Kozlowski, 2005). Involving various experts in the process will certainly help the problem identification and solving process to result in greater accuracy. In terms of planning for sustainable development through the triple bottom line approach, interdisciplinary approach must be present. Integrating environmental, social and economic sustainability certainly are not sufficient to involve just an environmental expert to solve the complicated problems challenging sustainable development. In addition, lack of interdisciplinary approach may bring further limits on problem analysis and data examination, which may lead particular problems to be under-estimated.

The integration of scientific knowledge is an element of a good plan management that helps an accurate interpretation for a further plan implementation (Fallding, 2000). However, one of the greatest challenges to integrate science into planning is the political agenda, which often directs decision making to a wider tendency, deflecting scientific approaches to contribute to a better decision-making. Ignorance of scientific findings would be even greater when decision makers with particular political agenda deal with uncertainties of the results of scientific approaches. In addition, different perspective of knowledge leads to further different concern and interests among them and may deliver scientists and decision makers to a greater gap (Liu, 2008).

Despite the political challenge to integrate science into decision-making, scientific approach is still a vital component to a distinctive planning. Thus, improving the credibility and legitimacy of information produced in a scientific process, and it also enhancing the intensity of communication between science and the political value of decision will improve the benefit of scientific approach to better support and eliminate the nature problems of planning and making decision which is consist of six elements (Kozlowski, 2005):

Uncertainty

It is difficult to predict and measure the possibilities that will happen in the future exactly. Here, planning are engaged to adapt the uncertain future and should have the capability of being dynamic. The way to minimize the problem of future uncertainty is to forecast and predict the future, while also work with comprehensive consultative groups (stakeholders). This aims to record more accurate problem, and to gain
relevant problems based on the groups’ experiences. Successfully identifying problems accurately may improve the performance of planning as a media to build a better social, economic and environmental well-being.

Problems Related to Land Use Management:

The physical dimension of planning is as great as the management itself, especially when planning deals with the environmental sustainability. Planning is closely related to the activity of land use management, and has always been a guide and control to the physical development. The pressure of land development had always been a threat to biodiversity and its conservation, especially when economic motivations are the main drivers of planning. Thus, sustainable development, which promote the integration of conservation, and development has been a great breakthrough of planning.

Problems about Data Provision:

The availability of sufficient data will influence the process of planning and decision-making. The problem is that planning must work to solve problems no matter where it undertakes, while not every region or location has the same level of data provision. The availability of data may differ between places, regions or countries depend on how local government or stakeholders work to prepare data to support the scientific approach of planning and decision-making.

The Problem with Political Boundaries:

This is a classic problem at the decision making level. It is common that planners work under the political circumstances to help decision makers decide the planning and development implementation. Meanwhile, environmental planning often deal with regions that are bounded by nature or geography instead of a political boundary. More than one local government usually shares a bioregion or protected area (buffer area) as the boundary differs to the political or administrative boundary of local places. This will bring to further policy overlapping or possibly underestimated by local government because of an unclear authority.

Risk and Impact Assessment as Supporting Tools to the Decision Making Process:

Continuing the debate of the integration of scientific approach to decision-making, there is a significant difference between scientific and political perception. Scientist with all its capability to measure and identify problems in scientific way tends to think more of the future. Meanwhile, decision makers who are usually political practitioners prefer a shorter length of plan implementation, or more of thinking about how to solve problems due to present condition or short-term goals (Rosenbaum, 1995). Although short-term goals are also important, long-term goals plays a vital role as it addresses holistic and sustainability to a particular environmental problem solving. In the other hand, the level of uncertainties of scientific approaches can be even higher when dealing with forecasting in a longer period. In order to eliminate uncertainties, an accurate data and methods must apply in planning. However, integrating scientific approach in decision-making is an essential process but mostly difficult (Rosenbaum, 1995). It is essential in terms of the methodological guide they provide, but often found its difficulty to fulfil the decision makers’ request of technical information within a short time. Despite the difficulty of scientific approach to integrate in decision making process, the presence of science is a great importance. Scientific approach can help decision makers measure the risks and impacts of problem identified in the earlier step of planning, as well as giving positive feedbacks regarding plan implementation.

