

Finding the common ground: Is there a place for sustainability education in VET?

David Goldney

Tom Murphy

Western Research Institute

John Fien

RMIT University

Jenny Kent

previously NSW Department
of Education and Training



Need more information on vocational education and training?

Visit NCVER's website <<http://www.ncver.edu.au>>

- ✓ Access the latest research and statistics
- ✓ Download reports in full or in summary
- ✓ Purchase hard copy reports
- ✓ Search VOCED—a free international VET research database
- ✓ Catch the latest news on releases and events
- ✓ Access links to related sites



Finding the common ground

Is there a place for sustainability
education in VET?

David Goldney

Tom Murphy

Western Research Institute

John Fien

RMIT University

Jenny Kent

previously NSW Department of Education and Training

The views and opinions expressed in this document are those of the author/project team and do not necessarily reflect the views of the Australian Government, state and territory governments or NCVER

Publisher's note

Additional information relating to this research is available in *Finding the common ground: Is there a place for sustainability education in VET?—Support document*. It can be accessed from NCVER's website <<http://www.ncver.edu.au/publications/1718.html>>.

To find other material of interest, search VOCED (the UNESCO/NCVER international database <<http://www.voced.edu.au>>) using the following keywords: sustainability; education for sustainability; sustainable development; ecological sustainability; environmental management.

© Australian Government, 2007

This work has been produced by the National Centre for Vocational Education Research (NCVER) on behalf of the Australian Government and state and territory governments, with funding provided through the Australian Department of Education, Science and Training. Apart from any use permitted under the *Copyright Act 1968*, no part of this publication may be reproduced by any process without written permission. Requests should be made to NCVER.

The views and opinions expressed in this document are those of the author/project team and do not necessarily reflect the views of the Australian Government, state and territory governments or NCVER.

The author/project team was funded to undertake this research via a grant under the National Vocational Education and Training Research and Evaluation (NVETRE) Program. These grants are awarded to organisations through a competitive process, in which NCVER does not participate.

The NVETRE program is coordinated and managed by NCVER on behalf of the Australian Government and state and territory governments, with funding provided through the Department of Education, Science and Training. This program is based upon priorities approved by ministers with responsibility for vocational education and training (VET). This research aims to improve policy and practice in the VET sector. For further information about the program go to the NCVER website <<http://www.ncver.edu.au>>.

ISBN 978 1 921170 78 2 print edition

ISBN 978 1 921170 84 3 web edition

TD/TNC 89.04

Published by NCVER

ABN 87 007 967 311

Level 11, 33 King William Street, Adelaide SA 5000

PO Box 8288 Station Arcade, Adelaide SA 5000, Australia

ph +61 8 8230 8400, fax +61 8 8212 3436

email ncver@ncver.edu.au

<<http://www.ncver.edu.au>>

<<http://www.ncver.edu.au/publications/1718.html>>

Foreword

This research was undertaken under the open category of the National Vocational Education and Training Research and Evaluation Program.

The impact of human activity on the environment, and the implications this may have for future generations, are high-profile matters; for example, turbulent patterns in our weather, access to a sustainable water supply, and sources of future energy should world oil stocks dwindle. The role of educators in giving citizens and members of the workforce an informed basis upon which to review and modify their behaviour is important. This project examines an aspect of this, by exploring the role that vocational education and training (VET) policy and practice can make towards increasing knowledge and understanding of environmental issues. It primarily draws together some of the key concepts, international trends and issues regarding the role that education systems can take to establish and promote sustainable development.

The report will be most useful for those in VET delivery, industry, and government who are interested in the topic of environmental sustainability and sustainable development. In the Australian VET context, this report should be read in conjunction with:

- ✧ Anderson, D 2003, 'From productivism to ecologism: Dilemmas, issues and strategies for VET', *Australian Vocational Education Review*, vol.10, no.1, pp.1–14.
- ✧ Ferrier, F 2001, 'Can VET meet the skill needs of new industries? Case studies of two "green" industries', in *Knowledge demands for the new economy: Proceedings of the 9th annual international conference on post-compulsory education and training—volume one*, eds F Beven, C Kanen and D Roebuck, Centre for Learning and Work Research, Brisbane, pp.223–30.
- ✧ Kyle, L 2003, *Sustainable futures: A report identifying women's pathways and participation in emerging skills areas in environmental management and technology*, Equity Research Centre, Collingwood, Victoria.
- ✧ Plane, K 2003, 'Embracing change: Reengineering VET for triple bottom line and developing sustainable learning regions for the future', Sixth Australian VET Research Association conference: *The changing face of VET*, <http://www.avetra.org.au/abstracts_and_papers_2003/K.Plane.pdf>.

I am grateful to the research team at Western Research Institute for agreeing to continue the work on this project when the original lead researcher became unavailable.

Tom Karmel
Managing Director, NCVER

Acknowledgements

We would like to acknowledge:

- ✧ The National Centre for Vocational Education Research (NCVER) for funding this research, and to staff for valuable advice, understanding and provision of additional key resources
- ✧ NSW TAFE staff, in particular Peter Batten, Associate Director, TAFE NSW Primary Industries and Natural Resources Curriculum Centre, who facilitated the transition of this project from TAFE to Western Research Institute
- ✧ Peter Andrews (landholder), Brian Powell (inventor), Dr Donna Windsor (restoration ecologist), and Professor Peter Newman (academic) for providing materials to create four of the five 'good news stories' that form part of this report. Our thanks also to Professor Peter Newman for providing a copy of *Western Australia State Sustainability Strategy* and *Training for sustainability: The vocational education and training sector*
- ✧ Ms Sarah Medway, administrative officer with the Western Research Institute
- ✧ Karen Davidson, research assistant, Western Research Institute
- ✧ Luciana Mazzotti and Barbara Murphy for revamping and authoring the literature review initially prepared by Jenny Kent.

Contents

Key messages	7
Executive summary	8
Introduction	11
Purpose of this project	11
Aims and objectives	11
Research questions	11
Methodology	11
Outline of this report	12
What is education for sustainable development?	13
Sustainability and sustainable development	13
The role of education in sustainable development	15
Education for sustainability in Australia	16
In summary	17
Sustainable development and VET: International trends	19
Introduction	19
International policy development	19
England: Learning to last	20
In summary	21
Australian policy on VET and sustainability	22
Introduction	22
Australian Government policy influences on VET	22
National sustainability policy	23
Industry policy	23
The great policy divide	24
In summary	25
Future nature of work and sustainability in VET	26
Introduction	26
Generic skills, VET and education for sustainability	26
VET pedagogy: Compatibility with education for sustainability	27
National training packages and sustainability	28
In summary	29

Barriers to sustainability in VET	30
Introduction	30
Lack of a shared national vision	30
Lack of adequate resources and trained personnel	30
Existing VET culture, pedagogy and training packages	31
In summary	31
VET and education for sustainability: The common ground	32
Conclusions and proposed actions to encourage the adoption of education for sustainability in VET	34
References	37
Support document details	40
Appendix 1: Good news stories	41

Key messages

Society is becoming increasingly aware of the need to sustain and repair the environment for future generations, and to incorporate environmental concerns when making social, political or economic decisions. Education is a key agent of change in this process and involves integrating knowledge and understanding about sustainability into practical, vocational skills. ‘Education for sustainability’ is now a widely accepted concept which seeks to promote and develop sustainability skills and awareness throughout a learner’s educational pathway.

- ✧ The vocational education and training (VET) sector has a key role to play in promoting sustainability education, both in policy and practice. The development of practical skills which promote sustainability in the workplace will be vital for employers of the future and for the wider community.
- ✧ Training packages are a practical means of integrating sustainability into vocational education and training. The current incorporation of generic or life skills into VET programs—rather than merely technical, occupation-specific skills—leads the way for a similar integration of long-term sustainability skills.
- ✧ VET practitioners already use teaching practices which are appropriate for sustainability skills. These include action learning, group learning and problem-solving. However, restrictive curriculum requirements limit the ability of training providers to incorporate sustainability concepts into their courses.
- ✧ If they are taught sustainability skills throughout their education, learners can develop the ability to promote these concepts in the workplace, devise and encourage sustainable work practices, and develop strategies for negotiating and justifying desirable changes with colleagues and managers.

Executive summary

This report seeks to answer the question of whether there is a place for the concept of ‘education for sustainability’ in vocational education and training (VET) policy and practice. It explores where and how ideas of environmental sustainability could be built into VET policy and practice, as well as the common links between sustainability and VET skill needs. Specifically, this report identifies ways in which sustainability education can assist the VET sector in addressing the challenges posed by globalisation in relation to the future nature of work and organisational capacity.

The term ‘sustainability’ does not have a set definition and can mean a range of things to a range of people. However, in general, the concept of sustainability proposes a balance between biophysical, economic, social and political systems in development (Fien 2001). It also seeks to ensure that society meets ‘the needs of the present without compromising the ability of future generations to meet their own needs’ (World Commission on Environment and Development 1987).

Underpinning the concept is a series of agreed principles which show what sustainability might mean in practice. These include:

- ✧ giving equal weight to environmental, social and economic factors in decision-making
- ✧ taking a precautionary approach and allowing for possible risk factors
- ✧ ensuring that environmental assets are valued, and taking into account their ‘costs’ when valuing goods and services
- ✧ ensuring that future generations have equal access to the resources we enjoy and the same or better quality of life
- ✧ ensuring the full participation of people in democratic decision-making
- ✧ understanding and recognising the global dimensions of our actions.

To achieve a sustainable future, society needs to undergo a significant shift in attitudes and behaviours. Education is regarded as the key to changing behaviour and, worldwide, education for sustainability has been identified as a means of achieving this change for future generations. On an international level, the push for sustainability education is led by the United Nations. In Australia, the VET system has a central role to play in the adoption and promotion of practices which encourage sustainability.

Despite a national and international push for sustainable development and education for sustainability, significant barriers exist to their implementation in vocational education and training.

This report examines the current VET environment in Australia to identify the challenges and problems that lie ahead and to develop possible solutions. A literature review and interviews have been used to determine national and international attitudes towards sustainability and current practice, with particular reference to the VET sector. The complete literature review has been provided as a support document to this report and can be found on the NCVET website <<http://www.ncver.edu.au/publications/1718.html>>. This report has also been reviewed by an independent panel of individuals in the fields of education and environment.

There are a number of international examples of how the concept of sustainability can be integrated into the education system. England, in particular, provides a stand-out case for a whole-of-government, unified approach to the issue. A series of actions required to achieve sustainable development has been incorporated into a ten-year strategy for the development of education for sustainability (Learning and Skills Council 2005).

The approach to sustainability in Australia is less coherent. *Environmental education for a sustainable future: National action plan* (Commonwealth of Australia 2000a) is an intergovernmental agreement for the inclusion of environmental education into the Australian system. However, implementation is also influenced by national VET policy, as well as Australian Government strategies for sustainability and strategies implemented by individual government departments. If Australia is to commit to this initiative, the policy divide must be overcome by these groups all working together in a unified approach.

The lack of understanding as to how education for sustainability can be incorporated into vocational education and training provides an additional obstacle to its implementation. While VET practitioners are already engaged in teaching styles which could facilitate sustainability education—action learning, problem-solving and group learning—some fundamental contradictions remain. In particular, restrictive curriculum requirements limit the likelihood of training providers accepting sustainability education as a valuable aspect of their courses.

Given the increase in environmental awareness and the importance of employability skills, the workplace of the future is likely to require more generic cognitive and behavioural skills, in addition to technical competency. The ability of the VET sector to accommodate this need will be limited by a number of significant barriers. These include a lack of shared national vision; a lack of adequate resources and trained personnel; and existing VET culture, delivery systems and training packages.

