



Professional Development
in Climate Change Adaptation

Shifting Towards Sustainability

Education for climate change adaptation in
the built environment sector



Anna Lyth, Sandra Nichols and Daniella Tilbury

October 2007



Australian Government
Department of the Environment
and Water Resources



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Project Staff

This research project is a response to a recognised research need by the Australian Greenhouse Office (AGO) in the Australian Government Department of the Environment and Water Resources (DEW). It was framed and developed by the Australian Research Institute in Education for Sustainability (ARIES) in association with DEW. Involved in this project were:

Anna Lyth (Project Leader) Anna worked in consultation with DEW during the various planning and implementation stages of the project. She co-directed and framed the project and provided specialist input into the climate change adaptation and built environment components. She engaged the project partners, designed and facilitated the two workshops and undertook project management. Anna is the lead author of this report.

Sandra Nichols (Project Coordinator) Sandra coordinated the project and was the main ARIES contact for the professional institutions. She provided mentoring and support for the professional institutions as they worked through their action inquiry and assisted in the facilitation of the workshops. She is a co-author of this report.

Daniella Tilbury (ARIES Director) Daniella framed the research project and was responsible for seeking funds for its development. She co-directed the research, specifically providing input on the methodology and project design. She assisted with capturing the recommendations arising. She is a co-author of this report.

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Shifting Towards Sustainability: Education for climate change adaptation in the built environment sector

Executive Summary

Who is this document for?

This document will be of interest to you if you are involved in educating built environment practitioners in climate change adaptation, or if you are interested in the development of skills that will facilitate an effective response to climate change in the built environment sector.

What is this document about?

The document reports on a scoping study which investigated the professional training and development needs of architects, landscape architects, planners and engineers in climate change adaptation through engaging relevant accrediting institutions in an action inquiry process. The project sought to go further than a normal scoping study would, as it aimed to also assist the professional institutions involved to begin to think about, and take action on, professional development in climate change adaptation.

This document highlights:

- ◆ the need for education in climate change adaptation for built environment professionals
- ◆ the current status of education for climate change adaptation in Australian tertiary institutions and in continuing professional development programs
- ◆ how the project led to organisational change and initiatives that promoted education about and for climate change
- ◆ the outcomes of the project both for the individual professional institutions and collectively

- ◆ project findings and recommendations for promoting education in climate change adaptation.

What was the purpose of the project?

The Australian Research Institute in Education for Sustainability (ARIES) undertook the study for the Australian Government Department of the Environment and Water Resources (DEW). ARIES was asked to investigate opportunities to improve the capacity of graduate practitioners and existing practitioners to effectively respond to climate change adaptation challenges through accredited university courses and professional development.

How does the project complement other Australian Government initiatives?

The project complements the Australian Government's *National Climate Change Adaptation Programme* (2004-2008) which aims to help prepare Australian governments, vulnerable industries and communities for the unavoidable impacts of climate change. One of the four key objectives of this four year program is to build capacity to support the development of effective and targeted adaptation strategies¹. The Australian Government has also recently launched a strategy that outlines its approach to the *United Nations Decade of Education for Sustainable Development (DESD)*. It commits to "Develop education for sustainable development training and professional development initiatives for specific sectors."²

Who was involved in the project?

Commencing towards the end of August 2006, the project recruited four professional institutions as project partners. They were deemed to be crucial stakeholders in the process of strengthening education for climate change adaptation. All institutions have responsibility for quality assurance in professional education for their professions:

- ◆ *Engineers Australia* (EA) representing 80,000 members
- ◆ *Royal Australian Institute of Architects* (RAIA) representing 9,500 members
- ◆ *Planning Institute of Australia* (PIA) representing 5,000 members
- ◆ *Australian Institute of Landscape Architecture* (AILA) representing 1,000 members.

The project provided the professional institutions with the opportunity to spend time and resources on an issue that they recognised as important, and in some cases urgent, but had not yet begun to address.

Why was the project needed and what did it try to achieve?

The recently released Intergovernmental Panel on Climate Change's (IPCC) *Fourth Assessment Summary Report for Policy Makers*³ and the *Stern Review Report on the Economics of Climate Change*⁴ strongly highlight the scientific and economic basis for urgent action to reduce global greenhouse gas emissions *and* prepare for climate change through adaptation responses. The complex and uncertain nature of climate change will require increased foresight and the application of a range of practical skills across many sectors and professions. In the built environment sector, there is a need to reflect on the adequacy of current knowledge, skills and practices that will be required to effectively prepare and respond to climate change and build resilience in communities, resources and industries.

This project acknowledges that professional development in climate change adaptation is in its infancy in Australia. It sought to identify how professional institutions and bodies which accredit built environment education programs can embed a response to climate change within education programs. Through a process of critical inquiry by each of the professional institutions participating in the project, it was hoped that organisational change would occur to promote incorporating or embedding education for climate change adaptation in tertiary education programs and professional development courses.

Primarily concerned with climate change adaptation, the project recognises that past emissions have already contributed to global warming presenting diverse challenges for the built environment now and in the future. The focus on climate change adaptation does not understate the parallel importance of developing skills in climate change mitigation however.

What is climate change adaptation?

As defined by the IPCC climate change adaptation is:

*"...an adjustment in ecological, social and economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities."*⁵

Built environment professions will be required to embrace three objectives that form the basis of purposeful adaptation planning:

- ◆ reducing the sensitivity of built environments and their communities to climate change
- ◆ altering the exposure of built environments and their communities to climate change
- ◆ increasing the resilience of built environments, communities and planning systems to cope with impacts or changes⁶.

What is education for climate change adaptation?

The focus of education on climate change in the built environment professions to date has largely been on:

- i. acknowledging climate change as an issue and learning the context and/or science of this phenomenon, which can be referred to as education about climate change; and more specifically,
- ii. education about mitigation, particularly a focus on ways of reducing greenhouse gas emissions from built environment activities and structures.

Education for climate change adaptation has been the missing component in built environment tertiary courses. Education for climate change adaptation borrows from the experience of Education for Sustainability (E/S). Education for climate change adaptation is about the development of adaptive capacity - increasing the ability of individuals, groups, or organisations to adapt to changes associated with climate change. This approach promotes the development of critical skills necessary for understanding the complexity associated with climate change issues and the systemic changes needed to address these.

How was the project conducted?

A collaborative action inquiry process was used to gather the data alongside a desktop investigation of the status of climate change adaptation professional development initiatives in Australia. An action inquiry process involves striving to understand a question(s) which stimulates new ideas for further interrogation and action. The process involved the project partners thinking about, and reflecting on, the role and work of their institutions and professional sector and how they might use (or incorporate) education for sustainability techniques in relation to climate change adaptation. This approach was intended to promote development in thinking about climate change adaptation thus leading to action.

The core questions around which the action inquiry revolved were:

- i. *How skilled are built environment graduates and young practitioners in climate change adaptation?*
- ii. *How are engineering, planning, architecture, and landscape architecture professionals able to gain knowledge and skills in sustainable climate change adaptation?*
- iii. *How is climate change adaptation being incorporated into professional development courses?*
- iv. *What are the needs of the profession's teachers?*
- v. *How are the accrediting bodies responding to these needs?*

Outcomes achieved

The project achieved tangible outcomes. Each of the project partners progressed their thinking and actions in working towards better addressing climate change in professional development. Some developed actions to better address the climate change adaptation professional development issue. Examples of outcomes specific to individual project partners include:

- ◆ Raised awareness amongst those responsible for accreditation and education policies about the need to address education about and for climate change adaptation (all participants).
- ◆ Changes to professional institutions' policies and charters to embrace climate change issues and adaptation responses (AILA).
- ◆ Mainstreaming of sustainability as an assessable component of *all* industry recognition awards - not just environmental or sustainability awards (AILA).
- ◆ More accessible resources and information on climate change and climate change adaptation via professional institutions' websites and other practice publications (AILA, RAlA, PIA).
- ◆ Project partners committed to encouraging university educators to begin to include climate change adaptation case studies within existing curricula (all participants).

- ◆ Attention to education for climate change adaptation in national reviews of tertiary education policy in 2007, along with education about climate change and education for climate change mitigation (PIA and EA).
- ◆ The commencement of discussions about professional development for climate change adaptation in a range of forums engaging practitioners and high level institutional committees responsible for policy and decision making in professional development (all participants).
- ◆ Enhanced recognition by the project partners of the need for urgency in developing links with other built environment professions and climate change experts to facilitate greater understanding of climate change impacts and foster integrated approaches to climate change adaptation and sustainability (all participants).
- ◆ Rolling out special seminars to discuss this project, and its implications for the professions (AILA and PIA).

