IAIA10 Training Course #3

Multi-Criteria Analysis (MCA): A Tool for Sustainability Assessment

Level
Advanced

Prerequisites
Participants should a basic understanding of sustainability concepts and issues and the incorporation of these concepts into planning and impact assessment practice. This course builds upon the principles presented in the course *Practical Guide to Sustainability Planning and Assessment* offered at IAIA06, IAIA07 and IAIA09. It would therefore be useful, though not essential, for participants to have previously completed this course, or alternatively to have some practical work experience in sustainability assessment or strategic environmental assessment. No prior experience with decision support systems is assumed, and nor will participants be expected to have quantitative skills.

Language of Delivery
English

Duration
1 day course

Names and Contact Details of Trainers
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Summary of the Purpose, Content and Learning Outcomes
Multi-criteria analysis (MCA) is a valuable and increasingly widely-used tool to aid decision-making where there is a choice to be made between competing options. It is particularly useful as a tool for sustainability assessment where a complex and inter-connected range of environmental, social and economic issues must be taken into consideration and where objectives are often competing, making trade-offs unavoidable. It provides a robust and transparent decision-making structure, making explicit the key considerations and the values attributed to them, and providing opportunities for stakeholder and community participation. MCA can be applied at all levels of decision-making, from the consideration of project alternatives to broad-reaching policy decisions guiding a transition towards sustainability and the green economy.

This advanced course focuses on MCA as a tool for sustainability decision-making, building upon principles presented in the course *Practical Guide to Sustainability Assessment* offered at previous IAIA conferences. It presents an ideal opportunity for previous participants in that course to further develop their skills in sustainability assessment, but this is not a formal pre-requisite. While participants should have some prior understanding of sustainability concepts, the course is designed for participants with minimal prior knowledge of MCA techniques.

The course will address the following topics:

- Theory of MCA
- Application of MCA within a sustainability assessment framework (theory and case studies)
- Determining when to apply MCA and which approach to use
- Detailed demonstration, using computer simulation, of two different MCA techniques: additive weighting and concordance analysis
- Developing sustainability criteria
- Criteria scoring and weighting
- Sensitivity analysis
- Opportunities for stakeholder and community participation
- Advantages and disadvantages of MCA as a tool for sustainability assessment
- Alternatives to MCA - deliberative decision-making

Participants will undertake group exercises using the models presented to develop comprehensive understanding of their use and characteristics.

Detailed Description of the Course

Introduction: Multi-criteria analysis (MCA) is a valuable and increasingly widely-used tool to aid decision-making where there is a choice to be made between competing options. It is particularly useful as a tool for sustainability assessment where a complex and inter-connected range of environmental, social and economic issues must be taken into consideration and where objectives are often competing, making trade-offs unavoidable. It provides a robust and transparent decision-making structure, making explicit the key considerations and the values attributed to them, and providing opportunities for stakeholder and community participation.

MCA can be applied at all levels of decision-making, from the consideration of project alternatives to broad-reaching policy decisions guiding a transition towards sustainability and the green economy.

Target audience: This advanced level course is designed for planners, government agency personnel, proponents and consultants, and students in IA related fields with an interest in the making of complex public or private decisions. These decisions might focus on projects, or strategic initiatives such as policies, legislation, programmes or plans. Some prior knowledge of the concepts and principles of sustainability as they relate to planning and impact assessment is recommended and previous participants in the course *Practical Guide to Sustainability Assessment* offered at IAIA06, IAIA07 and IAIA09 are particularly encouraged to attend. No prior experience with decision support systems is assumed, and nor will participants be expected to have quantitative skills. The course will have a general applicability to all fields of IA (i.e., environmental, health, socio-economic, SEA).

Learning outcomes: In this course participants will develop an understanding of:

- The principles and theory of MCA
- The advantages and limitations of MCA as a tool for sustainability decision-making

- Comprehensive understanding of two alternative MCA techniques: additive weighting and concordance analysis
- Practical experience with these tools through facilitated exercises
- How to choose the right MCA tool
- How to develop sustainability criteria for MCA
- Approaches to criteria scoring and weighting
- How to conduct sensitivity analysis to ensure the outcomes are robust
- Opportunities for stakeholder and community participation in MCA
- Alternatives to MCA - deliberative approaches to decision-making

Format: The theory and principles of MCA will be presented in lectures, drawing on numerous case studies from the presenters' experiences. The emphasis, however, will be upon practical exercises and group discussions to maximise learning. Participants will also be provided with an up-to-date resource guide listing useful references relating to the topics covered.

Outline of Course Program: The *Multi-Criteria Analysis (MCA): A Tool for Sustainability Assessment* course will be highly interactive, providing participants with practical experience with the application of MCA tools to sustainability decision-making. A summary table of the topics, their content and participatory activities follows.

