

A Literature Review on Integrated Resource Management (IRM)

Gatot Yudoko
School of Business and Management
Institut Teknologi Bandung

ABSTRACT

This paper is aimed at outlining a literature review on integrated resource management (IRM). The literature review highlights IRM from three views, namely conceptual perspective, methodological perspective, and implementation perspective. Our critical discussion of IRM leads us to a conclusion that considering the various applications of IRM, we propose that it is time to change the label of IRM into IREM (integrated resource and environmental management). We also propose that further work on IREM could be directed on developing an alternative analytical framework based on the cycle of management processes as well as developing a more operational framework to implement IREM.

1. INTRODUCTION

There is a variety of applications of IRM found in the literature. These applications include integrated resource management (Lang, 1986; Walther, 1987); integrated water management (Mitchell, 1990), integrated environmental system management (Cairns, 1991; Djajadiningrat, 2005), integrated catchment management (Mitchell and Hollick, 1993), integrated natural resource management (Monika, 1993; Probst and Hagmann, 2003; Place and Okoro, 2004), integrated environmental management (Born and Sogzoni, 1995), and integrated solid waste planning and management (Yudoko, 2004, 2005). This paper presents a literature review on integrated resource management from three major perspectives, namely conceptual, methodological, and empirical. Then, a critical discussion is outlined. And, recommendations for further research are proposed.

1. A LITERATURE REVIEW ON INTEGRATED RESOURCE MANAGEMENT

2.1. Conceptual Perspectives

Conceptual perspectives of integrated resource management include definitions and rationale, basic characteristics, and the analytical framework.

2.2.1. Definitions and Rationale

Cairns (1991, 5) referred to integrated environmental management (IEM) as "coordinated control, direction, or influence of all human activities in a defined environmental system to achieve and balance the broadest possible range of short- and long-term objectives." The emergence of IRM and IEM has been motivated by various reasons, including increasingly complex problems of resource management due to interconnecting forces: technical, social, economic, administrative, political, and legal (Petak, 1990), a need to capture the maximum benefits from multiple uses of scarce resources through coordinated action (Lang, 1986), many obstacles from fragmented and shared responsibilities among agencies (Mitchell, 1990), failures in dealing with different competing views (Bowonder, 1987), dissatisfaction with the outcomes from narrowly-focused environmental management (Bowonder, 1987; Born and Sonzogni, 1995; Margerum and Born, 1995), and failures in environmental management to deal with linkages, complexities, multiple perspectives, multiple uses, and externalities (Margerum and Born, 1995). Accordingly, problems in resource or environmental management should be addressed from a systemic view (Petak, 1981) or holistic view (Margerum and Born, 1995).

The integrated approach to resource and environmental management offers many potential benefits. This approach can function as a medium to address different concerns, achieve and secure agreement, set up coordinated action and conflict resolution (Lang, 1986), provide can improve effectiveness through cooperation and coordination (Walther, 1987; Mitchell, 1990), eliminate data redundancy, preserve resources, and reduce expenditures to deal with conflicts over competing uses (Cairns, 1991), and become an opportunity to define common goals and identify the most critical issues (Margerum and Born, 1995).

2.2.2. Basic Characteristics

According to Monika (1993) and Born and Sonzogni (1995), the concept of integrated resource management (IRM) had been most explicitly defined by Mitchell who outlined the components of this approach. Mitchell (1986) argued that IRM involves comprehensive, integrated, and unified approaches. It was comprehensive because it took into account many aspects; it was integrative because it combined diverse elements into a harmonious whole; and it was unified since it arranged many perspectives into a whole, large scope. Similarly, Born and Sonzogni (1995) and Margerum and Born (1995) argued that IRM and/or integrated environmental management (IEM) had four distinctive themes: comprehensive or inclusive, interconnective, strategic or reductive, and goal-focused. The first two attributes, inclusive and interconnective, were basically identical to those mentioned by Mitchell (1986). Being strategic involves identifying the most critical aspects to narrow the focus of the system being analyzed; and goal-focused refers to the development of common goals from a variety of interests.

