Abstract
Purpose – To describe the development and structure of a new Master’s-level subject entitled “Aspects of sustainability: an international perspective” as a potential model, adoptable by other tertiary-level educators.
Design/methodology/approach – This paper describes the evolution and re-shaping of a subject designed for postgraduate students from diverse programmes (from science-based to sociology-based). It was re-designed in 2004, in part to support the co-introduction by Lincoln University of two new, globally innovative Masters degrees, but also as a contribution to the Decade of Education for Sustainable Development (DESD, 2005-2014). The two new degrees are taught and awarded jointly by Lincoln University and a partner European University, and thus are based on unique Northern-Southern hemisphere linkages. We describe the subject content (including its major assignment), and its evaluations by students.
Findings – A successful subject has been developed, but it required a step change in its structure in order to (a) retain connectedness and common themes across its wide-ranging topics, and (b) meet the expectations and aspirations of multi-disciplinary, multi-national classes.
Practical implications – This paper details the key ingredients of a subject designed to prepare postgraduate students for careers involving sustainability at international or regional level. The subject’s structure is a potential model for adoption in other tertiary programmes.
Originality/value – The subject’s structure is highly appropriate for a multi-disciplinary, multi-national student group, and demonstrates one university’s efforts to contribute to DESD. The format of the main assignment is offered as a model for adoption by others engaged in education for sustainability.
Keywords Masters degrees, Sustainable development, Curriculum development
Paper type Case study

Introduction
In a world of increasing internationalisation, individual nations are increasingly extending and inter-penetrating their environmental impacts and ecological footprints. Thus, the “new age” of sustainability demands a matching internationalisation of environmental management and stewardship. Consequently, there is a need for people...
trained to work in an international setting, with a sound understanding of sustainability issues and the mechanisms for tackling them; or in a local setting with an international perspective.

At postgraduate level, sustainability education is often embedded within single-discipline subjects, rather than being taught *per se* as a separate subject (Leal Filho, 2002). There are only a few reports in the literature (Eagan *et al.*, 2002) on subjects which combine the following three features: at postgraduate level; interdisciplinary; and based on an international view of sustainability. This paper describes such a Masters-level subject[1], entitled “Aspects of sustainability: an international perspective” developed as part of an innovative international Masters degree linking northern and southern hemispheres (the Master of Natural Resources Management and Ecological Engineering (MNaRMEE) degree – see below).

Lincoln College was founded in 1878 as the original “agricultural” college for New Zealand’s (NZ’s) South Island (Figure 1). In 1990, it became the independent “Lincoln University” (LU), and now specialises in primary production, environmental and resource management, and commerce, in its teaching, research and extension activities. Sustainable management features in its mission statement and goals. It is the smallest public university in NZ with a student roll of c. 2,800 EFTS, and 180 academic staff. In 2006, over 40 per cent of Lincoln’s students are international, the highest proportion of the eight NZ public universities. This creates a strongly multicultural campus.

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**Figure 1.** Location of LU, 20km SW of Christchurch City (the gateway to the Antarctic) on the Canterbury Plains (alluvial plains covering 750,000 ha)

Notes: The Southern Alps mountain range lies along the western side of the South Island. NZ lies astride the boundary of two tectonic plates, and so is a dynamic landscape prone to earthquake activity
Several of LU’s degree programmes focus on sustainable management of environment and resources. At postgraduate level, programmes include Masters degrees in: Resource Studies; Science (Environmental and Biological Sciences); Environmental Policy; Indigenous Planning and Development; Landscape Architecture; and Parks, Recreation and Tourism. LU has also been a pioneering university in NZ in development of its environmental policy and practices (Spellerberg et al., 2004).

Nationally, NZ’s main income streams flow from primary production and tourism. This adds an economic impetus to the pursuit of sustainability. Drivers for this pursuit include the following factors: NZ has an intrinsic desire to protect its unique environment, ecosystems and biota; international markets increasingly demand “clean” agricultural products from approved and secure sources; and NZ must protect its image for tourism.