Title	Topic Content	Participatory Activities
1. Welcome and introductions	Interactive session: • Introduce presenters – organisation affiliation and background • Introduce and meet participants • Outline aims of course and program of events	Introductions

2. The theory of MCA	Lecture with discussion:
	• What is a "good" decision?
	• Theory of MCA as a tool for optimising choice
	• Case study examples
	• Applying MCA:
	  • Identifying alternatives
	  • Developing sustainability criteria
	  • Criteria scoring
	  • Criteria weighting
	  • Sensitivity analysis
	  • Dealing with uncertainty
	• The application of MCA techniques as a tool for sustainability assessment
		Discussion question:
		What advantages and disadvantages are there to MCA as a tool for sustainability decision-making?

BREAK	*MORNING COFFEE*	
3. Two alternative techniques for MCA: additive weighting and concordance analysis	Lecture and demonstration: • Presentation of theory and algorithms underpinning the two techniques • Discussion of appropriate application, and advantages and disadvantages • Demonstration of computer models using real-life examples	Discussion question: *To what type of decisions could MCA be applied in your area of work? Which tool would be most appropriate and why?*
4. Commence small group activity	Small group activity: • Present case study scenario • Select appropriate tool • Identify sustainability criteria • Use information provided to score and weight the criteria	Small group activity

BREAK	*LUNCH*	
5. Complete small group activity	Facilitated activity: • Complete tasks from Session 4 • Load criteria, scores and weights into the computer model and complete analysis to identify the preferred alternative (one group) • Conduct sensitivity analysis	Participation in facilitated activity
6. Lessons learnt from small group activity	Facilitated discussion: • What worked well? • What was difficult? • How confident can we be in the outcomes? • What trade-offs were made? • Advantages and disadvantages of MCA as a tool for sustainability decision-making	Participation in large group discussion
BREAK	*AFTERNOON TEA*	
7. Stakeholder and community participation in MCA	Lecture with discussion: • Incorporating different values into sustainability decision-making • MCA from a stakeholder perspective	Discussion question: *What strengths and weaknesses do you see*
8. Alternatives to MCA – deliberative approaches to sustainability assessment	Lecture with discussion: • Deliberative techniques – why and how • Overview of alternative techniques – citizens' juries, deliberative polls, consensus conferences and others • Case study – citizens' jury	Discussion question: *Are deliberative techniques a viable alternative to MCA? What are the advantages and disadvantages?*
9. Conclusion	Summary and discussion: • Overview and conclusions from course • Participant questions and feedback	Opportunity for participants to ask questions and make final comments.

Training Materials Received by Participants

Participants will be provided with a Resource Guide which will contain copies of the PowerPoint slides used in lecture presentations, a paper written by David Annandale and Ross Lantzke on the use of MCA, and a list of other useful publications, websites and other information sources on MCA as a tool for sustainability assessment.

Pre-conference and post-conference Communication with Participants

The presenters will be in attendance for all of IAIA10 and thereafter readily contactable by email. Specifically the presenters will be available to provide follow-up support through e-mail exchange, access to relevant websites and (immediately post-course through) participation in sustainability assessment related workshops at IAIA10.

QUALIFICATIONS OF THE PRESENTERS

Dr Jenny Pope

Qualifications: BEng (Chem) (First Class Honours)
Grad. Dip. Sci. (Biotechnology)
Post Grad. Cert. (Policy Studies)
PhD in Sustainability and Technology Policy

Current Position: Director and Principal Consultant, Integral Sustainability

I am a chemical engineer by training and have over 20 years experience in the field of environmental and sustainability management. I commenced my career as a water and wastewater engineer for the Water Authority of Western Australia before moving to BP, where I worked as an environmental engineer at the Kwinana Refinery in Western Australia and as an environmental consultant in the Oil Technology Centre in London, providing wastewater and environmental management services to BP business units across the world. I was responsible for the development and implementation of the ISO 14001 environmental management system (EMS) at Kwinana Refinery.

Building upon my environmental management experience, I commenced post-graduate study in sustainability at Murdoch University in 2001. I undertook my PhD from 2002-2006, investigating the evolution of sustainability assessment processes in Western Australia. Since 2002 I have been extensively involved in the development and implementation of sustainability assessment processes in Western Australia, working with both the Government and the private sector in this area.

In this capacity, I have completed a broad range of consultancy projects, including facilitating and reviewing a number of projects involving multi-criteria analysis (MCA), with a focus on site selection for infrastructure. Recent clients have included the Water Corporation of Western Australia, Western Power, Gold Coast Water, Woodside Energy Limited, the City of South Perth and the Australian Green Infrastructure Council (AGIC).