Other distinctive dimensions of IRM, according to Lang (1986) were action-oriented because its aim was to bridge the gap between planning and implementation; interactive by involving stakeholders; and flexible to options and adaptive to unpredictable change. In summary, IRM or IEM was a "dual-perspective" approach (Margerum and Born, 1995) since it has a broad view of the system being addressed and focused on key variables.

Mitchell and Hollick (1993) proposed five building blocks of (IRM), namely a systems approach, an integrated approach, a stakeholder approach, a partnership approach, and a balanced approach. A systems approach implied identifying the elements of a system and their interrelationships and interconnections between a system with other systems (Muller-Merbach, 1994). The integrative nature of IRM was represented by identifying key issues and variables, finding linkages among these key issues and variables, and by consulting with many stakeholders. Thus, IRM was also a "stakeholder approach" because it emphasized the importance of involving many stakeholders to participate in the decision-making process. Grimble and Chan (1995) suggested that by involving different stakeholders, trade offs over the use and management of resources and distributional impacts upon stakeholders could be discussed. The main purpose of a stakeholder approach was to recognize roles, authorities, and responsibilities of each stakeholder, find common objectives among stakeholders, and developed mechanisms to resolve conflicts. Although conflicts cannot be avoided, the main emphasis was on cooperation and accommodation rather than on competition of interests of stakeholders. The last building block, the balanced approach, has been inspired by the idea of sustainable development of the Brundtland Commission (1987) that advocated balanced development between the economy and the environment. Implications of the balanced approach of IRM were the preservation of the quality and integrity of natural systems and the satisfaction of social and economic norms and values. Mitchell and Hollick concluded that the adoption of IRM was expected to foster the acceptance and pursuit of cooperative initiatives, to facilitate cooperation among stakeholders, and to assist the development of complementary regulatory instruments and the preparation of plans.

2.2.3. The Analytical Framework of IRM

The analytical framework of IRM, developed by Mitchell (1998) as shown in Figure 1, consists of seven main components: context, vision, legitimation or credibility, functions, structures, processes and mechanisms, and organizational attitudes and cultures. This framework is chosen due to its general nature so that it can accommodate the various types of IRM. More importantly, that framework clearly reflects the very basic concept of management.

2.2.3.1. Context

The analytical framework of IRM begins with recognizing the context of the problem or system being analyzed. Context may involve physical, historical, social, cultural, economic, and institutional aspects (Mitchell and Hollick, 1993). By identifying and examining the context of the problem or the system, constraints and opportunities for devising solutions can be formulated. Mitchell (1990) asserted that by analyzing the context of the problem, justification can be made to indicate whether integration is necessary or not. Several factors that deserve attention in investigating the context of the problem include the state of the natural environment; predominant ideologies; choice of goals, objectives, and strategies; economic conditions, and legal, administrative and financial arrangements (Mitchell, 1990).

2.2.3.2. Vision

The next component of IRM is vision or direction. According to Kotter (1990), vision is "a description of something (an organization, a corporate culture, a business, a technology, an activity) in the future, in terms of what it should become" or "a concept for a new and desirable future reality that can be communicated throughout the organization". Mitchell (1998) argued that the state of the desirable future should be specified to direct an integrated approach in attaining that future.