Thus, three factors combine to make LU a university inherently suited to teach sustainability in an international context:

1. It specialises in education and research for the management of the environment and its resources, offering degrees in, e.g. agriculture, environmental science, conservation and ecology.
2. It has a strongly multi-national campus, and staff have strong international linkages and collaborations, in both teaching and research.
3. The national economy relies strongly on a “clean environment”.

Since, 2000, Lincoln has developed strong partnerships with two European Universities, to create two globally unique and innovative Masters degrees, connecting northern and southern hemispheres in jointly taught, jointly awarded degrees:

1. The MNaRMEE, offered jointly since 2003 by LU and the University of Natural Resources and Applied Life Sciences (BOKU), Vienna, Austria (Spellerberg et al., 2007).

2. The Master of International Nature Conservation offered jointly since 2004 by LU and the University of Goettingen, Germany.

Emergence of these two sustainability-oriented, international degrees has coincided closely with the launch in 2005 by the United Nations of the Decade of Education for Sustainable Development (DESD, 2005-2014).

Since, the central focus of the MNaRMEE degree is sustainability on both international and regional scales, the authors decided that it was necessary and timely to introduce a new Masters-level subject, entitled “Aspects of sustainability: an international perspective”. Here, the authors describe the structure and content of that subject, and its progress in its first two years of operation, with the aim of offering a model for the study of sustainability issues at postgraduate level.

**Development and content of the subject**

There were two main incentives for introduction of this subject. First, LU has historically had a high proportion of international students at postgraduate level. Given the ascendency of sustainability, it became timely to offer a distinct subject devoted to sustainability with a clearly international perspective. Second, the new
MNaRMEE degree arose from a joint desire by its two partner universities (LU and BOKU) to combine both their common and complementary skills and offer a jointly-awarded degree not constrained by the culture, viewpoints and available resources of a single nation, but founded on a wider cross-global basis.

Central aims
The central aims of the subject are to establish the following:

- **Generic meanings of “sustainability” and “sustainable development” (SD), and their distinction.** Appendix 1 presents an explanation of this distinction, by means of a human health analogy (This analogy is given to the students to aid concept-building).
- **Context-specific meanings of SD.** Within specific and dominant sectors of human activity, including: materials use; energy use; urban and physical resources (including water use and waste management); primary production (agriculture, forestry); transport; economics; and tourism.
- **The criticality of international collaboration.** Centuries ago, “SD” was largely a local issue determined only by local practices. The globalisation of trade and traffic means that much of our environmental impact is now internationalised, demanding collaboration, or “sustainable development sans frontiers”.
- **The drivers for SD.** These include: international drivers such as the multiplicity of multilateral agreements and conventions, and the international network of organisations (including NGOs) promoting SD; national or regional drivers, such as legislation; and trade and economic drivers.
- **Measures of progress toward sustainability.** These include ecological footprints; product life-cycle inventories; greenhouse gas budgets.
- **A multi-disciplinary approach.** While some postgraduate programmes infuse sustainability into teaching within specific disciplines (e.g. within an engineering programme, Leal Filho, 2002) this subject does so in an interdisciplinary way.

Structure and content of the subject
In line with LU requirements for Masters-level subjects, the subject occupies one semester, or 15 weeks (12 being formal teaching weeks), and has a target student workload of 200 h. Thus, a full-time postgraduate student taking subjects only will take three subjects per semester. The structure includes: one 2-h session per week, with formal presentations, either by guest presenters or by the students themselves; a weekly 1-h tutorial/discussion session; plus self-directed study, including preparation of the major assignment (Appendix 2) and of the two oral presentations.

Key components of the subject include the following (Table I):

1. **Introductory session.** Motives for the subject, key concepts and definitions.
2. **Student definitions of sustainability.** In week two, students each give a short presentation on their own a priori perspectives on SD – either from a “first principles” approach, or in terms of specific actions required for SD (e.g. in everyday lifestyle and behaviour).
3. **Guest speakers.** Table I shows a programme of presentations.