Risk Assessment Analysis:

The background of this assessment was to tackle the problem of uncertainty that occurs in planning and decision-making processes. Risk and uncertainty are two components, which cannot separate. The fundamental value of risk is the definition of probability and the consequences of an event to (Benke, 2007). Risk assessment itself consists of the hazard identification and assessment, the measurement of consequences and the assessment of the level of expectation of something to happen. Therefore, risk equals to the probability of an event times the consequences if an event happened. Regarding the mission of risk assessment to minimize the level of uncertainty, there are two types of uncertainty, the epistemic uncertainty and the linguistic uncertainty. Those that belong to epistemic uncertainty are the variability or population diversity, lack of knowledge, error counting system, a bias result of analysis,
the natural or environmental dynamic change, the uncertainty of models and a subjective assumption. The linguistic uncertainties are the unclear delineation, the level of context dependence, ambiguity, the bias generality and the confusing usage of terms.

**Environmental Impact Assessment:**

Environmental impact assessment is a rational approach to an objective decision making. Environmental impact assessment is a technical and rational method and it is one of the most popular tools used in environmental planning and decision-making (Jay, 2007). The purpose of environmental impact assessment is to make a quantified prediction and forecast of environmental impacts before the decision are made (Dunker, 2007). The disadvantage of this method is the set of quantified measurement is unplaced on a common scale (Pearce, 1992). Furthermore, environmental impact assessment aims to address the environmental matters at the same level of consideration to economic and social values (Alshuwaikhat, 2005).

**Case Studies:**

This section will discuss two case studies of environmental planning. The first case is the sustainable land use evaluation and scenario analysis in the Loess Plateau in China, and the biodiversity landscape planning in Nottinghamshire, UK will come as second. Both case studies represent an environmental planning, which attempts to integrate the environmental or ecological value into the frame of sustainable development.

**Land Use Evaluation and Scenarios at China’s Loess Plateau (Chen, 2003):**

This research carried out at a small catchments area at China’s Loess Plateau. The problem faced by the catchments area was the massive soil erosion that happened in a long period. The level of erosion becomes more and more serious as the population grew rapidly together with their activities that exploit the catchments area. Vegetation experienced a great loss as the soil damaged due to grain productions. The lack of land coverage was the main reason of the environmental degradation happening at China’s Loess Plateau.

The objective of the environmental planning project held at China’s Loess Plateau was to establish a land use structure that is capable to control the soil erosion and address further sustainable land use management. The project carried out through an evaluation of land suitability, based on the observation of the current condition and record further land use deviation. The considerable components to measure in defining the scenarios are the effectiveness how to prevent further erosion, economic consideration and whether the community in terms of social values will accept the scenarios.

The result of planning were the establishment of three scenarios that are considerably the best match to balance the urgency to safe the catchments area from further serious erosion while at the long term will support the economic and social well being of China’s Loess Plateau community. The three scenarios explained as follows:

**Scenario 1**

This scenario attempts to redistribute the land use structure, where agricultural land will be relocated to land which had a level slope <25°. Land with the slope larger than 25° will allocate with vegetations that have more conservative functions such as woodland or grass.

**Scenario 2**

The second scenario aims to provide a larger protection compare to the first scenario. Agricultural land will be placed on land with a slope level lower than 20° while the restricted area that supports more of the environmental protection values are placed on land with the slope level higher than 25°. The major difference between this scenario and the first is that there is a mixed used on the land with the slope level between 20° and 25° where vegetation with two functions, as a soil protection and as a crop are allocated.

**Scenario 3**

The land use redistribution in scenario 3 places agricultural activities on land with a lower slope from 15°, while restricted area will be located on land with a slope higher than 25°. Compare to the second scenario, the transition zone is larger located on land with the slope level between 15° to 25°.
Based on the three scenarios, the third scenario chose as the best fit to solve the problem at China’s Loess Plateau. Although all scenarios will reduce the farmers’ income from their agricultural activities, the third scenario had the best support to solve the soil erosion problem due to the large area of land allocated for conservation.

The biodiversity landscape planning in Nottinghamshire, UK (Hawkins, 2002):

This research investigates as a concern to the problem of biodiversity. UK is facing a serious environmental degradation due to the agriculture and forest conversion. Thus, ecological landscape planning emerged to solve this problem. The research aimed to examine how different approaches of landscape planning may fit in to particular problems faced by the UK. The approach to ecological landscape planning is based on three key elements, first is the landscape stabilization, which is to seek the level of stability of every element in the landscape and to define a network between landscapes. The second key element is the focal species, which meant as a representative of the species characteristic as landscape planning had always found difficulties to satisfy every single species. The third key element, the greenway, places a principle that the interconnecting path between landscapes has multifunction, whether ecologically or other set of functions related tourism and aesthetic.