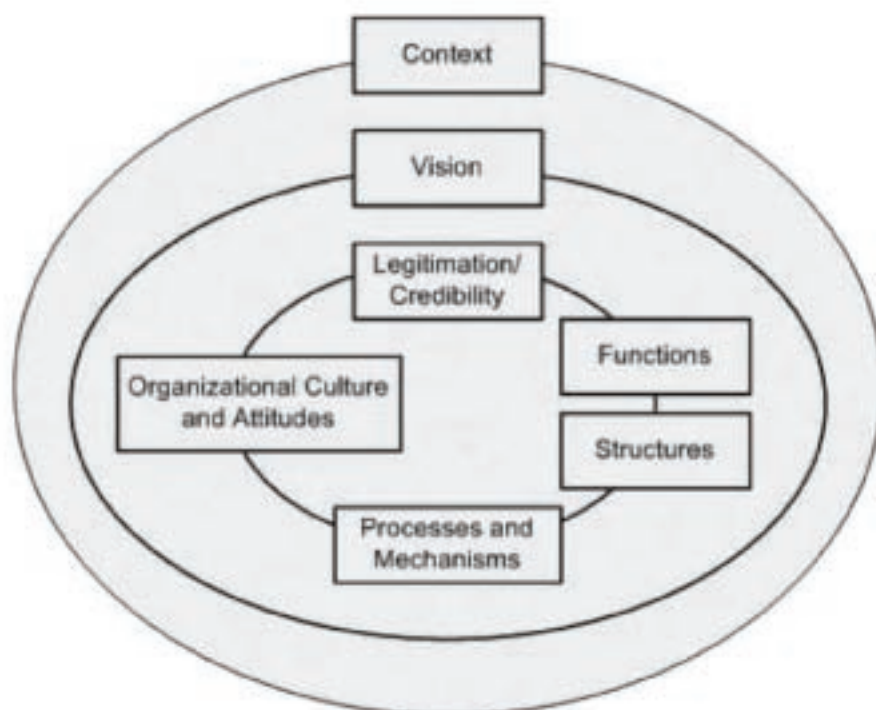


Figure 1. A conceptual analytical framework for integrated resource management (Mitchell, 1998)

2.2.3.3. Legitimation or Credibility

Legitimacy is a prerequisite for the effective implementation of any policy. Without legitimacy or credibility, individuals, agencies, or the public may neither respect nor follow that policy. According to Mitchell and Hollick (1993), legitimacy can be achieved through legislative, political, administrative, and financial instruments. Legislation can provide formal credibility to any agency because it can require any stakeholders to comply, since to do otherwise would result in penalties. In addition, statute or legislation can also be used to assign power or to be employed for resolving conflicts (Mitchell, 1990). Political legitimacy can formally or informally support the credibility of any stakeholder or agency in the eyes of others. Government agencies through administrative procedures can establish legitimacy for any appointed stakeholder or agency. Legitimacy through financial arrangements enables any stakeholder to provide financial support to others. In the implementation of IRM, a combination of these instruments may be used.

In deciding the appropriate means for providing legitimacy, Mitchell (1990) suggested attention to three important aspects: the objectives of relevant agencies by identifying both common and different interests, the authority and responsibility of each agency, and the rules for mediation and arbitration by higher level authorities to reconcile any conflicts that cannot be settled by stakeholders directly involved. Thus, it is important to know who or which agency has the right and obligation to resolve deadlocks (Mitchell, 1990). Because IRM includes many stakeholders, it is likely that conflicts will arise. Therefore, conflict resolution will be important in planning and implementation of this approach. Mitchell (1990) noted that even when objectives and powers are stated explicitly, conflicts can still arise because of boundary effects as a result of fragmented or shared responsibilities.

2.2.3.4. Functions

The next component is to determine the management functions required and distribute them to each actor or stakeholder. Mitchell (1990) contended that an important concern is to decide which management functions should be delegated to which scale or hierarchy such as the local, state, or federal level. He advised that a guiding principle in allocating management functions to stakeholders is to assign them to the scale or hierarchy that has the closest association with those people getting the service or the product.

Mitchell (1990) categorized management functions into two groups: generic and substantive. The former involves data collection, planning, regulation, development, monitoring, and enforcement; while the latter is specific to a resource or sector which in water management comprises supply, sewage treatment, pollution control, and other substantive functions from linkages between water and land and from linkages among water, environment and economy.

2.2.3.5. Structures

Organizational structures will be needed and should be designed to facilitate efficient performance of the identified management functions (Mitchell and Hollick, 1993). As cited in Mitchell (1990), Paterson argued that the primary motivation in designing the structures should be to determine organizational units that have well-defined functions with clear autonomy and responsibilities so that they can perform their tasks effectively. Mitchell (1990) added that because the perfect match between functions and structures can rarely be found, boundary problems are likely to emerge and lead to conflicts.