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**Education for sustainability**
Field trips. These are viewed as critical, to connect the ideology of SD with current real-world practices. The two trips are:

- Waste management. Visit to a landfill site plus a city “Recovered Materials” (recycling) centre. These illustrate practices at approximately the opposite ends of the waste management spectrum.
- Sustainable farming. Visit to an organic farm, illustrating the cyclic use of resources, and principles of biological control of crop pests and diseases.

The major assignment. The main objective of the assignment is to enable detailed insight into collaborative, international efforts at achieving SD. Each student selects one of the numerous multilateral agreements, and/or one of the multiplicity of organisations which are guiding nations towards cooperative action for sustainability. Appendix 2 shows the structure of the assignment, including lists of some of the leading international treaties, conventions and organisations.

Student presentations on their assignments.

Progress in the first two years (2004-2005)
An antecedent version of the subject, entitled “Perspectives on sustainability” was offered from 2000 to 2003. The rationale for that subject was to present the students with a wide range of distinct disciplinary perspectives on sustainability. This was achieved via a series of guest speakers (one per week in a 2-3h session), and by ensuring that the topics were wide ranging (from sustainability and forestry to social theory and sustainability). This structure was criticised by the students for being: too theoretical; disconnected and lacking continuity; and too biased towards science. Despite guest lecturers being well briefed and the fact that the subject’s examiner (i.e. coordinator) was always present, the different “stand-alone” perspectives were

<table>
<thead>
<tr>
<th>Week no.</th>
<th>Topic</th>
<th>Presenter(s)</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction to subject. Key concepts and definitions.</td>
<td>Staff</td>
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<tr>
<td>2</td>
<td>Measures of sustainability</td>
<td></td>
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<tr>
<td>3</td>
<td>Student “definitions” and examples of sustainability</td>
<td>Students (10 min each)</td>
</tr>
<tr>
<td>4</td>
<td>Field trip: landfill site and a resource recovery centre</td>
<td>Waste management tour guide</td>
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<tr>
<td>5</td>
<td>Atmosphere and climate. Roles of the Kyoto and Montreal Protocols</td>
<td>Visiting speaker</td>
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<tr>
<td>6</td>
<td>Transport systems, fuel and sustainability</td>
<td>Visiting speaker</td>
</tr>
<tr>
<td>7</td>
<td>Agriculture – conventional and organic farming. Visit to organic farm</td>
<td>University staff</td>
</tr>
</tbody>
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Mid-semester break

<table>
<thead>
<tr>
<th>Week no.</th>
<th>Topic</th>
<th>Presenter(s)</th>
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<tbody>
<tr>
<td>7</td>
<td>Ecological economics/life cycle assessments</td>
<td>Visiting speaker</td>
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<tr>
<td>8</td>
<td>Ecological economics</td>
<td>University staff</td>
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<tr>
<td>9</td>
<td>Tourism and sustainability</td>
<td>University staff</td>
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<tr>
<td>10</td>
<td>Urban and physical environment – basics</td>
<td>University staff</td>
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<tr>
<td>11</td>
<td>Urban and physical environment – a city manager’s perspective</td>
<td>Visiting speaker, city council</td>
</tr>
<tr>
<td>12</td>
<td>Student oral presentations on their major assignments</td>
<td>Students (10 min each)</td>
</tr>
</tbody>
</table>

Table I. Programme for the subject, including guest speaker presentations
disconnected and did not maintain continuing themes. Also, the students felt that there was insufficient time for detailed discussion of each distinct presentation.

The current version of the subject, run in 2004 and 2005, was redesigned with the following features:

- Suitable for students from any discipline or programme area (including science, engineering, environmental or resource studies, social sciences or commerce).
- Suitable for an international student audience. This is reflected in the change of title from “Perspectives on sustainability” to “Aspects of sustainability: an international perspective”.