The action inquiry process not only helped to build the capacity of the individual partner institutions to bring about change, but also maintained enthusiasm and interest in change and sustainability issues through the partnerships and networks established. This further enhanced opportunities for collaborative actions.



Summary of findings and recommendations

Finding 1: Variable existing skills and access to professional development

All professional institutions identified that there was a variable skills base in the area, with some significant skill gaps. There was variable access to, and availability of, professional development in climate change adaptation. This confirmed the need for attention in this area.

Finding 2: Need for government leadership to set new benchmarks and new support for professional development initiatives

The professional institutions pointed to the important role of governments in leading the way, setting new benchmarks and altering operational environments (practice environments and systems in which built environment practitioners work).

Recommendations

That the Australian Government:

- a. release clear statements about the critical and urgent need for Education *for* Sustainability in all higher education programs associated with the built environment, and the critical need for education for both climate change adaptation and mitigation.
- b. take a lead in incorporating sustainability and preparedness for climate change into any future built environment project briefs for which it is responsible.
- c. demonstrate leadership and commitment to implementing action in climate change adaptation through the monitoring and reporting of indicators in climate change adaptation professional development initiatives.

Finding 3: Need for education for both climate change adaptation and mitigation

While there was clear recognition that professional education for climate change adaptation was limited and urgently needed, it was strongly stated by the professional institutions and their members that it should be integrated with education about and for climate change mitigation, as they are complementary and of equal urgency.

Recommendation

The study recommends that education about and for climate change adaptation in accredited courses be addressed in an integrated way with education about and for climate change mitigation.

Finding 4: Need for rapid adoption of education about and for climate change adaptation in accredited course programs and ongoing professional development initiatives

It is important to ensure that education about and for climate change adaptation is incorporated into the core curricula of accredited programs. Due to long lead times for reviewing, modifying and re-accrediting courses and given the urgent need to address this issue, voluntary adoption is also

Recommendations

To assist with the voluntary adoption, the study recommends:

- a. That the accrediting bodies amend their education policies to reflect climate change adaptation requirements in the short term.
- b. The formation of partnerships (and building of already established partnerships) to facilitate an integrated approach to professional development and climate change adaptation including:
 - identification of ways of raising standards and implementing them in the built environment sector (i.e. regulatory environments, building codes, government policy development and strategic planning).
 - Investigation of opportunities for a national series of cross-disciplinary seminars on climate change.

encouraged, while professional development activities in climate change adaptation (i.e., short courses) are required in the meantime to meet existing demand for skill development.

c. Using opportunities for immediate amendments to existing curricula and programs

In order to facilitate this, however, there will need to be a range of mechanisms and incentives provided by the professional institutions, universities and governments. These may include provision of:

- funding for teachers to study in a new area
- curriculum development grants for teachers to renew their existing programs/ subjects and develop new programs where appropriate
- university or government research grants for university staff to undertake practical research (thus contributing to research kudos for the teacher and the possibility of increasing 'research led teaching' in the curriculum).

d. Provision of support for professional development initiatives (particularly short courses)

e. Participatory research approach to facilitate learning and change

The Australian Government, in partnership with the accrediting bodies, needs to provide opportunities to review existing programs and the application and context for relevant competency standards to address education for climate change adaptation within professional courses. The professional institutions recommend a participatory research approach which is not threatening to stakeholders, enables them to take learning and change at their own pace and enhance their own competencies in the process of undertaking the study with the delivery of practical outcomes within the medium term.

Finding 5: Necessary changes to form and content of education

There were some important issues raised that relate to the form and content of education about and for climate change adaptation in accredited courses and other professional development initiatives.

1. The research indicated that professionals understand the need for climate change adaptation but not the practical implications. Therefore, professional development that focuses on *'what we should be doing on the ground'* is needed, supported by quality assured resources and processes to support tertiary teachers, trainers and practitioners
2. The professional institutions agreed that the ability to effectively respond to climate change adaptation challenges should be built out of a strong grounding in sustainability principles. They considered that, while there will be many specialist competencies to develop for each profession, there are a number of generic sustainability competencies that graduates and established practitioners need to develop (such as being able to work in integrated teams to solve problems, lateral thinking, and being able to engage with creative ideas outside practice norms).
3. It was recognised that educators (including program assessors) also need to review and develop their knowledge in climate change adaptation and skills in education for climate change adaptation. In addition to providing new resources (i.e., teaching materials on climate change adaptation) it was agreed a new educational paradigm whereby teaching and learning is seen through the 'prism of climate change' was needed.
4. It was acknowledged that there will be an increasing need for built environment professionals and students to work in cross-disciplinary teams to be able to understand problems related to climate change, collectively solve them, and share best practice case studies. This is likely to require partnerships between professional institutions and increased resources (financial and time) to facilitate collaborative teaching and learning initiatives.
5. The professional institutions opposed the idea of a sole focus on specialised courses on climate change. It was agreed that such an approach would limit the ability to embed core competencies across the professions and might foster an inequitable distribution of competency across Australian communities, thus limiting adaptive capacity in some places and sectors.

Finding 6: Need for quality control and competency standards in climate change adaptation education

There is an evident need for core competency standards and quality control of professional development for climate change adaptation. Professional institutions responsible for accrediting courses and setting competencies are the appropriate bodies to facilitate action in this area, but support is required to do this.

Recommendations

a. Identify core competencies in climate change adaptation

Accrediting bodies and other relevant professional institutions to work with stakeholders (university program directors, teachers, students and industry employers) to identify the climate change adaptation context for the application of competencies specific to each profession.

b. Integrate climate change adaptation as a core area within policies and procedures of accrediting bodies

A review of accreditation policies and processes is needed. Accrediting bodies and relevant stakeholders need to embed the competencies within their systems.

c. Assure minimum levels of competence

Accreditation bodies and professional institutions need to play a role in assuring climate change adaptation is a core area within formal accredited university programs and ongoing professional development.

Finding 7: Need for a national strategy for the sharing and dissemination of climate change information and resources

Feedback via the action inquiry process re-iterated the need for quality assured and useful information and resources to be used by practitioners and teachers. The project partners consequently recognise the need for a national strategy for the sharing and ready access of climate change information and resources for practitioners and teachers (across sectors).


Recommendation

The project partners support a national and multi-stakeholder strategy for identifying the mechanisms for sharing and disseminating climate change and adaptation information (including teaching resources). Mechanisms for dissemination might include the establishment of a clearinghouse which would disseminate resources, offer advice on accessing quality assured information, and facilitate multi-sector and specialist professional development activities. Online information and professional development courses would promote equitable access to training across the country, particularly for those practitioners unable to attend face to face professional development activities. For example, the Built Environment Design Professions' *Environment Design Guide* (BEDP-EDG) provides an immediate structure through which to deliver this. In addition, education for climate change adaptation could also be incorporated into the charter of the proposed Australian Centre for Climate Change Adaptation.

Abbreviations

AACA	Architects Accreditation Council of Australia
AASA	Association of Architecture Schools of Australasia
AGO	Australian Greenhouse Office
AILA	Australian Institute of Landscape Architects
ALGA	Australian Local Government Association
ANZAPS	Australian and New Zealand Association of Planning Schools
ARIES	Australian Research Institute in Education for Sustainability
BEDP-EDG	Built Environment Design Professions'-Environment Design Guide
CPD	Continuing professional development
DEW	Australian Government Department of the Environment and Water Resources
DESD	Decade of Education for Sustainable Development
EA	Engineers Australia
EfS	Education <i>for</i> Sustainability
ESD	Ecologically sustainable development
HCCREMS	Hunter & Central Coast Regional Environmental Management Strategy
IPCC	Intergovernmental Panel on Climate Change
LGSA	Local Government and Shires Association
MSS	Manly Sustainability Strategy
NEC	National Education Committee (RAIA)
NYPG	National Young Planners Group (PIA)
NEnvC	National Environment Committee (RAIA)
PDP	Professional development program
PIA	Planning Institute of Australia
RAIA	Royal Australian Institute of Architects
RMIT	Royal Melbourne Institute of Technology
SCCG	Sydney Coastal Council Group
SONA	Student Organised Network for Architecture
TNEP	The Natural Edge Project

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1 Introduction

1.1 Overview

Climate change is now top of mind within the community at large. The recently released Intergovernmental Panel on Climate Change's (IPCC) *Fourth Assessment Report Summary Report for Policymakers*⁷ and, prior to that, the *Stern Review Report on the Economics of Climate Change*⁸, highlighted the scientific and economic basis for global action on climate change. Popular media, such as the film *An Inconvenient Truth*⁹, have also contributed to the heightened community awareness. There is an understanding that the implications of changes to our global climate system will have diverse environmental, social and economic impacts at all scales.