There is undoubtedly a place for education for sustainability in VET policy and practice. In fact, if vocational education and training is to remain relevant in the changing workplace and community in general, the integration of sustainability education in policy and practice should become mandatory. However, for the VET sector to take on this role, there will need to be:

- ✧ a new paradigm that recognises the need for broader, generic skills in training. It should also develop and take an active role in the integration and evaluation of sustainability skills within industry training packages
- ✧ public funding arrangements for vocational education and training that contribute to this integration in training packages, hence providing incentives to training providers to fund sustainability courses or subjects
- ✧ a more united approach by government to sustainability, by incorporating environmental policy across all government portfolios, rather than limiting it to single departments
- ✧ a re-examination of industry's role in VET policy-making, to allow the inclusion of broader policy goals rather than the more narrow economic focus commonly held by industry.

Further, nine suggestions for further action have been made—drawn from previous research and incorporating ideas from this report—to develop a comprehensive list of actions which will encourage the adoption of sustainability education in vocational education and training. These are explored in the final chapter of this report and include:

- ✧ developing a national approach and vision to implementing education for sustainability in VET policy and programs
- ✧ encouraging a culture of sustainability awareness in the VET sector
- ✧ determining an appropriate VET pedagogy, or teaching and learning practice, which will promote sustainable development

- ✧ embedding sustainability principles in VET policy, practice and training packages
- ✧ identifying areas in particular need of sustainability training
- ✧ encouraging and facilitating the adoption of sustainability across the entire education sector
- ✧ pursuing a nationwide, united transition towards sustainable development
- ✧ adequately resourcing the VET sector to implement the required change
- ✧ establishing sustainability implementation and delivery groups within vocational education and training.

Introduction

Purpose of this project

The purpose of this research was to explore and describe the principles of education for sustainability in the context of vocational education and training (VET) policy and practice.

Aims and objectives

The research aims to identify:

- ✧ where and how concepts of sustainability could be built into vocational learning through Australian VET policy and practice in response to national environmental education strategy and in preparation for the United Nations (UN) Decade of Education for Sustainable Development (began in 2005)
- ✧ the common issues between education for sustainability and VET skill needs, and how sustainability approaches can assist the VET sector in addressing the challenges posed by globalisation in relation to the future nature of work and organisational capacity.

Research questions

- ✧ What relevance do education for sustainability principles have for the Australian National Training Authority's national strategy? (ANTA 2003b)¹
- ✧ What is the common ground between education for sustainability and vocational education and training?
- ✧ What aspects of national policies and trends regarding sustainable development are relevant to the VET sector and what are the implications of these?
- ✧ What can the VET sector learn from sustainability theory and practice to address the impacts of globalisation on the future nature of work, workers and workplaces?
- ✧ What aspects of education for sustainability could be integrated within vocational education and training and how might these influence the development of VET policy and pedagogy, or teaching and learning practices?

Methodology

This report is a comprehensive review of national and international attitudes towards sustainability education and its current practice, with particular reference to VET sector. The Western Research

¹ ANTA was abolished in July 2005; however, all responsibilities and functions of the authority passed to the Department of Education, Science and Training.

Institute was approached mid-way through the project to complete the report after the departure of initial co-author, Jenny Kent. Upon commencing the project, the institute was provided with:

- ✧ a partially completed literature review
- ✧ limited data from two interviews (held with representatives of the Australian Council for Private Education and Training and the Insurance Australia Group)
- ✧ an incomplete draft report with comments from two anonymous reviewers
- ✧ various scripts and administrative materials.

From this point, the Western Research Institute continued to work with Professor John Fien (also an initial contributor to the report) to complete the project. The literature review and interview transcripts were used to provide direction to the main report. The literature review, in particular, was revised to include detailed information of specific concern to the project and is available as a support document on the NCVET website: <<http://www.ncver.edu.au/publications/1718.html>>. Interview material was not directly used in this report, but rather provided direction to the research and suggestions for further action.

The draft report was submitted to a review panel for comment. Reviewers were asked to provide feedback that would value-add to the final report. The panel included:

- ✧ Damon Anderson, Postgraduate Coordinator/Senior Lecturer in Work and Learning Studies, Monash University–ACER Centre for the Economics of Education and Training
- ✧ Joan Cornish, Environment Education Section, South Australian Department of Environment and Heritage
- ✧ Professor Richard Bagnall, School of Vocational, Technology and Arts Education, Griffith University
- ✧ Professor Peter Newman, Director, Institute for Sustainability and Technology Policy, Murdoch University, Chair Western Australian Sustainability Roundtable, New South Wales Sustainability Commissioner
- ✧ Christine Cooper, Principal Lecturer, Western Australian Horticulture and Environmental Science Skills Centre
- ✧ Robin Booth, Manager, TAFE Teaching and Learning, TAFE NSW.

This report combines the work of initial and subsequent authors, as well as those on the review panel.

Outline of this report

This report provides a comprehensive analysis of the concept of education for sustainability in vocational education and training. Firstly, it establishes a basic understanding of this concept, with particular reference to its current status in Australia. It then explores emerging international trends in approaches to sustainability before moving on to current Australian policy regarding education for sustainability in the context of VET. This leads to the question: are the current policies and approaches to sustainability education in Australia adequate to meet the needs of the workplace of the future?

Thirdly, the report includes a discussion regarding the adoption of generic skills to help promote sustainability and the implications of this for pedagogy and national training packages. The barriers to the development of sustainability education in VET in Australia are also examined before the common ground between the two is determined. The final chapter combines recommendations from previous research with those made in this report to provide a set of seven key actions that will help to further the implementation of education for sustainability in vocational education and training.

What is education for sustainable development?

Sustainability and sustainable development

As a concept, sustainability is open to much interpretation and debate. The literature on sustainability equates it to other broad and difficult-to-define concepts, such as ethics and justice. One of the barriers to the VET sector recognising sustainability is the lack of a basic definition or a shared understanding of what the concept entails.

The most commonly held definitions of sustainable development have their basis in the World Commission on Environment and Development's (1987) argument:

The environment does not exist as a sphere separate from human actions, ambitions, and needs, and attempts to defend it in isolation from human concerns have given the word 'environment' a connotation of naivety in some political circles. The word 'development' has also been narrowed by some into a very limited focus, along the lines of 'what poor nations do to become richer', and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of 'development assistance'. But the 'environment' is where we live; and 'development' is what we all do in attempting to improve our lot within that abode. The two are inseparable.

(World Commission on Environment and Development 1987)

In addition, sustainability involves:

... the ability to make development sustainable—to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs ... And furthermore, the concept of sustainable development does imply limits—not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities.

(World Commission on Environment and Development 1987)

Figure 1 outlines the range of definitions of sustainability. The most significant issues have been described as the 'pillars of sustainable development'. Fien (2001) proposes four interdependent systems (or 'pillars') that comprise sustainability:

- ✧ biophysical systems that provide the life support systems for all life, human and non-human
- ✧ economic systems that provide a continuing means of livelihood (jobs and money) for people
- ✧ social and cultural systems that provide ways for people to live together peacefully, equitably and with respect for human rights and dignity
- ✧ political systems through which power is exercised fairly and democratically to make decisions about the way social and economic systems use the biophysical environment (Fien 2001).

Figure 1 Definitions of sustainable development

What is to be sustained:	For how long?	What is to be developed:
	25 years 'Now and in the future' Forever	
Nature Earth Biodiversity Ecosystems		People Child survival Life expectancy Education Equity Equal opportunity
Life support Ecosystem Services Resources Environment	Linked by Only Mostly But And Or	Economy Wealth Productive sectors Consumption
Community Cultures Groups Places		Society Institutions Social capital States Regions

Source: United States National Research Council (1999)

Diamond believes that, despite most people intending to incorporate sustainability principles into their daily lives, there are no really obvious examples of sustainable cities or landscapes to draw on for guidance (Diamond 2005). The Global Scenario Group (1995), together with the United States Board on Sustainable Development, believes it is possible to realise a sustainable future but only if nations are prepared to make a very disciplined commitment to the goals of sustainable development (Raskin et al. 2002).

As it stands, sustainable development is a compromise between elements of the 'green' movement, economists and those who are concerned about the environment (Kates, Paris & Leiserowitz 2005). Sustainable development remains a term which is questioned from both a social and cultural viewpoint. It is also open to widely different interpretations, and thus largely remains an enigma (Fien & Tilbury 2002). Evidence suggests that we are moving away from, rather than towards, the goals of sustainable development, and that human activity is changing and degrading the life support systems on which our survival ultimately depends.

In the 2002 New South Wales Environmental Education Action Plan, *Learning for sustainability*, sustainability is defined as:

... the ability to continue an activity into the future or maintain a state or condition undiminished (or enhanced) over time. Sustainability involves integrated ecological, personal and social (including economic) goals and implies change in behaviour and practices by individuals and organizations. (New South Wales Council on Environmental Education 2002)

Or perhaps, more simply, 'sustainability is ultimately about maintaining the resilience of the combined human and environmental system over many generations' (Swart, Raskin & Robertson 2002).

Underpinning this definition is a series of principles outlined by the 1992 National Strategy for Ecologically Sustainable Development (Commonwealth of Australia 1992a), which enhance our understanding of what sustainability might mean in practice. These include:

- ✧ giving equal weight to environmental, social and economic concerns in the decision-making process
- ✧ taking a precautionary approach to action, to lessen the possibility of risk
- ✧ ensuring that environmental assets are valued and their 'costs' internalised in the valuing of goods and services
- ✧ ensuring that future generations have equal access to the resources we enjoy and a similar or better quality of life
- ✧ ensuring the participation of the community in democratic decision-making
- ✧ understanding and recognising that our personal and political actions have implications on a national and international scale.

The role of education in sustainable development

The role that education could play in helping to achieve the goals of sustainable development has gradually gained prominence. Since the 1970s, international processes have formally recognised environmental education as vital to sustainability. At the World Summit for Sustainable Development in 2002 governments agreed to 'integrate sustainable development into education systems at all levels ... in order to promote education as a key agent for change' (Parliamentary Commissioner for the Environment 2004).

Beginning in the late 1960s and early 1970s, environmental education has always helped to promote and increase a greater environmental 'consciousness' and a recognition of the complex social, economic and environmental issues which challenge our world. As a testament to this, education for sustainability is now a recognised and accepted international policy imperative (Greenall Gough 1997; Fien 2001). Teaching the concept of sustainability will require the education system to create fundamental behavioural change and to provide learners with the ability to critically analyse and change the world in which they live.

To date, one of the key issues in exploring the relevance of sustainability education for vocational education and training is that much of the literature and policy-making is based upon the view of this sector as a supplier of skilled labour to industry. This purely economic perspective makes it difficult for the sector to respond effectively to emerging social and environmental priorities. Anderson (2003) attributes this to the culture of 'productivism' in vocational education and training, 'which presupposes that economic growth is a permanent and necessary feature of human existence, regardless of its environmental impact and consequences' (Anderson 2003, p.1).

By giving precedence to economic interests, productivism tends to subordinate the needs of individual students to those of industry, and give priority to work and 'employability' over other non-economic outcomes of learning. This has resulted in the VET sector being seen as a means of providing only 'training for growth' and 'skills for work', two goals which do not take into account the broader charter of the sector. This includes trying to serve the needs of a world which is becoming increasingly influenced by the concept of globalisation, as well as providing development in the areas of personal autonomy, citizenship and sustainability. Thus, there are both opportunities and challenges regarding the establishment of education for sustainability in the VET system in Australia. In particular, it requires a shift in mindset in both teaching and learning in vocational education and training to balance the traditional focus on productivism, the preparedness of students for work, and the development of practical skills and technical ability (Anderson 2003).