I have given numerous presentations across Australia and facilitated several workshops on sustainability assessment. I have co-presented with Angus Morrison-Saunders three 2-days courses entitled *Sustainability assessment of policies, plans and projects* on behalf of Engineers Australia. I have also taught environmental management and sustainability assessment at postgraduate level at Murdoch University (*ENV521 Organisational Strategies for the Environment and STP 220/440 Sustainability for Professionals*) and presented a number of guest lectures on sustainability assessment as part of other Murdoch University courses. I have successfully delivered training courses in sustainability assessment at IAIA06, IAIA07 and IAIA09. In addition, I have published a number of articles related to sustainability assessment in the last 5 years and was guest editor of a special edition of the *Journal for Environmental Assessment, Policy and Management* on sustainability assessment in September 2006. I co-chaired the sustainability assessment stream at SEA05 in Prague, IAIA07 in Seoul and IAIA09 in Accra.

I have been a member of IAIA since 2003 and have been an active participant at IAIA03, IAIA04, SEA05, IAIA06, IAIA07, IAI08 and IAIA09. I was Program Coordinator for IAIA08 in Perth and am currently Peer Review Coordinator for IAIA09.

Dr David Annandale

Qualifications: BSc Environmental Science (Honours)
MA (Public Administration)
PhD (Business Policy)

Current Position: Senior International Specialist, Integra Consulting Services s. r. o. Pobřežní 18/16, 18600 Praha 8, Czech Republic

I began developing decision support techniques as a combination of software and consultation/dispute resolution in the early 1990s. My initial interest was in incorporating these techniques into the teaching of environmental impact assessment to graduate students during my tenure as an academic at Murdoch University in Perth, Australia. I began by examining the European literature as it related to decision support, and then programming different techniques.

This activity quickly saw application in the private consulting market, and I have outlined practical experience gained with public and private clients, below.

I have spent 10 years refining both decision support software, and the approach used when undertaking consultancies for clients. On many occasions I have been approached to license and software. However, my interest remains in helping clients to solve problems, and I have resisted commercialisation of software because of my concerns about the overall process for reaching decisions when there are complex and controversial aspects to consider.

I have undertaken the following projects for public and private clients over the last decade:

- Use of multi-criteria analysis as a strategic planning tool to determine how to implement water consumption reduction targets across the State of Western Australia (Water Corporation of WA). [2003]

- Facilitation of a strategic planning workshop to determine how to implement a sustainable management framework for land and water use on Gnangara Groundwater Mound (Water Corporation of WA/CSIRO). [2003]

- Development of a multi-criteria analysis framework for a housing development decision in suburban Perth, Western Australia (Terra Consulting and Landstart (Government of WA). [2003]

- Investigation of the use of multi-criteria analysis for electricity transmission line route selection (Western Power). [2003]

- Evaluation of alternatives analysis work contained in a proponent's economic, social, and environmental assessment documentation (EPA Service Unit, Government of Western Australia). [2003]

- Strategic advice and computation associated with a multi-criteria analysis process for ranking catchment management issues in rural NSW (Terra Consulting and Parkes and Districts Landcare Area). [2003]

- Design and facilitation of a multi-criteria analysis process used to rank approximately 1,000 remnant bush patches in the Western Australian wheatbelt. (Ecoscape and the Lake Chinocup Region Catchment Management Committee). [2003]

History of the course

This course *Multi-Criteria Analysis (MCA): A Tool for Sustainability Assessment* has not previously been offered at an IAIA conference. However, much of the material has been presented in other training courses, at IAIA conferences and other forums, as discussed below.

History of comparable courses

Dr David Annandale has run MCA training courses in Australian and internationally for over 10 years. Initially, he taught MCA to final year undergraduate students at Murdoch University in *ENV420 Principles of Environmental Impact Assessment*, and *ENV 422 Techniques for EIA*). He has also organised and taught MCA in a short-course variation as a professional training endeavour in Australia.

Dr Annandale taught a variation of the proposed course at IAIA '05. That course was titled: "*The Right Place: An introduction to the use of innovative Multi-criteria Analysis/Decision Support tools for making complex decisions in environmental and resource management arenas"*. The Boston course did not have a specific sustainability assessment focus to it. Instead, it provided a general introduction to the theory and practice of MCA as it relates to standard project choices.

The proposed course for IAIA10 has a different focus from the IAIA05 offering. It will apply the same MCA techniques, but to sustainability assessment choices. Participants will be asked to think about complex situations that they have been involved with, where decision-makers need to assess choices using "triple bottom line" criteria. The course will pay special attention to applications of MCA to policy, plan, and programme choices.

Dr Jenny Pope has developed and presented a number of training courses related to sustainability assessment over the past five years, as already discussed. She has presented three courses on sustainability assessment at IAIA conferences (IAIA06, IAIA07 and IAIA09) together with Dr Angus Morrison-Saunders, and the proposed new course will build upon the concepts explored in the sustainability assessment course (a recommended pre-requisite).