Mitchell (1990) proposed a few important points to be considered in designing organizational structures. First, a perfect fit between management functions and organizational structures can rarely be achieved and this can lead to "grey" responsibilities in which either there is no clear assignment regarding which agency should be responsible for certain functions; or that there are many competent agencies responsible for the same management functions. This situation leads to the second consideration, what Mitchell called "the emergence of boundary problems" resulting from shared or fragmented responsibilities. Third, it is important to be aware of the consequences of the organizational structures chosen. Generally, the design of organizational structures lies along a continuum, with a few, big organizational structures at one end, and many, small structures at the other end. In the former case, the structures tend to be centralized and carry out many management functions, while on the other one, the

structures are decentralized with each having only a few functions. It is difficult to determine the best structure. In addition, the selection of the structure can be context-dependent. In other words, the context or area of the study and local conditions may dictate the best arrangement between management functions and the organizational structures. Therefore, it is possible to use a combination of a few large organizational structures and many small ones, depending upon the context of the problem or the system. Fourth, another issue is accountability. When authority and responsibilities have been defined and assigned, then the next step is to examine whether the appointed agencies or organizations have accomplished their mission and tasks accordingly or not. In addition, Mitchell (1990) emphasized a need for flexibility of the structure.

2.2.3.6. Processes and mechanisms

After determining the management functions and establishing the required organizational structures, mechanisms and processes to operate the system should be defined. These processes and mechanisms are important for addressing boundary problems as well as facilitating bargaining, negotiation, and mediation of conflicts. Processes to facilitate integration and coordination could be addressed at the political and bureaucratic levels. Examples of formal mechanisms at the political level are interministerial councils and select committees to deal with a specific issue. At the bureaucratic level, four mechanisms can be used: interdepartmental committees, commissions, task forces established for a specific purpose and period, and review procedures by which government agencies disseminate plans or proposals to related agencies for comment. Another mechanism, as important as the formal one, is the informal approach that supports cooperation and participation. Furthermore, the inclusion of viewpoints of the general community and individuals in planning and management exercises should be ensured. Several processes that can be used to bring together diverse perspectives or interests are regional planning, benefit cost analysis, environmental impact assessment, and public participation.

2.2.3.7. Organizational culture and attitudes

The effectiveness of any implemented policy and the success of the integration, cooperation, and coordination of efforts will be influenced by the organizational culture and attitudes of the individuals involved (Mitchell and Holick, 1993). It is therefore important to recognize the characteristics of the organizational culture and the participants' attitudes regarding their support for integration. Mitchell (1990) pointed out that human dimensions should be given as much consideration as the other components of IRM. Because culture and attitudes can be specific from one area to another, it is therefore important to know the context, people, and local conditions of the area or system being studied.

2.1.2. Methodological Perspectives

Two major methodological perspectives are highlighted in this review, namely research paradigms and research methods. In this regard, as mentioned by Neuman (2006), a paradigm is defined as *, while research methods are meant as any data collection methods and their analysis.

2.1.2.1. Research Paradigms

Reviewing from the various applications of IRM in areas such as water resources, ecosystem, natural resources, public administration, and urban planning and management, we can conclude that various research paradigms have been in place. These include positivism, interpretivism, and critical social science (Neuman, 2006). We argue that the nature of the problems in resource management and the necessity for adopting a systemic view have called upon the use of a mixed of these paradigms. A research by Yudoko (2004, 2005), for example, adopted a mixed of interpretivism and critical social science.

2.1.2.2. Research Methods

Unit analysis of a research in IRM may include living and non-living objects, individuals, communities, corporations, and government policies. Accordingly, various data collection methods have been used based on the paradigm(s) used. For instance, data collection methods used to evaluate government policy in urban solid waste management in developing country (Yudoko, 2004, 2005) were based on the types of reasoning being used, including normative, legal, logical, and empirical perspective (Pal, 1997). These methods consisted of in-depth interviews, surveys, observations and secondary data and data analysis used both descriptive and inferential statistics. Recognition of the challenges or difficulty in collecting comprehensive data in IRM research has long been recognized. To some extent, especially from policy perspective, this recognition falls into the methodological problems pointed out by Anderson (1984).