While economic and social objectives are important, to focus on these with little regard for the capacity of the environment is in direct conflict with the principles of sustainability. If these principles are ignored, the increasing population and finite resources of the environment will challenge future economic capacity.

Sterling (1996, 2001) has been a key contributor to the discussion on the need to transform education in order to move from unsustainable practices which primarily service the ‘consumerist machine’. There are increasing calls to revise our current systems of education to allow for new ways of teaching and learning which incorporate a vision of sustainability. For decades, international forums and agreements addressing education and sustainable development have identified the need for education to be reoriented to encourage social change which will promote quality of life for all (Tilbury 2002).

Recent work by Coll, Taylor and Nathan (2003) provides a practical exploration of what teaching sustainability may mean to cooperative education, an educational model which could be readily transferable to the VET setting. They suggest that there are three ways in which these two modes of education might be linked:

- ✧ experiential learning, which includes alternative practices of teaching and learning (examples include web-based learning and learning through exposure to theories in practice)
- ✧ exposure to sustainability education: both in the classroom, and then through transferring knowledge and values about sustainability into the workplace
- ✧ integration of this work-based knowledge of sustainability into all areas of experience.

However, the incorporation of sustainability education into workplace training may present a dilemma for learners; it may mean that they have to challenge current workplace practices in order to promote this wider vision.

Education for sustainability in Australia

Australia has accepted the need to direct its education system towards sustainable development and has adopted the *Environmental education for a sustainable future: National action plan* (Commonwealth of Australia 2000a). The national action plan aims to provide leadership to the various education sectors and to be the starting point for national support to achieve ecologically sustainable development. The need to develop environmental competency standards and national training protocols in vocational training is identified as a key priority in the plan.

The action plan also recognises the responsibility of government, industry, media, educational institutions, community groups and individuals to achieve sustainability, and promotes a wider appreciation of the environmental problem. Significantly, the plan states that:

... one of the objectives of environmental education is to develop a fundamental acceptance within the community that the action’s environmental objectives should be accorded the same priority as its social and economic objectives. (Commonwealth of Australia 2000a)

The national action plan has established a range of structural initiatives to promote greater coordination of activities between sectors and organisations. These initiatives include establishing the National Environmental Education Network, which has representation from environmental and educational portfolios across the state and territory governments. Other notable outcomes include the development of a national research body—the Australian Research Institute in Education for Sustainability—at Macquarie University; the development of the Australian Sustainable Schools Initiative; and, in 2005, the release of a National Environmental Education Statement for Australian Schools. This statement provides the first ever nationally agreed

description of the nature and purpose of environmental education for sustainability through all years of schooling. It also highlights a range of approaches to quality teaching and school administration to enhance sustainability within schools and their communities.

New South Wales was the first state to develop its own environmental education policy. *Learning for Sustainability: NSW Environmental Education Plan 2002–2005*, approved by the New South Wales Cabinet in 2002, provides a framework for whole-of-government and whole-of-community action in environmental education.

Other states have shown interest in developing their own environmental education plans, such as *Hope for the future: The Western Australian State Sustainability Strategy—A vision for quality of life in Western Australia* (Government of Western Australia 2003) and *Training for sustainability: The vocational education and training sector* (Newman et al. 2004) which are key policy documents in Western Australia. Victoria has also recently nominated a Commissioner for Environmental Sustainability and has two sustainability policy documents in progress. These are the Environmental Sustainability Framework—Growing Victoria Together and the Sustainability Education and Behaviour Change Strategy—Learning to Live Sustainably.

Decade of Education for Sustainable Development

In recognising the principal role that education plays in promoting sustainability, the United Nations declared a Decade of Education for Sustainable Development which commenced in 2005 (UNESCO 2004a). This initiative is being facilitated by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and is integrated with its other major global educational programs: Education for All and the United Nations Literacy Decade. The aim of the ‘decade’ is to encourage and support all governments to integrate sustainable development into their national education plans at all levels and all sectors of education.

In line with the UNESCO Implementation Scheme, the Australian Government has committed to investigating opportunities for developing sustainability education. Initiatives will be developed in conjunction with the National Environmental Education Council, the National Environmental Education Network, the Australian Research Institute in Education for Sustainability, and through the Australian Sustainable Schools Initiative.

In addition, stakeholders from business, government and the community are encouraged to work towards a common vision of a sustainable Australia. As a result, an industry working group has been involved in considering the main barriers which industry and business face when adopting sustainable practices, and how best to engage industry in change towards sustainability (Allen Consulting Group 1999; Commonwealth of Australia 2004b; Julian 2004). Another group, the Further and Higher Education Working Group, is working to assist universities and VET bodies in addressing the need for greater integration of sustainability principles in core curricula.

In summary

The term ‘sustainability’ is open to many different interpretations. Generally, however, it refers to the ability to ensure that we are able to meet ‘the needs of the present without compromising the ability of future generations to meet their own needs’ (World Commission on Environment and Development 1987). The concept of sustainability proposes a balance between biophysical, economic, social and political systems (Fien 2001). To achieve sustainability, governments, the community and individuals need to change attitudes and behaviours to look beyond a purely economic agenda, and accept that the environment does not have limitless resources.

Education has been nominated as a key agent for change in this process, with education for sustainability growing in prominence both nationally and internationally. Within the education

sector, vocational education and training has a central role to play in changing the way we as individuals approach work and life, by providing the skills to think and act with a wider vision of sustainable development in mind. The *Environmental Education for a Sustainable Future: National Action Plan* (Commonwealth of Australia 2000a) is an intergovernmental agreement for the inclusion of environmental education into the Australian system, and should serve to promote the idea of sustainability on a wider level in different education sectors.

Sustainable development and VET: International trends

Introduction

Internationally, there has been a gradual emergence of theory and practical recommendations about how to integrate sustainable development into vocational education and training. Although the development of ideas has been uneven—both among different countries and across industry and training sectors—there is a body of work which can be drawn upon in Australia. Two main sources of innovation are notable: international policy development and national policy and research initiatives.

International policy development

Since the publication of the 1987 ‘Brundtland Report’—*Our common future* (World Commission on Environment and Development 1987)—sustainable development has been at the forefront of international discussions, policy review and development, and collaborative action. One of the most influential findings of this report was the recognition of the need to view environmental and sustainable development issues as inextricably linked. This theme was taken up at the Second International Conference on Technical and Vocational Education (1999), where it was concluded that a new paradigm incorporating sustainable development into vocational education and training was needed.

As the Bonn Declaration of *Learning for work, citizenship and sustainability* stated:

Since education is considered the key to effective development strategies, technical and vocational education and training (TVET) must be the master key that can ... conserve the environment, ... and help achieve sustainable development ... These TVET initiatives are pivotal to human-centred sustainable development. (UNESCO 2004a)

Several international forums have reiterated the important role that vocational education and training could play in helping to achieve sustainable human development. The 2002 World Summit on Sustainable Development called for all countries and international agencies to meet ‘capacity for training, technical know-how and strengthening national institutions in economically viable, socially acceptable and environmentally sound development’. This represents a broadening of the current VET focus, from the narrow task of providing occupation-specific skills and training for industry, to the broader charter of workforce development and lifelong learning for sustainable development and citizenship.

Reinforcing the need for introducing sustainability to VET policy and practice, the International Labour Organization and UNESCO developed recommendations for training for ‘employment, decent work and the welfare of workers’ (UNECISO & International Labour Organization 2002).

Three goals for vocational education and training were identified, and the two most relevant to this report were to:

- ✧ develop an understanding of contemporary civilization so that people can comprehend their environment and are able to act upon it and take a critical view of the social, political and environmental implications of scientific and technological change
- ✧ empower people to contribute to environmentally sound sustainable development through their occupation and other areas of their lives.

(UNESCO & International Labour Organization 2002)

Such international activities have not emerged in a vacuum. Rather, they are part of a process occurring in many countries which involves identifying the priorities and capacity-building needs required to promote sustainability, and sharing innovative practices. There is also international recognition of the need for specialists, policy-makers and institutions in other countries to learn from the various initiatives being undertaken and to provide direction for their own systems of technical and vocational education (Fien & Wilson 2004).

At the present time, England provides the best example of a comprehensive approach to national policy-making for integrating sustainability into vocational education and training. Studies in Canada have also developed a Sustainable Development Skills Profile for the workforce, outlining the knowledge, skills and attitudes necessary to use sustainable development principles in everyday life. The English case study is discussed here as an example of a comprehensive approach which could help to guide Australia's implementation of education for sustainability in vocational education and training.

England: Learning to last

England is a world leader in providing government support for sustainable development. As a result, all sectors of education—from schools through to VET and higher education—have developed their own individual sustainability programs. These are all grounded in the national framework: *Sustainable Development Action Plan for Education and Skills* (United Kingdom Department for Education and Skills 2003). The action plan is the result of the efforts of organisations such as Groundwork, Forum for the Future, and the Environmental Association for Universities and Colleges. These groups have worked with communities, employers and colleges to develop and improve the integration of sustainability into relevant courses and the practices of institutions.

Activities currently being undertaken as part of the plan include:

- ✧ working with the Government Standards Unit to embed sustainable development into VET teacher training programs and new curriculum frameworks
- ✧ examining the potential links between vocational education and training and regeneration programs to analyse where the learning and skill sector can make a contribution to the development of sustainable communities (Cohen 2004).

In addition, the Learning and Skills Council—which is responsible for funding and planning post-school education in England—has recently released its sustainability strategy, *From here to sustainability: The Learning and Skills Council's Strategy for Sustainable Development* (2005). The strategy is based on a ten-year vision for sustainable development, matched by a set of measurable milestones. It suggests that the VET sector focus on the development of sustainability in a number of areas: positioning, buildings and estate, curriculum, and community. Key actions included in the strategy that may also be applicable to the Australian VET sector include:

- ✧ encourage capacity-building: raise awareness and understanding of sustainable development in vocational education and training
- ✧ identify sustainable development 'champions': find and train advocates for sustainable development to promote the concept throughout the VET sector

- ✧ influence and persuade relevant training bodies: to modify their programs, frameworks and qualification systems to include sustainable development policies and practices
- ✧ promote education for sustainable development: encourage a whole-of-institution acceptance and delivery of sustainability education within the VET sector
- ✧ develop links and partnerships: establish links between VET providers, industry and schools in the delivery of education for sustainability on a national and international level
- ✧ engage with the community: encourage greater community and employer involvement in sustainability education in the VET sector.

(Learning and Skills Council 2005)

The Learning and Skills Council recognises that the establishment of sustainability principles in vocational education and training—and within the community as a whole—represents a significant cultural change and, therefore, requires a long-term approach. To ensure that the actions and milestones outlined in the strategy are implemented immediately, an Implementation and Delivery Group has been established to advise and monitor progress on what is being achieved.

In summary

On the international stage, the push for education for sustainability is led by the United Nations, and is particularly influenced by the Brundtland Report published in 1987. This report linked environmental and development issues and has led to a series of international discussions centred on the role the VET sector could play in helping to achieve sustainable development. These discussions looked at the need for a new VET paradigm which moved the focus from providing training for industry and occupation-specific skills, to the broader task of workforce development and the encouragement of lifelong learning.

A number of individual countries have since taken on the responsibility of encouraging sustainability education in their respective educational systems. England, in particular, provides a stand-out case for a whole-of-government, unified approach to the issue. The Learning and Skills Council (2005) has adopted a ten-year strategy which identifies a series of actions required to achieve sustainable development.