Whilst built environment professionals have always had to deal with climate variability, human-induced climate change will require innovative strategies to cope with new situations that emerge from anticipated, unexpected and non-linear climate change. The complex and uncertain nature of climate change will require increased foresight, whilst systematic exploration of adaptation options will need to respond to local circumstances. Planners, architects, landscape architects and engineers already have many of the skills and tools that will assist in meeting these challenges; however there is a need to reflect on the adequacy of current knowledge, skills and practices that will be needed to effectively prepare or respond to climate change within built environments.

Box 1

The global consensus within the scientific community is that “warming of the climate is unequivocal” and while numerous long term changes in climate have already been observed around the world there are likely to be many more changes during the 21st century. The Intergovernmental Panel on Climate Change (IPCC) asserts that:
“continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.”

Source: IPCC 2007 p5

Box 2

The *Stern Review* recommends that action be taken as soon as possible to adapt to climate change to avoid prohibitive costs in the future, and confirms the important role of built environment practitioners, among other professionals, in preparing for, and responding to, climate change:
“Adaptation will be crucial in reducing vulnerability to climate change and is the only way to cope with the impacts that are inevitable over the next few decades.”

Source: Stern 2006 p403

1.2 The research

1.2.1 Commissioned research

The Australian Research Institute in Education for Sustainability (ARIES) undertook the study for the Australian Government Department of the Environment and Water Resources (DEW) to work with the built environment sector to consider the adequacy of current competencies for climate change adaptation in the built environment sector and to seek ways to embed climate change adaptation competencies within professional education. In addition, ARIES was asked to investigate opportunities to improve the capacity of graduate practitioners and existing practitioners to effectively respond to climate change adaptation challenges through formal accredited university course programs and professional development (such as professional short courses, training sessions and special seminar programs). Although the study focuses on building the capacity for adaptation practice in the built environment sector, the researchers recognise that equipping built environment professionals to be able to develop and implement sustainable practices, including strategies for mitigating global warming via the reduction of greenhouse gas emissions and enhancement of greenhouse gas sinks, is also of the utmost importance.

The project complements the Australian Government's *National Climate Change Adaptation Programme*, which commenced in 2004, and aims to help prepare Australian governments, vulnerable industries and communities for the unavoidable impacts of climate change. One of the four key objectives of this four year program is to build capacity to support the development of effective and targeted adaptation strategies¹⁰. The Australian Government has also recently launched a strategy that outlines its approach to the United Nations Decade of Education for Sustainable Development (DESD). It commits to "Develop education for sustainable development training and professional development initiatives for specific sectors"¹¹. This project is very relevant to this commitment.

Box 3: What is an action inquiry?

An action inquiry examines existing ideas, assumptions and practices through considering a set of research questions that are explored by a wide range of stakeholders relevant to the organisation carrying out the research.

1.2.2 The research focus

Essentially a scoping study, the project investigates the professional training and development needs of architects, landscape architects, planners and engineers through engaging relevant accrediting institutions (the project partners) in an action inquiry process. The project sought to go further than a normal scoping study. Its aim was to not only document the state of play in climate change adaptation education, but also assist the professional institutions involved to begin to think about, and take action to improve, professional education in climate change adaptation. This study is premised on professional institutions having the capacity to promote change through their policies and accreditation processes.

Thus, the purpose of the action inquiry was to:

- ◆ assess the current needs in education about and for climate change adaptation; and
- ◆ identify realistic and relevant ways of improving the quality of professional development in this field for engineers, architects, planners and landscape architects.

1.2.3 The research components

The project contained three research components which provided complementary forms of data: a scan of the state of play of professional development for climate change adaptation; a participative action inquiry including all project partners; and an independent action inquiry process.

Box 4: The core questions for the action inquiry

1. How skilled are graduates and young practitioners in climate change adaptation?
2. How are engineering, planning, architecture, and landscape architecture professionals able to gain knowledge and skills in sustainable climate change adaptation?
3. How is climate change adaptation being incorporated into professional development courses?
4. What are the needs of the profession's teachers?
5. How are the accrediting bodies responding to these needs?

The participative action inquiry brought the project partners together to provide an opportunity to collectively reflect and explore issues and questions. To facilitate this, two workshops were held. The first workshop followed recruitment of the project partners but was prior to the rollout of their action inquiries. It focused on explaining the action inquiry process to the project partners, and exploring opportunities for development of their own action inquiry approach. Core questions (see Box 4) were refined at this workshop.

This collective reflection on the research questions themselves was a process of action inquiry which led to a deeper understanding of what the institutions needed to learn about professional education for climate change adaptation in their sector, themselves as inquirers and actors, and their stakeholders.

The second workshop provided the opportunity for the project partners to discuss their collective findings and validate the results of their action inquiries. It was held after the submission of the project partner action inquiry reports to ARIES. The project team also provided guidance on data collection methods through the first project workshop, ongoing mentoring and a teleconference.

The workshops encouraged open dialogue and enabled people to ‘critically’ reflect on their existing practice and identify the changes necessary. Meeting with other project participants in the workshops gave the project a multi-disciplinary perspective that broadened perspectives and gave rise to innovative possibilities for embedding climate change adaptation education into the participants’ respective sectors.

1.2.4 The research methodology

(i) The action inquiry process A collaborative action inquiry process was used to gather the data for this project. The action inquiry process involves striving to understand a question(s) which stimulates new ideas for further interrogation and action. Existing ideas, assumptions and practices are freely examined and, as a result, new ideas for further interrogation and action arise. The project’s core questions for inquiry are outlined in Box 4. The process also involved the project partners thinking about, and reflecting on, the role and work of their institutions

and how it might encompass the key components of learning for sustainability in relation to climate change adaptation. This approach was intended to promote development in thinking about climate change adaptation by the professional institutions themselves leading to action and organisational change through ‘ownership’ of the issues.

(ii) Participatory research This approach, which is based within the critical theory paradigm, encourages those who can make the changes to address issues to investigate the issues themselves. It uses a methodology which allows for, and promotes, deep seated systemic change within organisations over time by motivating and empowering stakeholders who have the power to make change.

(iii) Data sources The project required different data sources and collection methods depending on the information and outcomes being sought at each stage of the project. The process of combining different data sources contributes to ‘triangulation’. Triangulation is used to ensure the validity and reliability of the gathered data (see Box 5).

Box 5 - Why triangulation is used

1. to obtain a variety of information on the same issue
2. to use the strengths of each method to overcome the deficiencies of the other data
3. to achieve a higher degree of validity and reliability
4. to overcome the deficiencies of single method studies

Source: Sarantokas 1998 p169

Each of the project partners developed their own data collection methods to maximise stakeholder response to the core inquiry questions. The methods varied depending on the size of the membership of the participating institutions and the time and resources available to carry out the research. Examples of data sources used include:

- ◆ online surveys
- ◆ telephone interviews
- ◆ written submissions
- ◆ workshops.

Box 6: Catalytic validity

Catalytic validity represents the degree to which the research process re-orient, focuses and energises participants toward knowing reality in order to transform it. The argument for catalytic validity lies not only within recognition of the reality-altering impact of the research process, but also in the desire to consciously channel this impact so that respondents gain self-understanding and, ultimately, self-determination through research participation.

Source: Lather 1991 p68

(iv) Data validation The fact that changes actually occurred *during* the project provides a further point of data validation. By understanding a different way of approaching change for sustainability through using an action inquiry process and supported by an Education *for* Sustainability framework the participants felt empowered to use a new way of thinking and implement change. This type of evidence leads to a process called ‘catalytic validity’ (see Box 6) whereby the impact of the action inquiry process alters perceived reality, so that those participating in the study gain a better understanding of the future direction of their institutions. The process can thus determine the success or otherwise of the action inquiry process.

(v) Support The support provided by the project leader and coordinator for the project participants was an essential part of the project and was facilitated by regular telephone and email contact. The project team also provided guidance on data collection methods through the ongoing ARIES research support process and a teleconference. The teleconference clarified and validated the approaches that the participants were planning to use in their action inquiry process. Key issues discussed included which stakeholders were to be involved, how these stakeholders were to be engaged and details of contingency plans. The teleconference allowed the project partners to share their progress, while it also aided motivation for continued progress in finding answers to the core questions and in pursuing opportunities for action.

(vi) Project limitations There were several limitations to this project which are outlined below:

Timing of the project: Due to the overall timeframe for the project, stakeholder involvement in the action inquiry project was scheduled from early December to mid February, which included the summer holiday season. This affected the response from online surveys in particular.