2.3. Implementation Issues

A framework for implementing an integrated approach to environmental management by Margerum and Born (1995) as shown in Figure 2 will be highlighted. Then, some common and unique problems in the implementation of IRM, particularly discovered by Mitchell (1996, 1990, 1997), will be summarized.

2.3.1. Operationalization

The conceptual framework proposed by Margerum and Born (1995) is based on their proposition that interaction is the key operational element to achieve integration. They describe the essence of interaction as information exchange and conflict resolution. Their framework, therefore, is primarily intended to ease interaction among the affected stakeholders and the public.

The interaction during the planning process occurs in the four components of integrated environmental management (IEM) include the inclusion of views, the examination of interconnections or linkages, goal identification, and the reduction process. Essentially, what Margerum and Born propose is not different from what has been addressed by others (Lang, 1986, Mitchell and Hollick, 1993, Slcombe, 1993) who emphasize that the process involved in the integrated approach is interactive and participatory. According to Margerum and Born (1995), one critical element of integrated environmental management is coordination that has two dimensions: communication and conflict resolution. They identified many tools for communication and conflict resolution (Table 1).

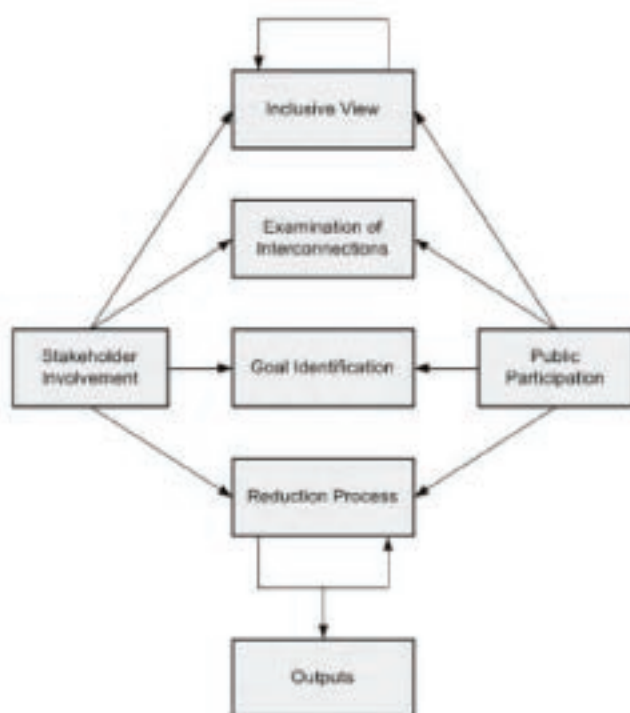


Figure 2. Interaction during the planning process (Margerum and Born, 1995)

Element	Tools
<ul style="list-style-type: none"> • Communication 	<ul style="list-style-type: none"> • Information and data sharing procedures • Common database or data gathering • Joint forecasting or scenarios • Joint models or jointly used geographical information systems (GIS) • Regular communication mechanisms • Informal communication • The creation of common jurisdictional boundaries • Joint reviews of plans or environmental impact statements • Formal review or clearance procedures • Supervisory oversight • Joint budgeting process • Scheduled meetings • Coordinating committees • Joint staff • Joint permit reviews • Joint planning process • Plans
<ul style="list-style-type: none"> • Conflict resolution 	<ul style="list-style-type: none"> • Additional research or analysis • Interpersonal or inter-group communication • Appeals to higher authority • Special meetings of committees or other groups • Negotiation or bargaining within the group • Appeals to outside party or third party intervention (i.e., facilitation and mediation)

Table 1. Coordination tools (Margerum and Born, 1995)