Australian policy on VET and sustainability

Introduction

VET policy in Australia is primarily shaped by the *Australian National Training Authority Act (1992)*. The Act establishes the role of the Australian National Training Authority (ANTA) and includes the ANTA Agreement which binds state VET systems to the National Training Framework. Although ANTA was abolished in July 2005, all responsibilities and functions of the Authority passed to the Department of Education, Science and Training.

Through the national VET strategy *Shaping our future* (ANTA 2003b), ANTA worked closely with government, industry and other stakeholders to ensure that the skills of the workforce were sufficient to meet the needs of industry and the individual. The Department of Education, Science and Training (2005) has introduced a new national training system—*Skilling Australia's workforce 2005–2008*—but this policy still supports the strategies originally determined by ANTA.

Australian Government policy influences on VET

Australian Government funding of vocational education and training was established in the 1970s. Increased funding over the following decades came with a greater pressure for vocational education and training to act as a 'vehicle for implementing Commonwealth economic and social policies' (Goozee 2001). The VET sector has become as a 'broker' of government policy (Chappell et al. 2003), and is at the forefront of industry and labour policy demands for higher efficiency, flexibility and competitiveness. It has also been shaped by the labour market need for flexible and multi-skilled workers, the introduction of an 'open' training market involving public and private providers, and competency-based training. Two key policies which influence vocational education and training in Australia are: *Learning for the knowledge society* (Commonwealth of Australia 2000b) and *Backing Australia's ability* (Commonwealth of Australia 2004a).

Flexible learning for the information economy

The development of computer and information technology has a huge influence on all sectors of education, particularly policy which relates to vocational education and training. Government policies support the integration of information and communications technology throughout the entire education and training system, including the VET sector. Computer and technical literacy is incorporated in all curricula to reflect its influence on many aspects of daily life.

Learning for the knowledge society: An Education and Training Action Plan for the Information Economy is the Commonwealth's action plan for the VET sector (Commonwealth of Australia 2000b). The plan identifies two key roles for vocational education and training: as a developer of workforce skills for industries within the knowledge economy; and as a user of the new technologies in teaching and learning.

Backing Australia's ability

The Australian Government showed commitment to science and innovation policy through the report *Backing Australia's ability: Building our future through science and innovation* (Commonwealth of Australia 2004a), which is an \$8.3 billion, ten-year program. One of the four national research priorities discussed is an environmentally sustainable Australia, which includes technology and research-driven responses to coping with current and future environmental issues. The report specifically notes key areas of interest, such as the impact of salinity on the agri-food sector and other non-sustainable agricultural practices.

Despite the Australian Government providing direction on how the VET sector could contribute to education for sustainability, there is no evidence that the sector has taken on this role. While information and communications technology skills are considered vital for learners to operate in a rapidly changing world, sustainability skills—which seek to provide learners with the ability to shape the world of the future—are not. The degradation of the Australian environment is one of the country's most pressing concerns, yet responses to this problem show no unified or holistic approach. Rather, they are reactive, sector-specific, and fail to promote the behavioural and attitudinal changes required to address the issue of sustaining the environment and protecting it for future generations.

National sustainability policy

The 1992 *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia 1992a) and the *Intergovernmental Agreement on the Environment* (Commonwealth of Australia 1992b) comprise Australia's primary national policy commitment to sustainability. Despite the intention of these policies to provide an overarching national, state and local government approach, 'sustainable development is not well understood as a concept outside of limited environmental circles nor is it seen as a whole-of-government commitment' (Fien 2001). Further, Yencken argues that no such approach currently exists and that the policy seems to be at a standstill (2000).

Industry policy

The global environmental industry is estimated to be worth \$1000 billion per annum, with a domestic market of \$8.6 billion and a predicted annual growth rate of 3%. With an estimated 127 000 people employed, the sector covers a broad range of activity and is widely dispersed. Most of the industry involves measuring, preventing, limiting, minimising or correcting environmental damage in order to minimise pollution and mitigate environmental risk (OECD, as quoted in Commonwealth of Australia 2000c).

The demand for environmental goods and services is being driven by a number of factors. These include environmental regulation and international standards such as ISO 1400, consumer pressure, changing business attitudes, and technological development. The Organisation for Economic Co-operation and Development (OECD) believes that 50% of the environmental resources that will need to be used in the next 15 years do not currently exist. In response to these concerns, the Department of Industry, Tourism and Resources—together with the Department of Environment and Heritage—sponsored the development of an Environmental Industry Action Agenda. This resulted in the Year 2000 discussion paper *Investing in sustainability*, which seeks to develop a policy framework for growth in a commercially viable and internationally competitive Australian environmental industry (Commonwealth of Australia 2000c).

The great policy divide

Encouraging the VET sector to take on a broader role would promote the recognition of sustainability as a vital issue—where economic, social and environmental objectives are negotiated as inextricably linked and equally important. This approach, termed the ‘skill ecosystem’ (New South Wales Board of Vocational Education and Training 2001), allows VET policy and skill formation to embrace a broader range of influences and domains. The notion of wide-reaching policy development provides a means for the integration of sustainability concepts into VET policy.

The skill ecosystem model proposes a linking framework, recognising that work and skill ‘cross-cutting’ provides a natural fit for sustainability goals, which call for the integration of economic, social, political, environmental and cultural divides. A report by Buchanan and colleagues (New South Wales Board of Vocational Education and Training 2001) notes three ‘logics’ of skill, shaped both by education and the labour market. These are:

- ✧ cognitive skills—foundational skills obtained through general educational competence in areas such as numeracy and literacy
- ✧ technical skills—those skills ‘purchased’ on the open labour market
- ✧ behavioural skills—personal skills associated with how a worker performs on the job and their relationship and interaction with the workplace.

Without a whole-of-government approach and significant community and industry backing, the VET sector is unlikely to be able to respond adequately to the challenges of sustainability. Given the likely exponential growth of the environmental industry and the unpredictable nature and changing role of innovative technologies, the VET sector may not have the ability to respond quickly to community and industry needs.

To establish and commit government to genuine sustainability goals, Yencken (2000) proposes that environmental policy needs to be integrated as a whole-of-government approach. Specifically, education for sustainability policy is currently situated within the Department of Environment and Heritage, and is having little impact outside its policy portfolio. Unless this concept is embedded within the broader framework and across all government departments, sustainability-generated economic and employment benefits are unlikely to be realised.

In the same way, there are calls within the VET sector to accommodate the ‘cross-cutting’ of policy initiatives on work and skill development through a unified approach (New South Wales Board of Vocational Education and Training 2001). In particular, a redefinition of industry’s role in VET policy-making is required to allow the inclusion of broader policy goals beyond those which meet a narrow economic agenda. There are some early signs of such an approach becoming a possibility, with a renewed interest in policy-making which includes environment, community and social goals as well as economic ones. An excellent example of this is the work of the National Centre for Sustainable Development, which has worked with several industry skills councils to develop a wide range of sustainability-related guideline standards for training packages for the seafood, construction, manufacturing, business, innovation and transport industries (Condon & Rickards forthcoming).

The United Kingdom’s approach to sustainability policy provides one model which the Australian Government could adopt to widen the current portfolio-specific policy. The United Kingdom’s overarching sustainability policy—the *UK Sustainable Development Strategy*—is one which spans a number of government portfolios. The United Kingdom Department for Education and Skills has responded through the development of a sustainability action plan specific to its interests—the *Sustainable Development Action Plan for Education and Skills*.

In summary

Education for sustainability in Australia is influenced by three levels of policy, leading to a divided and random approach. Firstly, VET policy is shaped at a national level as a vehicle for implementing Australian Government policies. Secondly, national sustainability has been communicated through various broad strategies. Finally, in response to growth in the environmental services industry, individual government departments have developed strategies for investment in sustainability. This policy confusion dilutes the ability of the education sector to establish sustainability in Australia. If Australia is to become committed to sustainability, a whole-of-government approach is required which spans portfolios to ensure that sustainability principles are central to all government policy and legislation.

Future nature of work and sustainability in VET

Introduction

The changing nature of work is a persistent theme throughout VET literature. These changes involve the skills required by workers, their productivity and the nature of employment and industrial practices (Wooden 2002). The changing nature of work can invariably be related to two key factors—globalisation and the technology–knowledge revolution (Robinson 2003; Lawrence 1997).

The shifting composition of employment in Australia has caused significant changes to industry and occupations, particularly with the rise of the knowledge economy. Over the last 20 years, there has been a significant decline in goods-producing industries and a dramatic rise in knowledge-based service industries (Wooden 2002). Accompanying these changes is the growth in non-standard employment characterised by part-time, temporary casual, and contract work. Young people in developed nations are expected to change careers up to five times and work for 12 to 15 different organisations in their lifetime (Fien & Wilson 2004), developing what have been termed ‘ensembles of opportunities’ rather than the defined career paths of the past (New South Wales Board of Vocational Education and Training 2001).

The workplace of the future will require organisations to adopt sustainable work practices and support workplace reforms. These reforms will aim to improve relationships between workers, their colleagues, and management; promote a democratic approach which encourages employees to contribute to decision-making; and develop lifelong learning skills which will contribute to productive, flexible business practice. Lloyd and Payne (2002) and Buchanan et al. (cited in New South Wales Board of Vocational Education and Training 2001) suggest that workplace transformation of this kind will only occur by government deliberately intervening in public policy. The current industry focus on developing technical skills leads to an imbalance between the development of such skills as opposed to generic skills. Sustainability educational skills are unlikely to be demanded by industry—particularly where public policy is weak or primarily supports the needs of business—and therefore change will need to be driven by government policy.

Generic skills, VET and education for sustainability

Skill dominates discussions about work, the labour market and VET policy. Traditionally, vocational education and training was primarily focused on the development of technical skill in workers. However, changing patterns of economic competition and forms of work organisation have led to a greater call for what are called ‘soft skills—the personal attributes of teamwork, work ethic, and a preparedness to be flexible and to embrace change’ (Curtis & McKenzie 2002). These generic skills—also known as key skills, core skills and employability skills—have become one of the most significant topics of debate in VET reform.

In an attempt to define which employability skills are in demand, the Australian Chamber of Commerce and Industry and the Business Council of Australia developed the Employability Skills Framework. The framework identifies both the personal attributes and key competency skills which

contribute to a person's overall employability. The key skills, which could be developed through VET courses and programs, include:

- ✧ communication skills that contribute to productive and harmonious relations between employees and customers
- ✧ team work skills that contribute to productive working relationships and outcomes
- ✧ problem-solving skills that contribute to productive outcomes
- ✧ initiative and enterprise skills that contribute to innovative outcomes
- ✧ planning and organising skills that contribute to long-term and short-term strategic planning
- ✧ self-management skills that contribute to employee satisfaction and growth
- ✧ learning skills that contribute to ongoing improvement and expansion in employee and company operations and outcomes
- ✧ technology skills that contribute to effective execution of tasks.

(Commonwealth of Australia 2002)

Despite the demonstrable importance of incorporating generic skills in vocational education and training, the practical implementation of delivery and assessment has always been problematic (Down 2004) because 'effective methods for teaching or otherwise developing employability skills remain to be articulated' (Curtis & McKenzie 2002). In response to industry needs, government has taken a keen interest in employability skills and is working to embed these skills in industry training packages (Down 2004). As a result, generic employability skills are a major focus in VET policy-making (ANTA 2004), but there is still an obvious need for industry and VET practitioners to develop a coordinated approach to their delivery.