Up-to-date information: Since commencing the project in August 2006, there have been many developments in the climate change education field. This has made it difficult to include all initiatives in the climate change adaptation education field, even within Australia. The information collected focused on:

- ◆ climate change *adaptation* related initiatives rather than on the much wider range of climate change related issues
- ◆ initiatives that are relevant to built environment professions rather than other sectors (this does not discount, however, the potential that initiatives in other sectors might have in contributing to the building of capacity in the built environment professions); and initiatives that go beyond the dissemination of climate change knowledge (e.g. information reports) and provide added capacity building elements.

Engaging the right stakeholders: The large variation in the numbers of members of each of the participating institutions (from 1,000 in AILA to 80,000 in EA) meant that it was not possible to always target the stakeholders most affected by the climate change adaptation education issue, such as practising professionals and students. The stakeholder involvement process was therefore necessarily skewed towards those stakeholders that were either interested in the research questions or had the time to complete the online survey, attend a focus group or face-to-face interview or engage in a telephone interview. More substantial action research projects would allow the engagement of a wider range of stakeholders.

Lack of time and financial resources to implement recommendations: This issue was only mentioned by one of the project partners, although the general consensus was that further funding (from the Australian Government and other sources) would expedite the process of bringing about change in this area.

1.2.5 The project partners

It was essential for the success of the project that the key accrediting bodies for built environment professionals were recruited as project partners and that the key people able to bring about systemic change within those institutions were involved directly in the project. The project team was fortunate indeed, therefore, in being able to bring on board *all* the professional institutions responsible for accrediting professional courses and/or specifying core competencies for practitioners in the built environment professions. The project partners ranged in size of membership from:

- ◆ *Engineers Australia* (EA)¹² representing 80,000 members;
- ◆ the *Royal Australian Institute of Architects* (RAIA), representing 9,500 members;
- ◆ the *Planning Institute of Australia* (PIA), with 5,000 members; to
- ◆ the *Australian Institute of Landscape Architects*, (AILA) with 1,000 members.

Each professional institution involved two to three senior personnel in the project.

The timeliness of the project helped the recruitment process. All of the partner institutions had realised that climate change education was an emerging issue for built environment professionals. While one of the project partners (PIA)¹³ had undertaken preliminary investigations of the issues for their profession associated with climate change, the others had not had the time or financial resources to pursue it. Thus the project provided the opportunity to progress the issue in a mutually beneficial and supportive environment.

1.2.6 Project outcomes

It should be acknowledged that the period of the project was subject to unprecedented attention to climate change issues. The media attention on climate change and national concerns about drought, added to the recognition of the timeliness of the project for each of the project partners and provided a strong impetus for organisational change.

Specific changes within each organisation during the course of the project included:

• AILA

The Landscape Charter prepared by AILA and endorsed at their annual conference in November 2006 had already mentioned global warming as a key value to be addressed within the charter¹⁴. The project provided a justification for this. As an extension of this, AILA decided to mainstream sustainability as an assessable component of *all* awards to replace previously separate environment and sustainability awards

Other tangible outcomes included adding a section to the AILA website on climate change adaptation issues, approaches and resources for practitioners, and encouraging university educators to begin to include climate change adaptation case studies in landscape planning. It was put by AILA that the project was:

*“...a timely exercise and a catalyst for change for the Institute and the priorities we set. Education was always a priority for us but we now have a concrete reason for it being **the** priority.”*

• PIA

The start of the project paralleled the start of a series of national seminars run jointly by PIA and the AGO on climate change strategies for planning practitioners. The seminars provided an opportunity to promote the project and initiate discussions with stakeholders. Information about the project was also submitted to external groups interested in planning issues such as the Australian and New Zealand Association of Planning Schools (ANZAPS) and the Australian Local Government Association (ALGA) for inclusion in their electronic newsletters. The project also fed into a national review of planning education policy by the National Education Committee. Meanwhile, the National Young Planners Group (NYPG) was also addressing the issue by developing an ‘Ideal Course’ which included issues to do with climate change, disaster management and other areas of planning.

In addition, the project prompted the organisation of an in-house discussion by the ACT Government Land and Planning Authority on skills needed for planning for mitigation/adaptation for climate change.

In summary, the inquiry allowed PIA to facilitate an enhanced level of discussion and thinking about the implications of climate change for the profession and the current gaps and needs in professional development through raising awareness of the project and the project's process.

• EA

The project was timely for Engineers Australia who will be involved as a key stakeholder, and as a Steering Committee member, in the 2007 National Review of Engineering Education. This is a Carrick funded project being undertaken by the Australian Council of Engineering Deans. A significant change noted by those responsible for accreditation and education policies within EA is the importance engineering schools are placing on the development of generic capabilities such as critical analysis and creative problem solving. The emphasis on broad ranging capabilities in graduates is permeating all engineering disciplines. An urgent need now is for the focus on generic skills, attributes and values to be focused through a “prism of climate change” (EA). As one of the EA participants explained:

“Many relevant skills are already being taught e.g. urban water management. Undergraduates are getting the underpinning skills but are not looking through the ‘prism’ of climate change. Fundamentally, the issue is one of putting the right set of glasses on.”

Engineers Australia have also been instrumental in leading and supporting the development of education for and about sustainability in Australia and overseas. This project was seen to complement established initiatives such as:

- ◆ The Natural Edge Project (TNEP) which has focused on developing academically rigorous and critically reviewed content for sustainability in engineering education. The development of the *Engineering Sustainable Solutions Program* by TNEP has received major funding and in-kind support from EA and also from the Society for Sustainability and Environmental Engineering (SSEE), UNESCO, DEW, and the Australian Government Department of Industry, Tourism and Resources.

- ◆ The Engineers Without Borders Australia (EWB Australia)¹⁵ initiative, of which EA has been a strong in-kind and financial supporter. EWB (Australia) works with disadvantaged communities to improve their quality of life through education and the implementation of sustainable engineering projects – in Australia and overseas. EWB’s education activities focus on the issues of sustainable development, appropriate technology and poverty alleviation by working with universities, professional institutions, high schools and industry to increase the understanding of these issues. There are currently more than 20 Australian universities participating in the annual ‘EWB Challenge’, which specifically integrates a sustainability project and an assessment item into undergraduate course work (first to final year students).

Ultimately, this project encouraged a reflective process and strengthened understanding about the need for integrated education for and about climate change mitigation and adaptation.

• RAIA

The main organisational change arising from the project for RAIA was recognising the need for urgency in developing links with other disciplines to facilitate a more holistic approach to the issue of sustainability and adapting to climate change. A comment from a RAIA project participant elucidates this point:

“Currently there is a focus on contracts and tension between architects and planners (e.g., through streetscape policies and the mismatch between the BCA (Building Code of Australia) and state planning provisions). This trend needs to be stopped and more cross-disciplinary work done.”

It was also recognised that:

“A strategic approach is needed for a paradigm shift to occur. It is important to always make sure urgency is part of the discussion without being alarmist. We cannot use the usual timeframes to make things happen. An incremental approach is no longer appropriate.”

1.2.7 Collective outcomes

As well as individual organisational outcomes described above, a number of collective outcomes resulted from the project. A common way of thinking developed that helped to clarify the issues and move the discussion forward to a point where a number of collective outcomes and realisations resulted. The action inquiry process not only helped to build the capacity of the individual partner institutions to bring about change as illustrated above, but also maintained enthusiasm and interest in change and sustainability issues through the partnerships and networks established between the institutions. These partnerships and networks are integral to establishing strong foundations that will hopefully continue beyond the life of the project¹⁶. The positive approach that the participants had towards the project and the action inquiry process is highlighted in the comment below:

“There is a need to identify opportunities rather than problems and to see the wider picture.”¹⁷

The collective outcomes of the project partners included the need for:

(i) Competency development in sustainability and climate change adaptation

There was collective agreement that in developing skills for climate change adaptation, further development of competencies associated with sustainable practice more broadly had become more important and urgent than ever. This was based on a concurrence that while there will be specialist knowledge and many skills to develop for each profession, it was important to ensure that graduates and practitioners were able to work in integrated teams to solve problems, use lateral and integrated thinking, and engage with creative ideas outside practice norms.

Box 7 lists the generic competencies for sustainability and climate change adaptation that were identified by the project partners in the first workshop. They highlight the essential need to move education about and for sustainability into the ‘core’ of curriculum (climate change adaptation and mitigation would be important elements of this).