The subject was still constrained by the 12 week semester, so the following features were introduced:

- Unifying themes: international aspects of sustainability; putting sustainability into practice; barriers to SD; tools for measuring sustainability.
- Emphasis on students learning from each other.
- More balanced content, including interactive sessions in class.
- Formal presentations given by both “teachers” and students, plus tutorials and discussion sessions.

All contributors to the subject are asked to put their material into an international context and to avoid an excessively theoretical approach. Sessions include emphasis on the tools for establishing or measuring sustainability (such as environmental management systems, indicators of sustainability and ecological footprints), and achievement of sustainability in practice. The practical emphasis includes the two field trips.

The value of what students can bring to the class cannot be over-emphasised. From the start, all students are encouraged to share their values, beliefs and disciplinary expertise (Table I). This has contributed greatly to the students’ learning. The introduction of time for discussion (tutorials) has allowed the students to gain much more from the formal seminars.

The two classes to date have included students from NZ, UK, Austria, Germany, Hungary, USA, Canada and Tanzania, with disciplinary mix as follows:

- 2004: 14 students, including 4 from the international MNaRMEE degree, and 10 from programmes in Applied Science, Resource Studies, Environmental Policy, and Tourism.
- 2005: 16 students, including 10 from the international MNaRMEE degree, and 6 from programmes in Applied Science and Resource Studies.

Assessment

In the antecedent (2000-2003) version of the subject, assessment was based only on the given course work. This was not successful for two reasons: the students became too preoccupied with assessment; and they were not given the incentive to read widely around the subject. In the new version, assessment is based on: the major written assignment (30 per cent, see Appendix 2); two oral presentations (each 10 per cent); and a main written examination (50 per cent).
Student evaluations of the subject

Table II shows a summary of the improvements achieved between the antecedent and current versions, as gauged by LU’s standard “subject evaluations” which are completed independently by the university’s teaching and learning service.

Table II shows a clear improvement in student assessment of the subject. We conclude that the changes made are more appropriate for the effective teaching of sustainability in an international context.

We aim to continue improvement of the content and delivery, by retaining the current methods while ensuring that:

• the content is updated and set in its ever-changing international context;
• the students are encouraged to learn from each other;
• the content is multidisciplinary; and
• the content has a practical emphasis.

Conclusions

The authors are committed in their teaching, research and personal lifestyles to aid human progress towards SD. This is reflected in their contributions to novel international degree programmes, and in the subject described here. Introduction of this subject at LU contributes to “curriculum greening” and is complemented by “operational greening” on the LU campus (Spellerberg et al., 2004). It also addresses the recommendations for tertiary education of NZ’s Parliamentary Commissioner for the Environment (PCE, 2004). Globally, we see increasingly unavoidable imperatives for SD, and hence a “need for graduates to develop a ‘literacy’ in sustainability” (Thomas, 2004). As a result there is a visible strengthening of the emergence of the quest for SD at all levels: in international, regional, national, sectoral (e.g. energy, transport) and business agendas. In parallel, with this, there are increasing career opportunities for graduates who combine traditional skills with a sound understanding of both the meaning of SD and the practical pathways to

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<tr>
<th>Question</th>
<th>Score in 2005 evaluation of new version</th>
<th>Score in 2003 evaluation of prior version</th>
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<tbody>
<tr>
<td>Did the learning objectives accurately reflect the content of this subject?</td>
<td>1.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Was the content covered as described in the subject outline?</td>
<td>1.7</td>
<td>3.6</td>
</tr>
<tr>
<td>Were the teaching methods effective?</td>
<td>1.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Were the instructional resources available?</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Were the assessment tasks clearly related to the subject content and objectives?</td>
<td>2.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Was the subject well managed?</td>
<td>1.8</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Note: A score of 1 indicates that the condition “always occurred” 2 indicates “usually” 3 indicates “sometimes” and 4 indicates “never occurs”. Thus, 1.0 represents the ideal score.