The acceptance of the importance of generic skills—which are relevant not only to work, but also to other areas of life—provides an opportunity for the recognition of skills for sustainability. However, the process of integrating generic sustainability skills into training packages and teaching is likely to be as difficult as that used to integrate employability skills. Growing recognition that workplace culture is instrumental in generic employability skill development (Virgona & Waterhouse 2004; Chappell et al. 2003) suggests that if sustainability education is embedded in VET and workplace culture, rather than added on as an afterthought, there is an increased chance that sustainable development can be achieved.

VET pedagogy: Compatibility with education for sustainability

Greater understanding of vocational education and training within the context of globalisation and the knowledge society is evolving. There is a growing interest in the different types of teaching and learning strategies required for learners, workers and employers which go beyond the mere transfer of technical competence. However, the increased diversity of teaching and learning methods—developed in response to immediate pressures—has not been accompanied by any theoretical or conceptual underpinning (Chappell & Hawke 2003). This has resulted in the realisation by the VET sector that there is a strong need to develop a clearly defined pedagogy which would support a unified, coordinated approach.

Dryden (2003) conducted a comprehensive examination of recent understandings of pedagogy within vocational education and training, and identified three main approaches:

- ✧ pedagogy (teacher-directed)
- ✧ andragogy (student-centred)
- ✧ heutagogy (learner-directed).

The learner-directed approach represents the most radical departure from traditional transmissive forms of teaching, and most closely aligns with what could become a practical means of teaching sustainability. This approach ensures the:

... facilitation of the learner's ability to unpack and repack, analyse and synthesise, or deconstruct and reconstruct in a different configuration, his/her current learnings against existing understandings within multiple frameworks. (Down 2004)

However, in a study by Clayton and Blom (2004), more than 50% of teachers indicated that they lacked knowledge and confidence in delivering strategies such as 'enhancing learner autonomy, negotiated learning, collaborative assessment, implementing innovative approaches and using problem-based learning approaches'.

There are some additional contradictions to using the learner-directed approach within vocational education and training. In particular, learner-directed learning may not incorporate essential areas of knowledge or skill—such as those contained within units of competency in national training packages—and therefore are unlikely to gain the support of either industry or training providers. Chappell et al. (2003) propose that the link between training packages and VET pedagogy is actually quite tenuous; in fact, the packages do not provide direction on the type of teaching practice or strategies which should be employed to deliver them. The authors go on to suggest that contemporary VET pedagogy should not only be learner-centred, work-centred, and attribute-focused, but should also include generic employability skills as well as other qualities and attitudes.

National training packages and sustainability

In Australia, VET curricula are competency-based and delivered through national training packages. These packages specify which competencies need to be learned and national qualifications will be attained, as well as the industry requirements for assessment. There are currently about 75 training packages used within the VET system in Australia, which provide the skills, knowledge and attitudes needed by a prospective employee wanting to work effectively in a particular industry (ANTA 2003a). The development of packages is primarily administered through industry skills councils, and outcomes are generated through units of competency.

A study conducted by TAFE NSW, *Environmental content in vocational education and training* (Russell 2003), identified significant gaps in national training packages in the context of environmental education and ecologically sustainable development policies and strategies. In particular, units related to environmental or sustainability outcomes are often elective and can be ignored in delivery; competency is strongly focused on areas of regulatory compliance; and some content is irrelevant or out of context with the targeted workplace environment. In addition, government agencies with an environmental/sustainability focus and expertise tend not to be involved in the development and review of national training packages (Russell 2003).

Based on the results of her research, Russell recommended that the VET sector be encouraged to:

- ✧ revise the *Training package developer's handbook* to support greater environmental-sustainability content in training packages
- ✧ require training package developers to have some knowledge and expertise in environmental/sustainability issues related to their sector
- ✧ use broader consultative processes for the development and review of training packages and ensure that developers include units of competence, elements or performance criteria that support sustainability goals
- ✧ provide greater support for the professional development of teachers and curriculum developers in understanding and integrating sustainability (Russell 2003).

Given that sustainability is applicable to all industries, it is not easy to capture all the required information within a single module. In addition, the skills and workplace practices needed to achieve sustainable production may not be readily transferable to units of competency. It is not surprising, then, that sustainability education has not been incorporated into training packages. In 2005, Rickard and Condon evaluated the current status of environmental sustainability in training packages in Australia. They found many of the same problems as Russell (2003) and concluded that the VET sector also needs to:

- ✧ involve environmental multi-disciplinary specialists within the consultation process to provide relevant knowledge and skills and show how these can be delivered
- ✧ encourage industry associations and organisations that influence the development of industry training packages to assess the environment and contribute their knowledge to the *Training package developer's handbook*
- ✧ improve monitoring and reporting mechanisms so that they identify areas for each industry which could impact on the environment, and incorporate them into training packages
- ✧ undertake an audit of social and economic sustainability issues within training packages which need to be addressed
- ✧ incorporate new Guideline Competency Standards for Sustainability (National Training Information Service 2005) into training packages
- ✧ integrate sustainability education as a formal aspect of vocational education and training.

This research by Rickard and Condon further suggests that the integration of sustainability education in training package development and review can only be achieved through a series of activities. These include: a high-level training package review; engagement with key VET and industry stakeholders; recognition of which generic skills support sustainability knowledge, skills and capabilities; and acceptance across industry of sustainability competencies. The *High Level Review of Training Packages: Moving on* (ANTA 2004) acknowledges the importance of embedding generic skills in training packages, but does not take the next step of suggesting that education for sustainability should also be incorporated across the board.

In summary

The VET sector needs to look at its modes of teaching and learning and discover which have the potential to incorporate practices which will develop sustainability knowledge, skills and values. The good news is that VET practitioners are already engaged in pedagogical practice of this type—through action learning, problem-solving and work-based group learning. However, some fundamental contradictions still remain.

Despite calls for a recognised VET pedagogy, 'there is yet no coherent picture of what teaching and learning in VET might be' (Dryden 2003). This raises the question of whether the strong interest in teaching and learning practice will remain, and whether sustainability education can therefore influence the debate. As learner-directed approaches may not meet course requirements (Dryden 2003), the VET sector may not be able to embrace this practice. The rigid curriculum requirements of VET courses and programs limit the ability of training providers to accept sustainability education as a valuable contribution.

Barriers to sustainability in VET

Introduction

Educators work with restrictive, traditional modes of delivery and training package development, and thus can find it difficult to incorporate change and development in areas such as industry and new 'green' technologies, as well as promote a recognition of the need for this change in order to sustain the environment. Taking these restrictions into account, major barriers to the establishment of a culture of sustainability in vocational education and training appear to be: the lack of a shared national vision; the lack of adequate resources and trained personnel at all levels in the VET sector; and the existing traditional VET culture, pedagogy and training packages.

Lack of a shared national vision

Australia is in the process of creating a number of visions for achieving positive sustainability outcomes but, as yet, has not developed an overarching national policy to ensure these outcomes are achieved. While the beginnings of a sustainability legislative framework and policies are in the process of being implemented at federal and state levels, significant further action is required.

Firstly, it is imperative that Australia's approach to sustainability be united by a whole-of-government approach. A number of commentators and researchers (Newman et al. 2004; Fien & Wilson 2004; Rickard & Condon 2005) have highlighted the failure of governments at all levels to fully integrate their responses to sustainability and how to teach it. The integration of sustainability policy throughout all government agencies and departments would optimise Australia's ability to develop a coordinated response to sustainability issues. A whole-of-government approach would also help to integrate sustainable development principles across legislation, policy and action plans.

Secondly, a shared national vision must be supported by a negotiated policy for vocational education and training between the states and territories and the Australian Government. In spite of the Australian Government's commitment to sustainability principles and education, there appears to be little action in the area of national policy development, with the federal government adopting the approach that VET initiatives are primarily the responsibility of the states/territories.

Lack of adequate resources and trained personnel

In spite of the evidence that the VET sector is beginning to adopt a more disciplined, intentional and whole-of-sector approach to sustainability, resources and training appear to be persistent issues of concern. In particular, teacher training in sustainability is inadequate. Although there is an improved understanding of the importance of sustainability principles to many areas of life—such as engineering, mining, building, energy, business practice and accounting, agriculture and economics—it is not reflected in teacher education programs within the VET sector.

In addition, there remains a general failure to balance the need for environmental, economic and social priorities in VET training packages, resulting in significant gaps in the area of sustainability. Packages that do provide sustainability teaching tend to focus only on compliance, rather than on

promoting an understanding of the wider implications of the issue. These limitations challenge the ability of the VET sector to develop strategies for keeping up with new and emerging sustainable technologies; they also challenge the sector's capacity to respond appropriately to industry and community trends while working within limited budgets. There appears to be a failure to accord sustainability principles the same priority as that given to social and economic areas.

In order to deliver training packages and competency skills effectively, the VET sector needs to do more than just meet industry and community needs. It can achieve this by taking the lead and adopting sustainability principles at a national level and actually shaping policy and practice.

Rather than merely being a delivery system to meet industry and community needs, the VET sector needs to reinvent itself so that it actually begins to shape policy and practice. By adopting sustainability principles, the sector shows that not only can it embrace and encourage change, it can also respond to a changing workplace environment. The adoption of sustainability principles across the business community is likely to have profound implications on the way in which business is conducted in the future, because the economic cost of implementing sustainable practices on a widespread level could be significant.

Existing VET culture, pedagogy and training packages

On international, national and local levels, there is a strong emphasis on the need to embrace sustainability as both a concept and a practical process to be implemented. Our future and well-being—both environmentally, culturally, spiritually, politically and economically—are likely to depend on our ability to adapt traditional attitudes and behaviours to include a more wide-ranging vision. The VET sector can play a significant role in promoting such a future, but may be hampered by the current almost exclusive focus on production and industry, at the expense of economic, environmental and social issues, which should be recognised as equally important.

The push for sustainability is coming from a range of influential groups, which include government, community, industry and other organisations. This increasing awareness of environmental responsibility has led to expectations for a greater emphasis on sustainability in vocational education and training, including the provision of a range of courses which incorporate aspects of sustainability.

At present, however, there is a lack of strategic planning to ensure that the VET sector meets its sustainability obligations. In order for the sector to take on this leadership role, it needs an action plan which recognises that this is a long-term process and involves a change in culture, attitudes and behaviours. There is evidence to suggest that parts of the VET sector have incorporated sustainability principles into policy and practice; however, a sector-wide approach is still lacking. An overarching pedagogical stance which allows for the teaching and learning of emerging skill requirements—such as generic skills and sustainability principles—is necessary to create the integrated and relevant training packages which will address industry needs and shape our responses to sustainable development.

In summary

Given the rise in environmental consciousness and the push for vocational education and training to embrace sustainability, providers face a significant challenge in shifting their focus from technical competency to incorporating the more generic cognitive and behavioural skills required by the workplace of the future. In addition, the sector will have to cope with a number of difficulties: the lack of shared national vision; the lack of adequate resources and trained personnel; and the limitations of the existing VET culture, pedagogy and training packages. These barriers are not insurmountable, as evidenced by success stories in countries such as England. The following chapters discuss a possible way forward for the VET sector.

VET and education for sustainability: The common ground

Education for sustainability undoubtedly has a place in VET policy and practice. In fact, if vocational education and training is to remain relevant in the changing workplace and community in general, the integration of sustainability education in policy and practice will be mandatory.

Conceiving and designing EfS [education for sustainability] challenges all forms of educational provision to adopt practices and approaches, which foster the values of sustainable development. Thus ESD [education for sustainable development] must ... address pedagogical processes, the validation of knowledge, and the functioning of education institutions. (UNESCO 2004c)

Growing recognition of the need for sustainable development necessitates the transition from a productivist mentality to a more balanced approach—which considers economic, social, political and environmental issues—to life and learning.