2.3.2. Problems/Obstacles

Various implementation obstacles of IRM and/or IEM have been recognized. They include the need and scope for integration in a given context (Hooper, McDonald and Mitchell, 1999), a concern that management authority will be abused (Cairns, 1991), an overly lengthy time required for comprehensive planning (Mitchell, 1986; Cairns, 1991) and to facilitate public participation (Mitchell, 1990), the sensitivity of line agencies (Mitchell, 1986, 1997; Cairns, 1991), inadequate institutional arrangements (Mitchell, 1986, 1997; Cairns, 1991), vague, outdated, unrealistic, and excessive recommendations (Mitchell, 1986), data required to assist planning and management decisions (Mitchell, 1990), financial resources needed to carry out the process (Mitchell, 1990), and a long learning process (Walther, 1967). Another possible obstacle, according to O'Riordan as cited in Mitchell (1990), is the combination of organizational culture, personalities and participants' attitudes that can hamper integration and cooperation. Other important findings from water management in Nigeria (Mitchell, 1994) reveal institutional gridlock as a primary problem in the implementation of IRM. This gridlock consists of the inadequate funding, ambiguous responsibilities, preoccupation with institutional structures, and lack of attention to operation and maintenance.

Mitchell (1990) offered some recommendations to overcome the above problems. These initiatives may include: a well-defined scope for IRM; identifying common goals, objectives, and activities so that participants could determine how they might participate; and, devising the appropriate institutional arrangements through an appropriate mix of legislation and regulations, policies and guidelines, administrative structures, economic and financial arrangements, political structures and processes, historical and traditional customs and values, and key participants or actors. Furthermore, he pointed out that institutional arrangements should incorporate bottom-up initiatives in order to balance the top-down directions.

3. DISCUSSION

A few comments regarding this literature review can be identified. Firstly, using the critical theory of Kemp (1982) we critically challenge the label "resource" in IRM as too broad and some way could be misleading. Margerum and Born (1995), for instance, mentioned that IRM had been applied in water resources, natural resources, ecosystem, and urban and regional planning. It seems that there has been a common understanding about the meaning of "resource" as broad as perceived and used by many. In fact, there is another label that intersects and is closely related to the meaning of "resource". That such word is "environment" that may involve non-living objects, living creatures, and human beings. However, a few seem agree that "resource" and "environment" are different (Cairns, 1992; Born and Sonzogni, 1995; Mitchell, 1997). In addition, a research by Yudoko (2004, 2005) on urban solid waste planning and management based on IRM may further question the word "resource" in IRM. The literature on IRM has shown that the word "resource" is generally associated with "natural resource", while in the context of solid waste planning and management, wastes have been considered by many as "secondary resource" in contrast to "virgin material". Moreover, the context of waste planning and management has been empirically dominated by "urban management" view, instead of "resource management" view. Therefore, in this paper we propose that it is timely to change the term of IRM into IREM (integrated resource and environmental management) as this new label will accommodate the broad nature of both resource and environmental management.

Secondly, we propose that a research on developing another analytical framework of IREM is worth pursuing. This new framework should be developed by more formally adopting the cycle of management processes, consisting planning, organizing, actuating or implementing, and controlling than the framework developed by Mitchell (1988) as mentioned above. Then, research methods could be identified in a detailed manner based on the components of the proposed framework.

Thirdly, another important research is further work on operationalizing the interaction framework of IRM during the planning process proposed by Margerum and Born (1995). We argue that such the framework is more conceptual in nature than operational one. Hence, a procedural, systematic framework which more clearly outlines operational stages involving stakeholders and the relevant tools or techniques will gain merits from clarity of implementation. In this regard, tools for coordination and conflict resolution proposed by Margerum and Born (1995) will have their specific role in the implementation process.

4. REFERENCES

Anderson, J.E. 1984. *Public Policy Making*. Third Edition. New York: Holt, New York: Rinehart and Winston.

Born, S.M. and Sonzogni, W.C. (1995). "Integrated Environmental Management: Strengthening the Conceptualization." *Environmental Management*, 19:2, 167-181.

Boworder, B. (1987). "Integrating Perspectives in Environmental Management." *Environmental Management*, 11:3, 305-315.

Caims, J. Jr. (1991). "The Need for Integrated Environmental Systems Management." In Caims, J. Jr. and Crawford, T.V. (Eds.)(1991). *Integrated Environmental Management*. Chelsea, Michigan: Lewis Publishers, Inc., 5-20.

Djajadningrat, S.T. 2005. "Sustainable Future: From Concepts to Praxis." (In Indonesian Language). In Kusain et.al. (eds.). 2005. *Sustainable Future: Menggagas Warisan Peradaban Bagi Anak Cucu Seputar Wacana Pemikiran Suma Tjahja Djajadningrat*. Jakarta: Indonesia Center for Sustainable Development (ICSD).