Box 7: Generic competencies for sustainable practice and application of climate change adaptation (common to all built environment professions)

Graduates should be able to:

1. think about problems holistically and through the ‘prism’ of climate change
 2. understand principles of sustainable development
 3. problem-solve using lateral and integrated thinking
 4. comprehend the significance of the climate change problem
 5. interpret information about climate change from a range of sources and disciplines
 6. effectively interpret information about impacts and vulnerabilities specific to the locality, region or sector they are working in to develop appropriate problem-solving strategies for climate change adaptation
 7. make judgements for decision-making based on interpretations of degrees of uncertainty associated with scenarios for local and regional impacts
 8. think beyond social and professional practice norms to develop creative climate change adaptation strategies
 9. demonstrate resolve to make decisions despite uncertainties about local and regional climate change impacts.
-

Source: Workshop 1, 3 November 2006 Canberra

Box 8 outlines some of the views of participants associated with the collective view that the ability to effectively respond to climate change adaptation challenges should be built out of a strong grounding in appreciation of principles of sustainability. There is evidence that these issues are becoming more widely addressed.

Box 8: A need for grounding in sustainability

'We have learnt the lessons from the environment agenda....it is no longer acceptable to have separate sustainability teachers in universities....climate change adaptation needs to be integrated into existing courses.'
'Sustainability has to be embedded into everything we do.'

Source: Comments from Workshop 2, 5 March 2007 Canberra

(ii) Continuing professional development in climate change adaptation

As well as incorporating new competency standards in climate change adaptation for all graduating built environment professionals, the need to improve the quality and variety of continuing professional development (CPD) opportunities through adapting or 'tweaking' current practice to include education in climate change adaptation was also recognised. This need was highlighted as it is likely that implementing new competency standards in climate change adaptation into courses could take between three to five years; such changes are usually associated with accreditation reviews. However, two of the professional institutions are currently undertaking a review of their educational practices and competency standards which will allow them to incorporate a greater degree of attention to the competencies required for sustainable practice and climate change adaptation (Engineers Australia and the Planning Institute of Australia). Tailored, short, sharp courses were considered the preferred format to respond to gaps in education in the immediate term and complement formal accredited course programs on an ongoing basis.

(iii) Resources

Teaching materials and websites that are up-to-date with consistent quality information are needed to raise awareness and provide support for tertiary

teachers and trainers. In addition, financial and time resources will be required to facilitate the production and dissemination of these teaching materials. The needs of the professions' teachers vary depending on their interest, knowledge and skills in climate change adaptation and the requirement for them based, for example, on the areas in which they work. Their future needs are likely to include the ability to:

- ◆ understand the science of climate change and its implications for professional practice
- ◆ articulate the need for climate change adaptation to university stakeholders
- ◆ understand policy implications, particularly at the government level
- ◆ select strategies appropriate to specific contexts
- ◆ integrate climate change adaptation as a key competency for professional practice
- ◆ integrate adaptation principles into professional development programs for academics and engineers.

(iv) Registration of CPD

There was a recognition that it is currently difficult to reach all built environment practitioners to encourage them to update their skills in climate change adaptation. This is due to inconsistency in CPD requirements over the range of built environment professions. It was suggested by some project participants that attendance at CPD events related to climate change adaptation could be encouraged through a national registration system for CPD activities for all built environment professionals. However, it was largely agreed that this would be a difficult initiative to implement given the different approaches to CPD by each professional institution.

(v) Rapid adoption of climate change adaptation skills

Teachers and course assessors are able to build capacity in climate change adaptation education *now* by incorporating into current courses relevant case studies, assessment tasks and other teaching and learning activities (see Section 3.1.1 for the AILA example).

(vi) Development of cross-disciplinary skills

It was recognised that there will be an increasing need for built environment professionals to have cross-disciplinary, practical application skills and the ability to collectively solve problems related to climate change. Skills in contingency planning, sustainability standards and risk management are particularly relevant to climate change adaptation. Partnerships between professional institutions and also with government agencies, consultancies and industries were seen as one way of progressing the incorporation of cross-disciplinary skills into courses. Incorporating cross-disciplinary skills into all built environment courses was another identified option.

(vii) Strategic planning

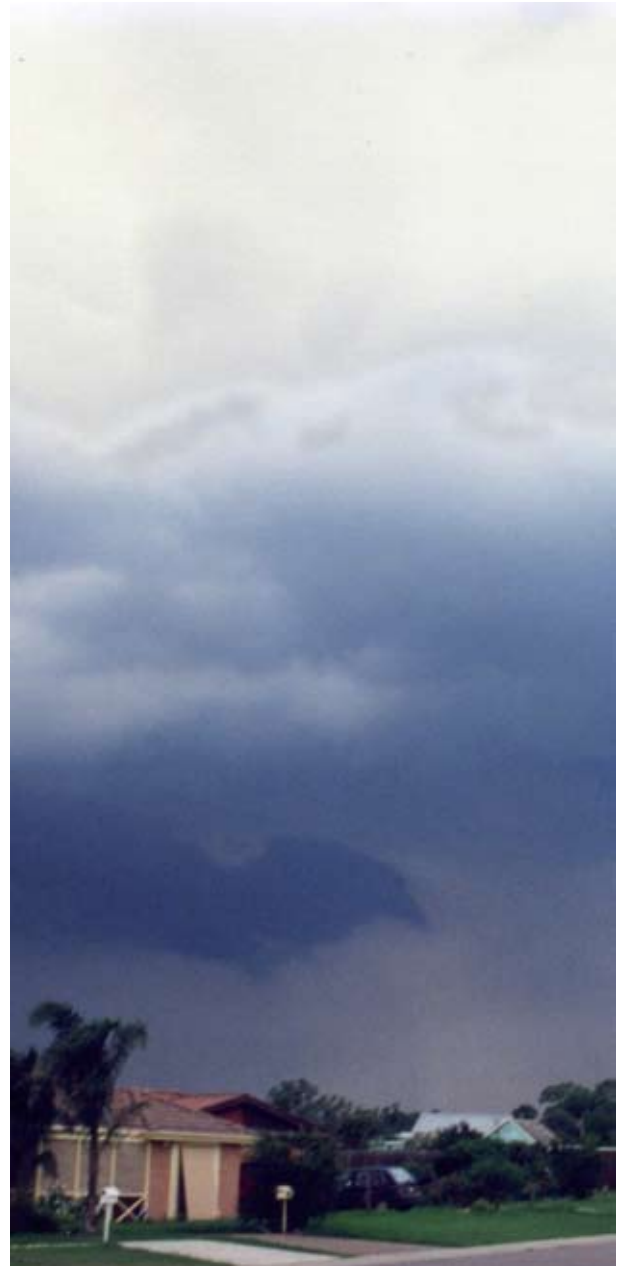
Urgent attention needs to be given to a strategic approach to bring about change in course delivery and content to incorporate futures thinking.

(viii) Embedding climate change adaptation education in all courses

Rather than developing new specialised climate change adaptation focused university courses, it was agreed that all existing courses should include a climate change adaptation component. The focus, however, should be on key impact areas and on professional practice skills. This would reduce the risk of producing only limited climate change adaptation experts and would widen the range of minimum competencies in climate change adaptation throughout the profession.

(ix) A national series of cross-disciplinary seminars on climate change adaptation

The seminars could be developed through establishing partnerships between the project partners and other stakeholders such as the overarching Australian Council for the Built Environment Design Professions (BEDP).



2 Professional development in climate change adaptation

2.1 Context

The need to prepare for the impacts of climate change across scales and sectors has been clearly and strongly articulated globally, while Australian governments at all levels are acknowledging the need to facilitate adaptation in some form or another. Most of the states have provided funding for undertaking assessment and adaptation projects with the aim of assisting communities, built environment professionals and local governments to better understand the implications of climate change for regions and localities and explore adaptation options in response to these.

There is a recognition that local government authorities need to assess their climate change adaptation needs, as they are the frontline government responsible for dealing with community and environmental issues in the first instance. Networking opportunities for local government planners, for example, have been provided through state government funded seminars and programs and regional groupings of councils.

It is likely, as we learn more about the regional and local impacts of climate change, that economic and legal risks will place increasing pressure on decision makers to regulate or pay attention to risk management and climate change adaptation in planning, building and design. The process of reviewing strategic plans, statutory planning documents, building codes and design standards has already begun (see Box 12), although it is early days and initiatives in this area are currently sporadic. For example, planners in local government areas that incorporate significant stretches of coastline are beginning to realise the potential impact of climate change and are amending their strategic planning documents and coastal management plans accordingly. State governments are also acknowledging that climate change will present new challenges requiring innovative solutions and new analyses.