On a global scale, a number of factors have caused increasing damage to the environment. These include escalating resource use, human population growth, industrialisation and unprecedented growth in cities. There are clear signals that our cities, industries and agricultural practices are not sustainable in their current form. While technology and science can help in the quest to achieve a sustainable future, long-term solutions require a more holistic yet strategic response involving the entire community.

Both internationally and nationally, there are positive examples of the novel and creative ways that individuals and their organisations are responding to meet the challenges of education for sustainability (see appendix 1). The five examples we briefly describe have significant implications for the VET sector.

The role of education in achieving the goals of sustainable development has also gradually gained prominence. There is increasing awareness that education needs to go beyond reform and create a VET system which provides learners with the ability to critique and revise the status quo. In response, Australia has adopted the Environmental Education for a Sustainable Future: National Action Plan, which has since been supported by a range of additional federal and state initiatives, including policies for vocational education and training.

The Bonn Declaration (UNESCO 2004a) cemented the role of vocational education and training in achieving sustainable development, believing that it should encourage environmental conservation and help to promote sustainable attitudes and behaviours. If the VET sector is to take on this role, however, a new paradigm will be required that recognises the need for generic skills and takes an active role in the integration and evaluation of sustainability skills throughout industry training packages. A recent review of the current status of environmental sustainability in training packages determined that sustainability issues are generally only explored in the context of compliance and rarely are the more comprehensive issues explored (Rickard & Condon 2005).

Government has taken a keen interest in employability (or generic) skills and is working to embed these skills both in industry training packages and throughout a student's entire education. Government, industry and the community need to realise that life skills are just as important as those required for work; this understanding paves the way for the acceptance of sustainability skills as an integral part of a student's education. Learning generic sustainability skills may encourage

future workers to devise alternative methods of working which are better for the environment, and to learn to negotiate these changes with colleagues and supervisors. If sustainability is embedded in VET and workplace culture, rather than added on as an afterthought, there is a greater chance that sustainable development can be achieved.

The VET sector is now an ‘open’ training market—including public, private and community providers—and allows greater flexibility and choice in how students construct learning. If sustainability skills are to be integrated into vocational education and training, they must be included in all aspects of learning and teaching to avoid the risk of being perceived as ‘non-core’ and thus easily excluded from mainstream education. Public funding arrangements in the VET sector must therefore contribute to this integration through their clear inclusion in training packages, hence providing incentives to training providers to fund sustainability courses or subjects.

The growth in demand for environmental services since the initial green movement in the 1970s has been exponential. Society now demands that environmental issues are given the same priority as economic and social impact ones. The opportunity presents itself for Australian VET providers to become world leaders in education for sustainability, and to position Australian industry to promote practices which lead the way in developing a sustainable and environmentally aware future.

Conclusions and proposed actions to encourage the adoption of education for sustainability in VET

Sustainability ethos and practice is now embedded in global and national policy and represents a paradigm shift in human thinking and behaviour. However, the ramifications of this change are yet to be recognised within the VET sector. Previous recommendations in sustainability research have yet to be acted on, so we have added these to our additional ideas to provide a comprehensive list of actions which will encourage the adoption of education for sustainability in vocational education and training.

Develop a national approach and vision to implementing education for sustainability in VET

If education for sustainability is to be achieved in Australia, it must be formalised throughout VET policy and programs (Rickard & Condon 2005). The development of a coherent and integrated national vision, supported by appropriate legislation, should therefore be of the utmost priority. This process should also seek to develop strategies which optimise networking between VET providers, government, industry, community groups and international bodies.

Encourage a culture of sustainability in VET

We recommend that an analysis of VET policy and culture be undertaken to assess how to facilitate the transition towards a sustainability culture and how to identify any barriers which could impede this process. Training programs that may be necessary to promote this change of culture should then be identified and implemented. Furthermore, professional development can fill gaps in staff understanding of sustainability to ensure that all staff are aware of, and committed to, sustainable development (Rickard & Condon 2005). Having agreed on a vision for the VET sector, a detailed action plan for implementation needs to be developed to ensure that the vision is achieved (Learning and Skills Council 2005). The VET sector needs to determine whether the adoption of sustainability principles makes it an agent of change in the community or a servant of industry; in our view, it needs to take on both roles. It also needs to gauge whether all stakeholders, including learners, should be encouraged to critique and revise the status quo.

Determine an appropriate VET pedagogy which will promote sustainable development

The flexibility of the VET sector to respond rapidly to changes needs to be assessed, given the current environment where changes, both positive and negative, are often exponential in nature. From this assessment, the true role of vocational education and training—as a creator of, or reactor to, change—can be determined. The necessary change in pedagogy can then be implemented. We support the view of Anderson (2003), who promotes a pedagogical model (such as the learner-directed approach) which distances itself from social reproduction and maintenance and recognises the rapid changes occurring within business, government and industry.

Embed sustainability principles in VET policy, practice and training packages

A vital task in the process is to ensure that sustainability is embedded in policy throughout the VET sector (Yenken 2000; Newman et al. 2004) and in all VET courses. In particular, the sector needs to

redirect its current primary focus on the economic and social aspects of VET—with its very narrow view of sustainability—to one which demonstrates a vision which is both long term and aware of the needs of future generations (Anderson 2003). This vision should recognise the limitations of current economic models and the fact that many national and global enterprises do not take sustainability or the environment into account. In doing so, we suggest that a national core and compulsory sustainability unit be developed to give equal importance to the role of biophysical, economic, social-cultural and political systems. In addition, the VET sector should develop core cross-industry training packages cooperatively with industry in various key sectors, such as the environment, sustainable landscapes, agriculture, energy, building, and economics.

Rickard and Condon (2005) conducted a review of the current role of sustainability in training packages, and this should be used as a model to determine where gaps can be filled to cater for future needs. In particular, the sector must take deliberate steps to move away from a focus on mere compliance, to encouraging the importance of actual competency skills in sustainability. In accomplishing this goal, it will be necessary to ensure that a number of groups have input into the development and review of national training packages. These include all government agencies with an environment–sustainability focus and expertise, and professional scientists who can use their expertise to emphasise the importance of a longer-term vision for the environment. Other important contributors to the process of including sustainability in training packages are industry representatives and the wider community.

An upgrading of the content and design of training packages to include skills and competencies which relate to sustainability could be assisted through a general agreement between governments, industry and the community (Newman et al. 2004). *The Guideline Competency Standards for Sustainability* (National Training Information Service 2005) should be included in training packages (Rickard & Condon 2005), and the *Training package developers handbook* should be revised to reflect greater environment–sustainability content (Russell 2003). Developers of training packages should also be required to have some knowledge and expertise in environment–sustainability issues related to their sector (Russell 2003). Furthermore, the relationship between sustainability and workplace competencies needs to be better articulated across all VET courses (Newman et al. 2004).

The VET sector should also capitalise on the Decade of Education for Sustainable Development to facilitate a change in attitude towards sustainability (Newman et al. 2004) and plan to set up an equivalent to the Australian Sustainable Schools Initiative. The sector should work to set an example in the way that it manages its estates, facilities, internal administration, purchase and the design of new buildings and plants, based on sustainability principles. It could also pursue flagship sustainability projects with industry and government to demonstrate leadership and innovation, and to identify and promote past and current successful Australian initiatives and expertise relevant to education for sustainability (Newman et al. 2004).

Identify areas in particular need of sustainability training

The VET sector also needs to identify and target industries and areas in need of professional sustainability training, such as the agriculture sector (Newman et al. 2004). In line with developments suggested in *Backing Australia's ability*, courses that respond to the major issues of land degradation, environmental restoration and the creation of sustainable landscapes will need to be developed. Small businesses, particularly in regional Australia, can also be targeted for learning and training in 'triple bottom line' reporting and practice through VET initiatives (Newman et al. 2004). Triple bottom line reporting was a concept developed by the World Commission on Environment and Development (1987) and involves business incorporating three major values: economic prosperity, environmental quality, and social justice.

Encourage and facilitate the adoption of sustainability across the entire education sector

VET providers, universities and industry should work together to establish sustainability standards and codes of practice (Newman et al. 2004). Further, given the broad range of skills required for industry and generic skill training, pathways for articulation of sustainability courses between universities and the VET sector should be clearly defined (Newman et al. 2004).

Pursue a nationwide, united shift towards sustainable development

Changes will also be required outside the VET sector to facilitate the development of education for sustainability in Australia. In particular, policy development needs to make the transition from single portfolios to a whole-of-government approach, to establish genuine sustainability goals and ensure government commitment to them (Newman et al. 2004). The Australian Government should also develop an Australian Sustainability Charter to set key national targets and sustainability objectives and implement a national report card administered by an independent sustainability commissioner (Commonwealth of Australia 2005). This should include an evaluation of all relevant government policy on urban sustainability.

Adequately resource the VET sector to implement needed change

We are not in a position to cost the implementation of the suggested changes, but clearly significant resources—particularly time and money to develop strategic, long-term planning—will be required.

Establish education for sustainability implementation and delivery groups within VET

There is a need to establish implementation and delivery groups at national and state and territory levels to oversee and facilitate the transition of the VET sector to a sustainability ethos and practice.

Conclusion

There is a significant role for education for sustainability in vocational education and training in Australia. The increasing recognition of environmental values in our society and the changing nature of work have necessitated a shift in the way that we think and act in learning and in life. The recent integration of generic skills into vocational education and training has paved the way for the inclusion of sustainability skills and can be used to provide direction in this process. The nine areas of focus provided above outline the key actions which we believe will further progress the development of education for sustainability within the VET sector in Australia.

References

- Allen Consulting Group 1999, *Training to complete: The training needs of Australian industry—A report to the Australian Industry Group*, Australian Industry Group, North Sydney.
- Anderson, D 2003, 'From productivism to ecologism: Dilemmas, issues and strategies for VET', *Australian Vocational Education Review*, vol.10, no.1, pp.1–14.
- ANTA (Australian National Training Authority) 2003a, *Annual national report of the Australian vocational education and training system*, ANTA, Brisbane.
- 2003b, *Shaping our future: Australia's national strategy for vocational education and training 2004–2010*, ANTA, Brisbane.
- 2004, *High level review of training packages: Moving on*, ANTA, Brisbane.
- Chappell, C 2003, *Contemporary vocational learning—changing pedagogy*, OVAL Research Faculty of Education, University of Technology, Sydney.
- Chappell, C & Hawke, G 2003, *An industry-led system: Issues for policy, practice and practitioners*, Report 7- Integrating report, Oval Research working paper 03–07, University of Technology, Sydney.
- Chappell, C, Hawke, G, Rhodes, C & Solomon, N 2003, *High level review of training packages. Phase one report*, ANTA, Brisbane.
- Clayton, B & Blom, K 2004, *Doing it well, doing it better: Practitioners, pedagogy and training packages*, Centre Undertaking Research in Vocational Education, Canberra Institute of Technology.
- Cohen, J 2004, 'Learning to last: A case study in sustainable development education', unpublished paper presented to Workshop on Orienting TVET for Sustainable Development, UNESCO–UNEVOC Centre, Bonn.
- Coll, RK, Taylor, N & Nathan, S 2003, 'Using work-based learning to develop education for sustainability: A proposal', *Journal of Vocational Education and Training*, vol.55, no.2.
- Commonwealth of Australia 1992a, *National strategy for ecologically sustainable development*, Australian Government Publishing Service, Canberra.
- 1992b, *Intergovernmental Agreement on the Environment*, viewed February 2007, <<http://www.environment.gov.au/esd/national/igae/index.html>>.
- 2000a, *Environmental education for a sustainable future: National action plan*, viewed December 2005, <<http://www.environment.gov.au/education/publications/nap/index.html>>.
- 2000b, *Learning for the knowledge society: An education and training action plan for the information economy*, viewed December 2005, <http://www.dest.gov.au/sectors/school_education/publications_resources/profiles/learning_for_the_knowledge_society.htm>.
- 2000c, *Investing in sustainability: A discussion paper to assist the development of an environment industry action agenda*, viewed December 2005, <<http://www.industry.gov.au/assets/documents/itrinternet/EIAADiscussion2000.pdf>>.
- 2002, *Employability skills for the future*, Commonwealth Department of Education, Science and Training, Canberra.
- 2004a, *Backing Australia's ability: Building our future through science and innovation*, viewed February 2007, <http://backingaus.innovation.gov.au/info_booklet.htm>.
- 2004b, *Environment industry action agenda: Second year implementation report*, viewed February 2007, <<http://www.nml.csiro.au/content/itrinternet/cmscontent.cfm?objectid=268A05F9-65BF-4956-B689E05A517AEFE7&indexPages=/content/sitemap.cfm?objectid=48A61B0F-20E0-68D8-ED98C056573FE942>>.
- 2005, *Sustainable cities*, House of Representatives Standing Committee on Environment and Heritage, viewed February 2007, <<http://www.aph.gov.au/house/committee/enviro/cities/report.htm>>.
- Condon, L & Rickards, A (forthcoming), 'The role of partnerships: Industry skills councils and training packages in supporting TVET for sustainable development in Australia', in *TVET for sustainable development: Opportunities and challenges*, eds J Fien, R Maclean and MG Park, Springer, Dordrecht.