Grimble, R. and Chan, M. (1995). "Stakeholder analysis for natural resource management in developing countries." *Natural Resources Forum*. 19:2, 113-124.

Kemp, R. 1982. "Critical Planning Theory Review and Critique". In Healey, P. (ed.). *Planning Theory for the 1990s*. Toronto: Pergamon Press, 59-67.

Kotter, J.P. (1990). *A Force for Change: How Leadership Differs from Management*. The Free Press.

Lang, R. (1986). "Achieving Integration in Resource Planning." In Lang, R. (Ed.)(1986). *Integrated Approaches to Resource Planning and Management*. Calgary: The University of Calgary Press, 27-50.

Margerum, R.D. and Born, S.M. (1995). "Integrated Environmental Management: Moving from Theory to Practice." *Journal of Environmental Planning and Management*, 38.3, 371-391.

Mitchell, B. (1998). *Sustainability: A Search For Balance*. University of Waterloo Faculty of Environmental Studies Research Lecture 1998. Waterloo, Ontario.

Mitchell, B. (1997). *Resource and Environmental Management*. Essex: Addison Wesley Longman Limited.

Mitchell, B. (1994). "Addressing "Edge" Problems in Land and Water Management in the Sokoto-Rima River Basin, Nigeria." *Geoforum*, 25:2, 133-143.

Mitchell, B. (1990). "Integrated water management." In Mitchell, B. (Ed.)(1990). *Integrated Water Management: International Experiences and Perspectives*. London: Belhaven, 1-21.

Mitchell, B. (1986). "The Evolution of Integrated Resource Management." In Lang, R. (Ed.)(1986). *Integrated Approaches to Resource Planning and Management*. Calgary: The University of Calgary Press, 13-26.

Mitchell, B. and Hollick, M. (1993). "Integrated Catchment Management in Western Australia: Transition from Concept to Implementation." *Environmental Management*, 17:6, 735-743.

Monika, R. (1993). "Integrated Natural Resource Management - A Question of Property Institutions?" *GeoJournal*, 29:4, 405-412.

Muller-Merbach, H. (1994). "A System of Systems Approaches." *Interfaces*, 24:4, 16-25.

Newman, R.E. 2006. *Social Research Methods: Qualitative and Quantitative Approaches*. Sixth Edition. Allyn and Bacon, Boston.

Pal, L. A. 1997. *Beyond Policy Analysis: Public Issue Management in Turbulent Time*. Scarborough, Ontario: International Thomson Publishing.

Petak, W.J. (1981). "Environmental Management: A System Approach". *Environmental Management*, Vol. 5, No. 3, 213-224.

Petak, W.J. (1980). "Environmental Planning and Management: The Need for an Integrative Perspective." *Environmental Management*, 4:4, 287-295.

Place, F. and J. Okoro. (2004). "Enhancing integrated management of natural resources". *Uganda Journal of Agricultural Sciences*. No. 9, 838-854.

Probst, K. and Hagmann, J. 2003. *Understanding Participatory Research in the Context of Natural Resource Management Paradigms, Approaches and Typologies*, ODI-AGREN Network paper No. 130.

Slocumbe, D.S. (1993). "Environmental Planning, Ecosystem Science, and Ecosystem Approaches for Integrating Environment and Development." *Environmental Management*, 17:3, 289-303.

Walther, P. (1987). "Against Idealistic Beliefs in the Problem-Solving Capacities of Integrated Resource Management." *Environmental Management*, 11:4, 439-446.

Yudoko, G. (2004). "Integrated Municipal Solid Waste Planning and Management (IMSWPM) in Developing Countries" *Jurnal Manajemen Teknologi*, Vol. 5 (Desember), 23-35.

Yudoko, G. (2005). "Integrated Municipal Solid Waste Planning and Management (IMSWPM) in Developing Countries: The Feasibility Analysis of a Case Study in the Municipality of Bandung" *Jurnal Manajemen Teknologi*, Vol. 4, No. 1, 12-32.