Box 9: Project example: Understanding climate change impacts in north east Victoria

Funding: North East Catchment Management Authority

Lead agency: North East Greenhouse Alliance

Date: 2006-2007

Target group: State & local government, industry, business, special interest, community services and residential groups

Nature of capacity building: Education & awareness program of potential threats & opportunities of climate change

Expected outcomes: Development & implementation of a regional climate change adaptation strategy

Source: URS Australia

Box 10: Project example: NSW LGSA

Funding: NSW Greenhouse/Cabinet Office

Date: 2006-2008

Target group: Local government council planners and officers

Nature of capacity building: Initial needs-analysis will lead to the production and distribution of a 'climate change action pack' to all local councils in NSW. A program of workshops in 2007 to roll out the toolkit and a Climate Change Summit in 2006 on the impacts and varying responses to climate change to assist councils and their local communities to develop climate change action plans.

Expected outcomes: Councils will develop climate change adaptation and mitigation strategies as part of their core business.

Source: NSW LGSA 2006

Box 11: Project example: Sydney Coastal Council Group (SCCG)

In July 2005 the Sydney Coastal Council Group partnered with Macquarie University to provide an information and discussion forum on climate change science, impacts and planning implications tailored to local government officers and decision makers (including councillors).

Stern notes that "market forces alone are unlikely to deliver the full response necessary to deal with the serious risks from climate change"¹⁸ and points to the critical role of government in providing a clear policy framework to guide effective adaptation. This changing operational environment will have implications for built environment professionals working both in and with governments as government directives, incentives or disincentives from any of the three government levels in Australia will impact directly on the skills and knowledge required by them.

2.2 What is meant by climate change adaptation

The definition of adaptation to climate change is outlined in Box 13. It is taken from the definition outlined by the IPCC. Adger refers to adaptation as involving both the building of adaptive capacity (increasing the ability of individuals, groups, or organisations to adapt to changes) and implementation of adaptation decisions (transforming that capacity into action)¹⁹. Built environment practitioners and decision makers need to be engaged with both of these elements of adaptation.

Adaptations can be classified according to a range of attributes (including temporal and spatial considerations) and according to their relative autonomous or purposeful nature (i.e., anticipatory, reactive or strategic adaptation). The need for purposeful adaptation is particularly relevant to built environments. Built environment practitioners are responsible for: the development of urban form; urban, building and infrastructure design; infrastructure provision and maintenance; environmental protection; and amenity and safety in human settlements. They consequently have a pivotal role in preparing us for an uncertain future through facilitating resilience and adaptability into many aspects of society.

Box 14: Adaptive options

"Adaptive options could include improving water use efficiency, providing more energy efficient housing and revised engineering standards and zoning for infrastructure development."

Source: Pittock 2003 p7

Box 12: Strategies addressing climate change

Manly Sustainability Strategy (MSS)

"The local effects of climate change and the need for local mitigating actions are the biggest unknowns that may influence the MSS. Monitoring of this situation with regular expert review is essential as some programs may need to be applied more urgently than is currently recognised"

Source: Draft Manly Sustainability Strategy (MSS) 2006

NSW Far North Coast Regional Strategy

"Long term climate change is likely to present new challenges that will demand careful analysis and innovative solutions"

Source: NSW DoP 2006, NSW Far North Coast Regional Strategy, p21

Box 13: What is climate change adaptation?

"...an adjustment in ecological, social and economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities."

Source: Adger et al 2005 p78

Essentially though, built environment professions will be required to embrace three objectives that form the basis of purposeful adaptation planning:

- i. reducing the sensitivity of built environments and their communities to climate change;
- ii. altering the exposure of built environments and their communities to climate change; and
- iii. increasing the resilience of built environments, communities and planning systems to cope with impacts or changes.²⁰

While there are diverse and numerous actions that will need to be employed, some examples of the sorts of actions that might relate to the roles of engineers, architects, planners and landscape architects according to each of these three areas of adaptation are provided in Box 15. Such actions will require practitioners to draw from existing knowledge, experiences, skills and tools, but will also require the development of new practice skills and knowledge to be able to respond to a new set of problems.

Box 15: Three categories of purposeful adaptation: Examples of actions for built environment professions

Reduce the sensitivity of the system to climate change	Alter the exposure of the system to climate change	Increase the resilience of the system to cope with impacts or changes
<p>Implement sustainable water supply and demand management actions</p> <p>Design buildings that focus on human comfort needs of potential future climate</p> <p>Design urban landscapes and neighbourhoods to facilitate adjusted lifestyles</p> <p>Design public infrastructure (eg. storm water infrastructure) for future climatic conditions</p> <p>Undertake integrated strategic planning to reduce risks, and minimise and manage vulnerabilities</p> <p>Select more resilient species in landscape design and management</p>	<p>Mitigate the impacts of natural hazard events (floods, bushfires, droughts, severe storms etc) through infrastructure and building resilience (design, materials), land use zoning, development controls</p> <p>Mitigate climate change itself:</p> <ul style="list-style-type: none"> • reduce greenhouse gas emissions from human activities (urban transport, energy consumption) • reduce the removal of greenhouse gas sinks (such as forests and woodland) • increase greenhouse gas sinks (conserve natural habitats, better integrate green space into urban environments) 	<p>Facilitate the enhancement of the well-being of communities and their supportive networks and services through social planning strategies and neighbourhood design.</p> <p>Increase resources to support the development of preparedness and recovery from loss through working with the insurance industry.</p> <p>Educate different groups (including individuals, public and private institutions) about their relative vulnerability to impacts and their adaptive options.</p>

Adapted from: Lyth 2006

2.3 The need for attention to both adaptation and mitigation

A scan of the Australian education scene (refer to Section 3.3, Finding 1) shows that there has been a recent rush in awareness-raising initiatives on climate change adaptation issues for built environment professionals. In built environment tertiary courses the focus still tends to be on climate change *mitigation* strategies (addressing the causes of climate change by reducing greenhouse gas emissions for example) rather than on climate change *adaptation* (preparing for, and responding to, climate change impacts).

While there is a global debate about the degree of public policy focus on adaptation vs mitigation, this study recognises that adaptation will be an essential task, as suggested by Pielke *et al* in Box 16. This project does not set out to emphasise adaptation over mitigation, but instead recognises the importance of giving attention to *both* mitigation and adaptation and that integrated responses are required in order to pursue sustainability.

Box 16: Why education for climate change adaptation is needed

“Whatever actions ultimately lead to the decarbonisation of the global energy system, it will be many decades before they have a discernible effect on the climate. Historical emissions dictate that climate change is unavoidable. And even the most optimistic emissions projections show global gas concentrations rising for the foreseeable future.”

Source: Pielke et al 2007 p597

The project also acknowledges that: past emissions have already contributed to global warming which is resulting in climate change *now*, presenting diverse challenges for the built environment; and that education for and about climate change adaptation is in its infancy in Australia and therefore needs urgent attention. For these reasons, education for climate change adaptation is the focus here.

2.4 Embedding climate change adaptation education into core curricula

The need for education for climate change adaptation for built environment professions has been outlined. The task can be summarised into two challenges, specifically:

- i. facilitating the progressive inclusion of teaching and learning about climate change, climate change adaptation and climate change mitigation into professional development including undergraduate and postgraduate university course programs and CPD (i.e., short courses); and
- ii. working towards adjusting the mindset of architecture, planning, landscape architecture and engineering practitioners and teachers to embrace sustainable thinking and move education for climate change adaptation into social and practice norm.

In order to prepare built environment practitioners for new operational environments and to ensure that new graduates are well educated in sustainable approaches to climate change adaptation the urgency to embed education for climate change adaptation into 'core' curricula of courses becomes clear. The key word here is 'core', as education for climate change adaptation is often non-existent or relegated to optional units of study in many professional courses. Box 17 outlines an innovative engineering education project that is attempting to embed sustainability into the core curriculum. A similar approach could be used to embed education for climate change adaptation into core curriculum.

A further reason for embedding education for climate change adaptation into the core curriculum is one of equity. Climate change and varying degrees of resilience in ecological, social and economic systems will invariably result in uneven local impacts. Some places and communities will be better prepared and able to cope than others. There is an ethical responsibility to ensure that future practitioners in particular have minimum

Box 17: The Natural Edge Project (TNEP)

The Natural Edge Project (TNEP) has enabled "key pieces of information, or so-called 'critical literacy' items relating to sustainability, to be incorporated as effectively as possible into the broadest range of engineering criteria." The program, which was trialed at Griffith University and is supported by Engineers Australia, UNESCO, DEW, DITR & the Society for Sustainability & Environmental Engineering comprises a number of modules (e.g Green engineering and chemistry), each containing six individual technical units (e.g Profitable Greenhouse Solutions), that can be delivered in either a full day workshop, in a series of one hour lessons or as part of a larger course or program.