- Curtis, D & McKenzie, P 2002, *Employability skills for Australian industry: Literature review and framework development*, Australian Council for Educational Research, report to Business Council of Australia and Australian Chamber of Commerce and Industry, Canberra.
- Department of Education, Science and Training 2005, *Skilling Australia's workforce: 2005–2008*, Commonwealth–State agreement for skilling Australia's workforce, viewed December 2005, <<http://www.comlaw.gov.au/ComLaw/Legislation/Act1>>.
- Diamond, J 2005, *Collapse: How societies choose to fail or survive*, Allen Lane, Camberwell, Victoria.
- Down, C 2004, *Employability skills: Revisiting the key competencies or a new way forward?*, Australian Academic Press, Brisbane.
- Dryden, R 2003, *VET pedagogy—An annotated bibliography of the literature 2000–03*, TAFE NSW TES, Newcastle, NSW.
- Fien, J 2001, 'Education for sustainability: Reorienting Australian schools for a sustainable future', *Tela*, no.8, Australian Conservation Foundation, Australian Association for Environmental Education and Trust for Young Australians, viewed December 2005, <http://www.acfonline.org.au/uploads/res_tp008.pdf>.
- Fien, J & Tilbury, D 2002, 'The global challenge of sustainability', in *Education and sustainability: Responding to the global challenge*, eds D Tilbury, RB Stevenson, J Fien and D Schreuder, IUCN Commission on Education and Communication, Gland, Switzerland.
- Fien, J & Wilson, D 2004, *Reorienting TVET for sustainable development*, discussion paper, UNESCO–UNEVOC International Centre, Bonn.
- Global Scenario Group 1995, viewed December 2005, <<http://gsg.org/>>.
- Goozee, G 2001, *The development of TAFE in Australia*, NCVER, Adelaide.
- Government of Western Australia 2003, *Hope for the future: The Western Australia State Sustainability Strategy—A vision of quality of life in Western Australia*, Department of the Premier and Cabinet, Perth.
- Greenall Gough, A 1997, 'Education and the environment: Policy, trends and problems of marginalisation', *Australian Education Review*, no.39, Australian Council for Educational Research, Melbourne.
- Julian, T 2004, 'Employability skills: Balancing the equation', in *Generic skills in vocational educational and training: Research readings*, ed. J Gibb, NCVER, Adelaide.
- Kates, RW, Parris, TM & Leiserowitz, AA 2005, 'What is sustainable development?', *Environment: Science and Policy for Sustainable Development*, vol.47, no.3, pp.8–21.
- Lawrence, J 1997, 'Adult education and jobs, or sustainable livelihoods?', presentation at UNESCO Panel on Changes in the World of Work, Hamburg, Germany.
- Learning and Skills Council 2005, *From here to sustainability: The Learning and Skills Council's Strategy for Sustainable Development*, United Kingdom Department for Education and Skills, London.
- Lloyd, C & Payne, J 2002, 'Developing a political economy of skill', *Journal of Education and Work*, vol.15, no.4, pp.365–90.
- National Training Information Service 2005, *Generic guideline units –Sustainability web pages*, viewed December 2005, <<http://orig.ntis.gov.au/cgi-bin/waxhtml/~ntis2/std.wxh?page=80&inputRef=685>>.
- Newman, P, Wiseman, N, Pepper, C & Kelly, K 2004, *Training for sustainability: The vocational education and training sector*, Green Skills Inc., Centre for Learning, Change and Development and Institute for Sustainability and Technology Policy, Murdoch University.
- New South Wales Board of Vocational Education and Training 2001, *Beyond flexibility: Skills and work in the future*, viewed December 2005, <<http://www.bvet.nsw.gov.au/pdf/beyondflex.pdf>>.
- New South Wales Council on Environmental Education 2002, *Learning for sustainability*, NSW Environmental Action Plan 2002–2005, viewed December 2005, <<http://www.environment.nsw.gov.au/resources/learnforsustainreport.pdf>>.
- Parliament of the Commonwealth of Australia 2005, *Sustainable cities*, House of Representatives Standing Committee on Environment and Heritage, Canberra.
- Parliamentary Commissioner for the Environment 2004, *See change: Learning and education for sustainability*, PCE, Wellington, NZ, viewed December 2005, <http://www.pce.govt.nz/reports/allreports/1_877274_56_9.pdf>.
- Raskin, P, Banuri, T, Gallopin, G, Guttman, P, Hammond, A, Kates, R & Swart, R 2002, *Great transition: The promise and lure of the times ahead*, Stockholm Environment Institute, Boston.
- Rickard, A & Condon, L 2005, 'Assessing the content of education for environmental sustainability (EFES) within national training packages', MS under review.
- Robinson, C 2003, 'Employment opportunities and needs for the future', notes for the presentation at the Skilling Australia Forum, Gold Coast, 10–12 September.
- Russell, D 2003, *Environmental content in vocational education and training*, TAFE NSW, Sydney.

- Sterling, S 1996, 'Education in change', in *Education for sustainability*, eds J Huckle and S Sterling, Earthscan, London.
- 2001, *Sustainable education: Revisioning learning and change*, Greenbook, Devon, UK.
- Swart, RJ, Raskin, P & Robertson, J 2002, *The problem of the future: Sustainability science and scenario analysis*, proceedings of the 2002 Berlin conference on the Human Dimensions of Global Environmental Change (December 2002), viewed December 2005, <http://www.glogov.org/upload/public%20files/pdf/publications/bc%20proceedings/bc2002/bc_2002_ch06_raskin.pdf>.
- Tilbury, D 2002, 'Emerging issues in education for sustainable development', paper presented at the World Summit for Sustainable Development, August–September 2002, Johannesburg.
- UNESCO (United Nations Educational, Scientific and Cultural Organisation) 2004a, *Learning for work, citizenship and sustainability: United Nations Decade of Education for Sustainable Development*, UNESCO International Experts Meeting, October 25–28, Bonn.
- 2004b, *Links to other international priorities meeting millennium development goals*, viewed 11 October 2004, <http://portal.unesco.org/education/en/ev.php-URL_ID=23298&URL_DO=DO_TOPIC&URL_SECTION=201.html>.
- 2004c, *United Nations Decade of Education for Sustainable Development 2005–2014: Draft International Implementation Scheme*, viewed December 2005, <<http://portal.unesco.org/education/en/ev.php->>.
- UNESCO & International Labour Organization 2002, *Technical and vocational education for the twenty-first century: ILO and UNESCO recommendations*, UNESCO, Paris and ILO, Geneva.
- United Kingdom Department for Education and Skills 2003, *Sustainable Development Action Plan for Education and Skills*, English National Sustainable Development Panel, viewed December 2005, <<http://www.dfes.gov.uk/aboutus/sd/docs/SDactionplan.pdf>>.
- United States National Research Council 1999, *Our common journey: A transition towards sustainability*, National Academy Press, Washington, DC, viewed December 2005, <http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD/PplaImppl.pdf>.
- Virgona, C & Waterhouse, P 2004, 'Making experience work: Displaced workers provide new insights into generic skills', in *Generic skills in vocational education and training: Research readings*, ed. J Gibb, NCVET, Adelaide.
- Wooden, M 2002, 'The changing labour market and its impact on work and employment relations', in *Working futures: The changing nature of work and employment relations in Australia*, eds R Callas and RD Lansbury, The Federation Press, Sydney.
- World Commission on Environment and Development 1987, *Our common future*, Oxford University Press, Oxford.
- Yencken, D 2000, 'Sustainable Australia: Refocusing government', in *Tela*, no.3, Australian Conservation Foundation and the Nature and Society Forum, viewed December 2005, <http://www.acfonline.org.au/uploads/res_tp001.pdf>.

Support document details

Additional information relating to this research is available in *Finding the common ground: Is there a place for sustainability education in VET?—Support document*. It can be accessed from NCVET's website at <<http://www.ncver.edu.au/publications/1718.html>>. The support document contains:

- ✧ Global context
- ✧ What is education for sustainable development?
- ✧ Education for sustainability and the future nature of work
- ✧ Sustainable development and technical and vocational education and training (TVET)—
International trends
- ✧ National policy on sustainability and VET
- ✧ VET learning and teaching: Building a model for the future
- ✧ Generic skill development.

Appendix 1:

Good news stories

Good news story 1: Natural sequence farming

Natural sequence farming is a holistic land management process developed by Peter Andrews in the 1970s at Tarwyn Park, Bylong, in the Upper Hunter catchment of New South Wales. Natural sequence farming specifically addresses land degradation and biodiversity losses associated with the widespread, incised, riparian systems and their disconnected floodplains and valley slopes. It does this primarily by restoring the hydrological functions once associated with the ‘swampy-meadow-chain of pond complexes’, or similar complexes, landscape features almost completely destroyed by European agriculture. This style of farming can be viewed as a ‘circuit breaker’, which enables the inherent energy and biological potential still present in the landscape to be harnessed.

The implementation of natural sequence farming enables pre-existing and natural self-repair mechanisms to revitalise degraded systems. Water flow, the watertable, alluvial deposition (i.e. active erosion), plant succession and production are harnessed and manipulated in a sequence of relatively simple actions. These include:

- ✧ physical intervention in the floodplain to create small-scale, leaky structures in the stream bed to slow down water flow and to facilitate water recharge
- ✧ the creation of one or more additional channels through the floodplain, thereby enabling water to be redistributed across the floodplain to the ‘break of slope’ of the valley floor
- ✧ the harnessing of natural freshes or flooding (minor or major) to initiate the processes of sedimentation and plant succession across the floodplain, above and below the leaky structure(s)
- ✧ the adaptive management of managing the process to fine-tune structures and processes, manipulate vegetation through targeted replanting and/or removals, and facilitate nutrient reallocation across the valley from riparian zone to valley tops.