Table II. Key results from student evaluations of the two versions of the subject: the antecedent version (run in 2000-2003), and the “new” version, run in both 2004 and 2005.
sustainability. The subject described above helps provide these skills, in the increasingly important context of globalisation.

We conclude with a quote from one 2005 student whose assignment addressed international energy issues:

We are all in this together. The great divide between developed and developing countries needs to be overcome as increasing interdependency becomes inevitable.

Note
1. Note on terminology. At Lincoln University (LU), a “subject” represents a unit of study. A typical Masters degree will contain six subjects per year (three per semester). In other universities, the word “subject” may be replaced by “paper” or “course”. A subject at LU involves a total of 200h of student work, and is approximately equivalent to ten ECTS in the European Credit Transfer Scheme. (60 ECTS is equivalent to one study year).

References


Appendix 1. Clarifying the distinction between “sustainability” and “sustainable development” – an analogy given to the students

“Sustainability” is a condition. By contrast “sustainable development” (SD) is the means by which we achieve it. The term “development” is a good choice – it implies an unfolding or evolution of human activities, and of the controlling events and circumstances, and allows for change (hopefully improvement), e.g. it allows for gradual development of new technologies to substitute non-renewable with renewable resources.

As an analogy, “sustainability” can be likened to a condition of “good health” in a person. The parallel for “SD” is then the “healthy lifestyle” (including diet, activities, and social and medical infrastructure) required to achieve and maintain the condition.

To extend the analogy, a healthy lifestyle is achieved partly by trial and error (e.g. discovering compatible foods or activities, allergens to be avoided). Similarly, SD is a trial-and-error pathway of human development, leading to the condition of sustainability.
Appendix 2. Structure of the main assignment

Purposes

The purposes of the assignment are as follows:

- *To describe and assess.* An international agreement and/or an international organisation and its contribution to SD.
- *Understanding the international scene.* It should enable the student to understand part of the international setting for progress towards sustainability. There is a confusing multiplicity of international agreements (including conventions and protocols) designed to guide nations towards cooperative action for SD (Appendix 3). There is also an even greater multiplicity of international, regional, national and local organisations (including institutes and research centres) which are actively contributing, each in its own small way, to the practical implementation of sustainability (Appendix 4). This assignment should help students gain clearer understanding of one part of that complex network of agreements and organisations.
- *Pursuing own interests.* The project enables students to pursue their own specific interests, by research into one or more of the above agreements and/or organisations.

Outputs

Students are required to submit a written project of minimum length c. 3,000 words (about six pages of single-spaced 12-point text), and to give an oral (seminar) presentation to the rest of the class on that project. The project is worth 40 per cent of the total assessment as follows:

- Written report: 30 per cent; and
- Oral seminar presentation: 10 per cent

Note: While the subject title includes the term “sustainability” students may also use the terms “SD” or “sustainable management” but must explain what they mean by these terms.

Notes for guidance (given to students)

A combination approach. You may find that, by focussing on only one agreement or organisation, there is insufficient material for a project. However, recognise that there may be important (or even critical) synergies and cross-linkages between some of the agreements, between some of the organisations, and especially between agreements and organisations. For example, there is a critical link between (a) the Kyoto Protocol (an intended agreement) and (b) organisations such as the IPCC (the international organisation whose evidence substantiates the Protocol) or the APN (which fosters research to understand and mitigate climate change).

Therefore, please consider a combination approach, e.g. a project on an agreement will be greatly enhanced by inclusion of organisation(s) responsible for its inception, formulation or implementation. Or you may choose to discuss the interacting roles of several organisations (e.g. if you are addressing food security and agricultural sustainability, you may wish to include food policy, agricultural technology and food production).

NB Appendices 1 and 2 list most of the main agreements and organisations, but they are not complete lists. You may wish to report on other agreements or organisations. If so, please first obtain the approval of the subject examiner.