Source: Paten et al 2005 p268

competency standards at least in climate change adaptation so that places and communities around Australia are not disadvantaged by a lack of skills in one place or sector relative to a higher level of skill in another. This is particularly relevant to local government planning and engineering units since practitioners in local government are likely to be in the frontline of climate change adaptation.

2.5 Education about and for climate change adaptation

The issue of climate change has entered the discourses of educators and is now appearing with variable but increasing frequency within accredited tertiary course programs and other professional development activities. However, the focus of this education in the built environment professions to date has largely been on:

- i. acknowledging climate change as an issue and learning the context and/or science of this phenomenon, which can be referred to as education for climate change; and/or
- ii. education about and for climate change mitigation, particularly a focus on ways of reducing greenhouse gas emissions from built environment activities and structures.

Box 18: Education for Sustainability principles applied to this project

Core principles	Key words
Futures thinking	Engaging the representatives from the various professional groups to define the future professional needs and competencies needed in the area of climate change adaptation.
Critical thinking and reflection	Engaging representatives from the various professional groups in reflecting critically about the educational approaches needed to achieve the competencies identified.
Participation in decision making	Engaging representatives from the various professional groups in decision-making regarding their own profession. Rather than an external researcher identifying opportunities and needs for decision-making, engaging the participants directly in making those decisions and generating recommendations for next steps.
Partnerships	Engaging representatives from the various professional groups in collaborative partnerships to address the issue. Developing learning networks and combining resources and experiences.
Systemic thinking	Engaging in dialogue professionals working across the built environment sector to address the issue more systemically. Engaging with those who have the opportunity to influence professional development across institutions rather than working with a specific institution. These participants act as key multipliers in the system.

Education for climate change adaptation has been the missing component in built environment tertiary courses. Education for both climate change mitigation and climate change adaptation borrows from the experience of Education *for* Sustainability (EfS) which is an established field of learning. Education for climate change mitigation is about the development of mitigative capacity (increasing the ability of individuals, groups or organisations to mitigate the potential for negative climate change impacts) and the implementation of mitigation decisions (transforming capacity into action). Education for climate change adaptation is about the development of adaptive capacity - increasing the ability of individuals, groups, or organisations to adapt to changes associated with climate change.

This approach promotes the development of critical skills necessary for understanding the complexity associated with climate change issues and the systemic changes needed to address these.

This study encourages an education for climate change adaptation approach that embraces particular techniques to develop professional competencies, such as: critical thinking; systemic thinking and participation in decision making. The approach also allows professionals to promote the mainstreaming of this approach within the profession and/or organisations they are working with. Box 18 outlines how the core principles of education for climate change adaptation were applied to this project.

3 Professional responses to education for climate change

3.1 Accredited courses

University degree programs for built environment professionals aim to develop competencies for professional practice and are accredited by professional institutions (see Box 19). Throughout Australia there are some 93 accredited undergraduate and postgraduate courses in the built environment professions of architecture, planning, landscape architecture and engineering. Box 20 shows the distribution of programs by profession and state. Each of the professional institutions participating in this project assess university degree programs for compliance with their competency standards and are involved in accrediting programs either directly or indirectly.

Box 19: Why accredit courses?

The process of accrediting courses includes a holistic review by a visiting expert panel of a tertiary institution's ability to produce students with adequate competencies for professional practice. The review, which takes place once every 4 or 5 years, considers curricula, student outcomes and resources such as teaching materials and accommodation. It is important for built environment courses to be accredited to ensure both consistency in the quality of graduates and minimum competencies.

Box 20: Australian accredited university courses in the four built environment professions, 2007

Sate or Territory	Architecture	Landscape ²¹ Architecture	Planning ²²	Engineering ²³
VIC	3	2	2	13
NSW	4	1	5	17
QLD	2	1	4	16
SA	2	1	1	3
TAS	1	0	1	2
WA	2	1	1	4
ACT	1	1	0	1
NT	0	0	0	1
TOTAL	15	7	14	57

Source: www.pia.org.au; www.ea.org.au; www.aiala.org.au; www.raia.org.au

The accreditation process for each of the project partners varies between professions, but generally involves a visit by an expert panel to the tertiary institution running the course once every four to five years. Accreditation of planning and landscape architecture courses is relatively straightforward with both the Planning Institute of Australia (PIA) and the Australian Institute of Landscape Architects (AILA) directly responsible for the accreditation process. Architecture courses are jointly accredited and recognised by the Royal Australian Institute of Architects (RAIA), the Architects Accreditation Council of Australia (AACA) and relevant state/territory accrediting authorities whereas registration of architects is the responsibility of state/territory accrediting authorities.

National Generic Competency Standards for Engineers are the means by which Engineers Australia (EA), on behalf of the engineering profession, sets its performance standards for the profession. Stage 1 Competency Standards define the level of preparation necessary for entry to practice and can be used by universities as a platform for establishing a detailed specification of targeted graduate outcomes for their engineering education programs. Stage 1 Competency Standards are separately defined for the separate career categories of Professional Engineer, Engineering Technologist and Engineering Officer. The Stage 1 Competency Standard provides a fundamental reference for:

- ◆ setting accreditation criteria and assessing undergraduate engineering education programs
- ◆ the assessment and accreditation of engineering undergraduate programs
- ◆ the assessment by registered Stage 1 assessors of applicants' eligibility for membership of Engineers Australia
- ◆ the assessment of applications associated with the Skilled Migration Program.

Stage 2 Competency Standards provide reference for the assessment of competencies developed during the formation period subsequent to the achievement of Stage 1 competencies. During this formation period a graduate is expected to practice under the supervision of a senior, experienced engineer. Stage 2 competencies define the units and elements of

competence and the defining activities that can be used to assess professional skills and judgement, and thus the ability to practise in a competent, independent and ethical manner. Engineers Australia assesses Stage 2 competency as the basis for awarding Chartered status and for admission to the National Professional Engineers Register and the National Engineering Technologists Register. Engineers Australia operates a Professional Development Program (PDP) with a wide range of partner employers for nurturing the professional formation of graduate engineers as they work towards demonstrating Stage 2 competence.

3.2 Continuing professional development

Continuing professional development (CPD) refers to opportunities that are provided to practitioners to develop their skills and professional expertise. This is traditionally characterised by formalised short courses run by universities, specialist education providers or professional institutions; and informal professional development initiatives in the form of information forums, and specialist or expert seminars showcasing better (or new) practice. Such courses and forums are usually demand driven as new issues for practitioners emerge and demand for new skills is identified. A professional development program (PDP), on the other hand, is a structured program undertaken by new graduates to improve their competency levels for professional practice.

Reflecting on a demand for information, it is not surprising that there has been a recent rush of CPD initiatives on climate change topics. It is likely that there will continue to be demand for training and CPD initiatives in climate change adaptation in the immediate term. The less formalised form of education, such as forums and seminars on climate change issues, have become very popular for time-poor professionals trying to keep abreast of all the latest developments. Such events also serve to provide excellent opportunities for networking and developing useful partnerships for dealing with, and seeking innovative solutions to climate change.

The Engineers Australia's PDP establishes a partnership between the young EA member, their

employer and EA to guide their formation and ultimate attainment of the Stage 2 competencies expected of experienced engineers engaged in unsupervised engineering practice. The Australian Institute of Landscape Architects (AILA) runs a mentoring program along similar lines.

There appears to be a general acceptance of the importance of sustainability education in general in each of the built environment professions. For example, several courses run by Engineering Education Australia focus on sustainability issues relating to water management. This organisation runs courses on request or if they perceive a need exists. Responding to demand for courses despite a recognised need to develop knowledge and skills can be challenging, however. For instance, the Institute of Public Works Engineering Australia (IPWEA) had very little response to their course on drought management early in 2006, so much so that the course was cancelled²⁴.

In addition to the above, it is recognised that changes need to be made in engineering education so that engineers “retain a robust, rigorous and analytical approach whilst dealing increasingly with non-technical details.”²⁵ The social and economic context within which engineering solutions are sought, including a consideration of the impact of climate change, is redefining the requirements of future engineering education.

Each of the professional institutions has a policy on CPD, with several requiring attendance at a specified number of events as a requirement for ongoing professional registration (e.g. PIA). However, this policy can vary between states even within the one national professional association. For example, architects who are registered with RAIA in Victoria are not required to undertake CPD activities whereas their counterparts in NSW are. Engineers Australia also have a second list of competencies that engineers are expected to acquire before they can become ‘chartered’. Once their chartered status has been confirmed they are required to undertake a set number of hours of CPD per year to maintain their Chartered status. Members of Engineers Australia who have achieved Chartered status and engineers registered with the National Engineers Registration Board are required to undertake a set number of hours of CPD over a

defined time period. Records of CPD activity can be audited as required.