Natural sequence farming achieves a number of important outcomes which have implications for sustainability. It recreates a functional floodplain that drives high levels of productivity (i.e. useable and accessible farm biomass); cost-effectively repairs land degradation within valley floors (e.g. soil erosion, bank collapse, gully formation, floodplain stripping, saline leakage, saline scalds etc.); and functionally reconnects the hydrology of drainage lines, creeks and rivers to their adjacent floodplains. In addition, it enables the underground storage of significant volumes of water along the floodplain, thereby allowing plant production to continue during drought conditions (i.e. drought-proofing); ameliorates deleterious energy fluxes; and creates stable landforms that functionally imitate the pre-European ‘chain of ponds-swampy meadows’ complexes once prevalent in valley systems.

Some implications for VET in Australia

Natural sequence farming is a radically simple river-floodplain restoration strategy which challenges conventional wisdom about the management of water and salt in the Australian landscape. It has profound implications for recreating and/or restoring widespread, resilient landscapes that integrate both nature conservation and production goals. Implementing this process requires a range of practical skills and an integrated understanding of issues such as reading the Australian landscape,

hydrology, geomorphology, plant succession, creating stable structures, and de-energising water flow. Such an understanding is almost absent from higher education and technical and further education (TAFE) courses in Australia, nor are the needed skills part of the knowledge base of natural resource graduates from these sectors.

Good news story 2: The Nustroke engine project

Brian Powell from Powell Engine Company Pty Limited invented the Nustroke engine, which has the potential both to revolutionise transport engine production and efficiency, and to lower harmful emissions to near zero. Four working prototypes have been constructed and operated successfully, the last of which was a joint venture with the University of Wollongong. The following outcomes have been successfully demonstrated.

- ✧ The number of working and moving parts has been reduced and approximately 50% of the conventional engine replaced.
- ✧ Nustroke operates on the two-stroke principle but is in fact a three-cycle engine.
- ✧ Exhaust emissions tested in the presence of university staff have been close to zero.
- ✧ The combustion process is comprised of a pre-combustion chamber system, which raises the compression ratio to that of diesel with corresponding diesel efficiency. Further, efficiency in city traffic conditions would be very high, while part load conventional engine efficiency is extremely low.
- ✧ Nustroke burns any fuel on demand.

Nustroke has been singled out by a Swedish company as the most superior engine for hydrogen consumption.

Currently the company (Powell Engine Company Pty Limited) has closed down the Australian research establishment and has demonstrated the engine in the United States. A Florida company has accepted the Powell Engine Company's business plan to proceed and manufacture the engine in the United States. However, last-minute negotiations are proceeding in Australia in an effort to remain in this country.

The Powell Engine Company will now proceed to have production versions modelled on the existing prototypes. This work will be contracted to the Southwest Research Institute in San Antonio, Texas. The production version will be designed from the lightest available metals, fully tested and certified by the institute.

The Powell Engine Company has been approached by a Swedish company to form a joint venture, linking the Nustroke to a hydrogen-generating device originally invented at the University of Sydney. The Swedish company has had Nustroke evaluated by Volvo (with permission) and has a written statement confirming Nustroke's hydrogen-burning superiority.

The hydrogen-generating system in question claims to generate hydrogen from a chemical. The expired chemical is then capable of being regenerated by application of an electric current. It is planned to establish banks of regenerating cells supplied electrically by wind/solar farms. If proven, conventional fossil fuels would be completely replaced.

Some implications for VET in Australia

This is a prime example of a 'new technology' waiting in the wings that is likely to revolutionise unsustainable industries. How prepared is the VET sector to accommodate and facilitate the training needs resulting from the adoption of such a radical new technology? What changes in policy, structure and training packages would be needed to ensure such a response? Is the VET sector's organisational structure strong enough to enable a rapid response if one was required?

Good news story 3: The Lake Cowal Foundation

Barrick Gold is in the process of developing a major gold mine at Lake Cowal near West Wyalong expected to produce in excess of three billion dollars in revenue over a decade. The mine became fully operational in 2006. Barrick Gold is very committed to exceptionally high environmental standards, which are already filtering through to similar developments. Lake Cowal is a very large ephemeral and important wetland. When it is filled—as a result of flooding outbreaks from the Lachlan River—the wetland supports a huge amount of waterbird life. Due to its perceived effect on the environment, mining has often attracted the anger of the Green Movement in Australia. However, in recent times, there has been greater recognition that mining *per se* at any one time impacts on less than 0.04% of our land surface but is able to extract significant wealth from a relatively small area of land over very short periods of time (personal communication, Professor Michael Archer 2006). Some of this wealth creation can be redirected towards addressing major land degradation and biodiversity loss, issues which are directly attributable to the outcomes of past and ongoing non-sustainable agricultural practices. Such problems have been well canvassed in the Lachlan Catchment Blueprint and in other natural resource studies in the Lake Cowal catchment.

The Lake Cowal Foundation is an independent organisation created by Barrick Gold as part of the consent process to develop local and regional environmental initiatives, independent from and unrelated to those being implemented within the mining lease itself. The foundation has an independent board made up of ‘green’ and ‘brown’ elements, including one from the Total Environmental Centre, as well as an independent scientist. It has a small independent staff headed by a very respected restoration ecologist Dr Donna Johnston, and is funded through an assured income stream from Barrick Gold.

The foundation has established significant links with the regional community and government agencies concerned with natural resource management such as the New South Wales National Parks and Wildlife Service, New South Wales Department of Environment and Conservation, and New South Wales Department of Natural Resources. It also has strong links with the Lachlan Catchment Management Authority, local schools and local government, and with regional universities and landcare groups. The foundation is already developing an enviable reputation as a result of its current program of work. Examples of how it incorporates sustainability and environmental principles include:

- ✧ environmental training programs for local landholders
- ✧ joint applications with local farming groups seeking grants from a range of funding bodies
- ✧ initiation of a range of environmental programs for schools in West Wyalong
- ✧ the development of a training and education centre
- ✧ significant training and financial and logistical support for native bush regeneration and restoration plantings in the Lake Cowal catchment
- ✧ jointly funded initiatives with the Lachlan Catchment Management Authority
- ✧ community re-visioning programs and much more.

Some implications for VET in Australia

The creation of the Lake Cowal Foundation heralds a model likely to result in further corporate environmental initiatives as a result of an increasing awareness and a desire by the corporate sector to meaningfully engage in the process. To optimise outcomes, VET-based organisations need a new structural and policy flexibility to match sustainability initiatives that will be implemented by better public and private sectors.

Good news story 4: Sustainable cities report

The *Sustainable cities* report (Parliament of the Commonwealth of Australia 2005) represents the views of a bipartisan House of Representatives Standing Committee on Environment and Heritage of the Australian Parliament. Two of the five terms of reference were focused on:

- ✧ a blueprint of ecologically sustainable patterns of settlement with particular reference to eco-efficiency and equity in the provision of services and infrastructure
- ✧ mechanisms for the Australian Government to bring about urban development reform and promote ecologically sustainable patterns of development reform and promote ecologically sustainable patterns of settlement.

The committee saw its task as encompassing five processes: acceptance of the need for sustainability in our cities, establishment by the government of future sustainability targets, implementation of sectoral programs, monitoring of progress, and provision of accessible information to the public. The committee writes of the need for a vision for sustainability and the creation of a pathway whereby this vision could be realised based on multi-disciplinary understandings. Furthermore, the report argues for:

- ✧ the establishment (by the government) of an Australian Sustainability Charter to set key national targets
- ✧ the evaluation of all relevant Australian Government policy proposals to gauge their impact on urban sustainability, as well as assessing them against the Australian Sustainability Charter
- ✧ the establishment by the Australian Government of an Independent Sustainability Commission headed by a national sustainability commissioner
- ✧ the development of a set of sustainability objectives and the implementation of a national report card to assess how these objectives are being met.

Surprisingly, there are no explicit recommendations about the skill-based education system and programs needed to back up the successful implementation of the 32 recommendations.

Some implications for VET in Australia

While this report is not an easy answer to Australia's quest for sustainable cities, it does represent a strategy to take Australia along that route with creative input from a wide range of Australians. Not surprisingly, there are many implicit implications for the VET sector, given that key recommendations include the very practical areas of transport, water, building design and management and energy. While some sectors of vocational education and training in Australia are positioning themselves to respond appropriately, for the most part the needed conceptual understandings, long-term strategic and integrated planning—let alone the supportive policy and organisational cultural changes required—do not yet appear to be present in our public or private sectors. As this report implies and recommends, this will only occur when a leadership and policy framework is established by the federal government and supported by each state and territory.

Good news story 5: Sustainability achievements in Western Australia

Released in 2003, *Hope for the Future: The Western Australian State Sustainability Strategy—A Vision for Quality of Life in Western Australia* (Government of Western Australia 2003) is Australia's first comprehensive sustainability strategy. As part of this long-term transition strategy to move to a sustainable future, Newman et al. (2004) released another milestone document—*Training for sustainability: The vocational education and training sector*. *Hope for the future* provides the aspirational framework needed to gradually move Western Australia towards a sustainable future and is based

on 11 sustainability principles. It also incorporates six visions for Western Australia and six goals for government. The latter are to:

- ✧ ensure that the way we govern is driving the transition to a sustainable future
- ✧ play our part in solving the global challenge of sustainability to tackle interrelated issues of population, development aid and environmental technology
- ✧ value and protect our environment and ensure the sustainable use of natural resources
- ✧ plan and provide settlements that reduce the ecological footprint and enhance our quality of life
- ✧ support communities to fully participate in achieving a sustainable future
- ✧ assist businesses to benefit from and contribute to sustainability, including the establishment of training schemes to provide capacity in new areas of professional activity for sustainability. The report argues ‘that it is the vocational education and training sector that is best able to respond quickly to the needs of industry for many of its re-training and accreditation requirements’.

Training for sustainability: The vocational education and training sector was commissioned by the Department of Education and Training in Western Australia, to develop a strategy for the VET sector to respond to sustainability training requirements. The report recognises that TAFE institutes, the private sector and the community will be involved in such training programs. Key areas that need to be addressed include the development of a core capability unit (Australia wide), the embedding of sustainability principles into all VET courses, a reassessment of all existing VET course to ensure the delivery of sustainability competencies, articulation of VET and university degrees in sustainability, and assistance in the accreditation of key professions. Other key findings are acknowledged in the conclusions section of this report.

Some implications for VET in Australia

These two Western Australian reports are complementary landmarks in the quest for sustainability in Australia. If the VET sector is to optimise its role in facilitating sustainable outcomes, then it needs to look to the Western Australian experience in relation to a number of important factors. These include the need for integrated government policy at all levels, the preparation of action plans, appropriate training for staff, and the development of sustainability standards and codes of practice. Other necessary activities include the creation of more flexible organisations which can respond rapidly to community needs and continually changing environmental technologies, as well as develop strategic plans for managing the required changes. Currently, skills for sustainability are marginalised in the VET sector. The effort which it will take for the sector to incorporate these skills cannot be achieved without a corresponding and substantial increase in allocated resources.



The National Vocational Education and Training Research and Evaluation (NVETRE) Program is coordinated and managed by the National Centre for Vocational Education Research, on behalf of the Australian Government and state and territory governments, with funding provided through the Department of Education, Science and Training.

This program is based upon priorities approved by ministers with responsibility for vocational education and training (VET). This research aims to improve policy and practice in the VET sector.

Research funding is awarded to organisations via a competitive grants process.

**National Centre for Vocational
Education Research Ltd**

Level 11, 33 King William Street
Adelaide SA 5000

PO Box 8288 Station Arcade
South Australia 5000

Phone +61 8 8230 8400
Fax +61 8 8212 3436
Email ncver@ncver.edu.au

www.ncver.edu.au