Provide a contextual definition of SD. Since, sustainability is the central theme for all the reports, you should attempt to define what sustainability means in the context of your selected project, e.g. if you are dealing with biological conservation, how would you define, recognise or monitor “sustainability” or SD in the context you have chosen.
Be critical. Avoid presenting a purely passive review and description. Your project will be greatly enhanced by a critical approach, e.g. by: pointing to particular merits or flaws in the rationale underlying an agreement or organisation; or discussing the extent to which an agreement or organisation might in practice significantly under-perform in international efforts to achieve genuine sustainability; or giving specific suggestions on how an agreement or organisation could be improved.

Provide illustrations. An interesting report contains meaningful illustrations to break up the text, e.g. a map showing the location of an organisation, or the geographical domain of an agreement or action. Present any key data in a table or a conceptual diagram, rather than in running text. Illustrations should occupy space additional to the recommended 3,000 word total.

Outline of report.

• Title.
• Summary of the report.
• Introduction. Your motives for selecting this topic. Its importance: how much will the agreement and/or organisation(s) contribute to sustainability, or conversely what are the penalties for inaction?
• Main body of report. Be reader-friendly! Avoid multi-page blocks of unbroken text. Break this into subsections with sub-headings. Incorporate illustrations locally in this section to help readability. Include sections on: the historical context; geographical extent of the agreement, or domain of authority or action of the organisation; the meaning of “sustainability” or SD in the context of your topic.
• Conclusions.
• References. You will most likely need to include www references. Quote the URL in full, and note the date accessed, e.g. “Retrieved August 2005”.
• Appendices. E.g. an Appendix to present the original text of an agreement or convention.

Appendix 3. Multilateral environmental agreements
The following are examples of core environmental conventions and related agreements of global significance:

(1) Atmosphere-related conventions:
• United Nations Framework Convention on Climate Change (UNFCCC), 1992.
• Kyoto Protocol to the UNFCCC, 1985.

(2) Nature- and biodiversity-related conventions:
• UN Convention on Biological Diversity (UNCBD), 1992.
• Convention on Migratory Species (CMS), 1979.
• Convention on Conservation of Antarctic Marine Living Resources (CCAMLR), 1982.

(3) Chemicals and wastes-related conventions:
(4) Land convention:

(5) Other multilateral environmental agreements and programmes:
   - Agenda 21. A blueprint to encourage sustainability into the 21st century.
   - Man and the Biosphere Programme (MAB) – UNESCO.
   - World Heritage Convention (WHC) – UNESCO.

(6) Information sources on global and regional environmental conventions (available at the UNEP website: www.unep.ch):
   - ECOLEX (information on environmental law).
   - ENTRI (Environmental Treaties and Resource Indicators).

Appendix 4. Organisations and institutes which promote sustainable development
The following is a list of some of the leading international organisations and institutes with aims and activities which include a strong focus on the promotion of sustainability. They range from policy-making, through health, to organisations focussing on the specific technologies required to transform practice.

In reality there is a host of more local organisations which aim to help societies and communities achieve sustainability. Some examples in Christchurch include Agenda 21, the Sustainable Cities Trust, the Recovered Materials Foundation.

*International organisations*

- CGIAR: Consultative Group on International Agricultural Research, supporting 16 autonomous research centres which focus on primary production (agriculture, forestry, fisheries) and related land and water management, aiming at sustainable food and fibre production. Four examples are: International Food Policy Research Institute (IFPRI, Washington, DC); International Rice Research Institute (IRRI, Philippines); World Agroforestry Centre (ICRAF, Kenya); and the WorldFish Centre (Malaysia).
- IETC: International Environmental Technology Centre.
- APN: Asia Pacific Network for Global Change Research.
- IPCC: Intergovernmental Panel on Climate Change.
• IWAC: International Water Assessment Centre.
• ICSU: World Council for Science.
• IUCN: International Union for the Conservation of Nature.
• World Bank.
• Diversitas: An international organisation to promote biological diversity science.

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