The ecological plan itself has three alternative plans:

**Plan A – Biocenters and biocorridors:**

The purpose of this plan was to encourage a stable ecological landscape by developing linkages among biocenters, to preserve the networking biodiversity between ecological landscapes.

**Plan B – The arrangement of landscape to support focal species:**

This plan consists of four plan scenarios; the first is improving the current available sites and developing small patches of species’ habitat that will also functioned as a buffer zone. The second, improving the connectivity to reduce the patchiness, and the third is to support the wilderness and arrange the land use adapt with its role and the dynamic of change. Finally, the fourth is establishing new zones of conservation to protect the high level of biodiversity.

**Plan C – Development of multipurpose linear landscape features:**

The purpose of this plan was to establish greenways to strengthen the linkage between landscapes. Besides, to maintain the role of ecological protection, these greenways are valuable recreational assets.

**Discussion:**

This section will discuss the review of the planning and decision-making process of the environmental planning presented in both case studies and how it supports to the triple bottom line of sustainable development.

**Table 1:** Review of Decision making of the Land Use Evaluation and Scenarios at China’s Loess Plateau.

<table>
<thead>
<tr>
<th>Review of Decision</th>
<th>Environmental</th>
<th>Economic</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainties</td>
<td>Still remain uncertain: The strength of vegetation covering the land to prevent erosion</td>
<td>A small uncertainty: The length of time farmers will gain their regular income</td>
<td>Solved: The community id willing to participate and understand the future benefits</td>
</tr>
<tr>
<td>Risk / impact assessment</td>
<td>The degree of slope and erosion was measured, but no further prediction of environmental degradation.</td>
<td>The impact to farmers income was measured</td>
<td>Solved: The agreement of farmers to participate is assumed that no further social problem will occur</td>
</tr>
<tr>
<td>Data / methods of planning</td>
<td>Good data provision of geographical condition, and well overlaying process of land suitability analysis</td>
<td>Well presented set of data regarding the crop productivity from an in-depth interview</td>
<td>Interview was done well regarding the enthusiasm of the community to support the project</td>
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The case study of land use evaluation and scenarios at China’s Loess Plateau represents a good process of planning and decision-making. The goal of sustainable development is also carried out in a clear way. The
integration of scientific approach (risk and impact assessment) helped to ensure the community that the future benefits are brilliant. Although some uncertainty remained unsolvable, the effort to anticipate the uncertainty was terrific. The land use scenarios carefully measure the risks and benefits to each component of the triple bottom line of sustainable development.

Meanwhile, the other case study about the biodiversity landscape planning in Nottinghamshire, UK had significant weakness. The information provided in the article explained that the planning scenarios place a great focus on preserving the ecological landscape to solve the loss of biodiversity. The alternative plans given were adequate to support the environmental sustainability, but it lacks the value of human and environmental relationship. In addition, there is an uncertainty that remained unclear, which is the impact of this project to the perpetuity of biodiversity. Furthermore, the limited information provided in this article also addresses another uncertainty, which is whether this project fully supported the holistic goals of sustainability which is to build equity to the environment, economic and social or not.

**Conclusion:**

For summing up, this paper broadly discusses the nature of planning and decision making to support the sustainable development. As planning are forced to improve its performance in supporting the goals achievement of sustainability, planning and decision making still faces particular problems that hinder their improvement. A big concern also addressed regarding the involvement of scientific approach or tools to support the provision of adequate information. Somehow, between scientific principles and the political value of decision-making remains a big gap and this is considerably a big challenge to planning and decision-making. Despite the huge gap, scientific approach still contributes significantly to support the decision making process. In relation to planning and decision making problem as mentioned, two case studies were presented. Out of the two cases, the land use evaluation and scenarios at China’s Loess Plateau was considerably a good case to learn a planning and decision-making process.

Finally, to improve the performance of planning, the process of decision making should follow the seven steps, which are problem specification, define the objectives, formulate the decision alternatives, emphasis the result of risk and impact analysis, elicit utility functions, show the importance of weights and rank or classify the alternatives (Seip, 2006).

**References**