Continuing professional development should not only focus on the acquisition of new knowledge, such as climate change adaptation strategies, but also on the ways in which sustainability thinking can be mainstreamed into organisations and practice. The responsibility for this lies with the education providers who need to facilitate an E/S approach in their CPD activities. Examples that come to mind include considering case studies with an E/S focus, encouraging experiential learning and providing opportunities for visioning and critical thinking to promote innovative, lateral and integrated thinking and actions.

3.3 Scoping study

As a prologue to the project at large an assessment of the state of play of education for built environment professionals in the climate change adaptation area was undertaken over a three month period (through September to November 2006). The assessment was based on a desktop scan of formal professional development initiatives in the field of climate change adaptation for professionals working in the built environment; and initiatives that have a professional development intent, but are not formal education courses e.g. seminars and information forums, publications, and research activities.

Ultimately the findings of this initial scan reinforce the need for further attention to the building of knowledge and practical skills in climate change adaptation through formally accredited professional courses. The lack of attention to adaptation issues and practice skills development in core curricula and professional development programs (findings 1 and 2 below) point to a particular need for further investigation for opportunities in this area. The focus of this research has been on Australian initiatives, although an attempt has been made to identify examples of the type of initiatives that are occurring internationally to assist identification of any better practice in professional education and development in climate change adaptation that may be occurring outside Australia.

Some forty-one (41) climate change adaptation capacity building initiatives were identified. They included the following activities:

- ◆ tertiary courses
- ◆ continuing professional development activities
- ◆ industry training programs
- ◆ seminars/conferences/forums
- ◆ other projects with a capacity building intent
- ◆ publications
- ◆ examples of international professional development and tertiary courses that have a specific emphasis on climate change adaptation or climate change management.

In some cases initiatives are combined e.g. the NSW LGSA has combined an analysis of local government needs for capacity building in climate change adaptation (the focus of its project) with a climate change summit and information and action pack targeted at local government officers and councillors.

Scoping Study: Finding 1

Current professional development for built environment professionals in the area of climate change is predominantly focused on the development of knowledge and strategies for greenhouse gas mitigation (especially abatement of greenhouse gas emissions) rather than on climate change adaptation (i.e. anticipating and preparing for climate change). Education for mitigation is still at a low level, however, across the education sector.

Identified educational initiatives targeted at engineers, planners and architects specifically had a heavy focus on greenhouse gas abatement, particularly the sharing of knowledge on how to improve energy efficiency and reduce the reliance on fossil fuels in built environments, urban services and infrastructure. This finding is not unexpected as there is very little evidence of discussion in the literature targeted at built environment practitioners about climate change adaptation specifically. Also, Australian interpretations of sustainable development practice for built environments rarely

refer to the need to prepare for climate change impacts or threats and focus instead on the need to reduce greenhouse gas emissions from built environments²⁶.

Scoping Study: Finding 2

There is little evidence that adaptation practice for anticipating and preparing for climate change through applying learned knowledge and skills is being taught in Australian conventional tertiary courses for built environment professionals.

A report from the UK found that evidence of adaptation practice was plentiful in public and private sectors, although practice was not always explicitly linked to the need to put in place adaptation strategies for reasons associated with climate change²⁷. While there has been no equivalent study for Australia, this is also likely to be the case in this country in terms of both practice and teaching²⁸. Adaptation practice associated with the management of water resources in Australian built environments and involving engineering, planning and architectural (landscape and built structures) solutions is an obvious example where there are existing skills. How knowledge and skills specifically associated with climate change adaptation can be strengthened and made more explicitly evident in tertiary professional courses is something that this study investigated further via the action inquiry process.

Scoping Study: Finding 3

Current professionally focused education in sustainable climate change adaptation is largely limited to continuing professional development (CPD) initiatives and information forums (i.e. seminars, workshops and conferences).

Findings reveal that there is growing momentum in information forums and professional development activities on the topics of climate change adaptation, vulnerability and risk assessment for policy makers, decision makers, and practitioners in a range of business, industry and government sectors. The year 2006 saw the roll out of a number of initiatives in Australia and New Zealand targeted at built environment professionals, local government

officers and decision makers. More initiatives are coming on line in 2007. Initiatives include a Climate Change Mitigation and Adaptation Summit²⁹ (facilitated by the NSW Local Government and Shires Association), climate change practitioner workshops for planners (facilitated by the Planning Institute of Australia³⁰), short courses (e.g. short course called *Incorporating climate change predictions into engineering design* facilitated by Engineers New Zealand)³¹. Groups of local councils, such as the Sydney Coastal Council Group (SCCG)³², have also identified the need for tailored information on climate change impacts, risks and adaptation issues relevant to their region's circumstances. These groups have partnered with expert groups (e.g. universities and the CSIRO) to provide information forums and information for their local officers and decision makers (including councillors). In other states there are similar regional initiatives.

Scoping Study: Finding 4

Teaching about climate change in general is traditionally taught within discipline boundaries and outside practical professional courses, although there is a trend towards cross-disciplinary teaching in environmental studies programs in particular which are adopting a sustainable development emphasis in which climate change is embedded.

The science of climate change and its management has traditionally been taught within environmental studies or physical science programs and has been paid much less attention in professionally oriented programs. Nevertheless, formally accredited professional university undergraduate and graduate courses in engineering, planning, architecture and landscape architecture are increasingly referring to climate change in their programs and considering climate change mitigation and adaptation in their curricula via attention to sustainable development. To date, however, this has been largely sporadic in nature, dependent on individual teachers who have a particular interest in the topic, and limited to elective units of study or modules within units of study. Those courses that do deal with sustainability well also tend to market their courses accordingly and cater for a particular demand and specialisation³³.

The earliest institutions to have embedded climate

change mitigation and adaptation issues into their professional courses and professional development programs relevant to built environment professions have tended to deal with climate change management issues within a framework of teaching *about* and *for* sustainability (e.g. the TNEP adopts such an approach). The literature found supports this approach. A number of articles relevant to education for climate change adaptation³⁴ focus on the importance of education for sustainable development more generally in developing the skills and competencies for dealing effectively with climate change adaptation challenges.

The importance of interdisciplinary teaching and learning is pointed out by Klock (2005), who observes that colleges in the US are having difficulty in teaching graduates about global climate change when the majority of students are...

“ecologically deficient when it comes to having a holistic understanding of the environmental crisis affecting the world today.”³⁵

Responding to climate change will require an understanding of its scientific basis along with its socio-economic, ecological and environmental impacts and policy options. This implies that an interdisciplinary approach is essential. In working towards improving the quality of teaching and learning about climate change adaptation these are important considerations and challenges for tertiary education programs aimed at built environment professions.

Section 4 of this report investigates the status of education for climate change adaptation and Education *about* and *for* Sustainability in accredited professional courses in more detail, and looks at opportunities in this area.

Scoping Study: Finding 5

There is limited evidence that professional development programs and other capacity building initiatives have adopted an education for climate change adaptation approach (or elements of).

Education for climate change adaptation involves moving beyond knowledge and awareness-centred learning, to focus on promoting the critical reflective thinking, and other skills, needed to build capacity

for change. Various established masters programs in sustainability that deal with built environments have begun to adopt education for climate change adaptation principles in their programs, if not as a whole, at least in part³⁶. Overall, however, most of the recent professional development initiatives that focus on professional seminars, summits, and the preparation of information kits or tool kits, demonstrate few elements of education for climate change adaptation. This does not detract from the value of these initiatives, but it does point to an evident gap in educational activities that might be complementary. It also questions the ability of such initiatives to develop skills of professionals to act and deliver strategies for adaptation.

Scoping Study: Finding 6

Other developed countries (especially the UK and European countries) are more advanced than Australia when addressing climate change adaptation via professional development programs and professional tertiary education courses

Examples of better practices in professional development for built environment professionals were difficult to identify, but there is an indication that European countries (including the United Kingdom) are more advanced than Australia in building capacity for climate change preparedness. Information about initiatives in the USA were more difficult to source, although it would be logical to expect that a number of education initiatives in the area have recently emerged, particularly following the Hurricane Katrina disaster of 2005.

Like Australia, the UK experience is to embed teaching and learning about climate change and climate change mitigation and adaptation principles and strategies into interdisciplinary and sustainability focused courses, however a number of new postgraduate courses focused specifically on climate change for professionals working in the field have emerged in the last few years. A few examples of these (short courses and postgraduate courses) that offer a focus on climate change management (mitigation and adaptation) are listed in the database. These examples are specifically targeted at policy and decision makers and professionals working in a variety of sectors, including the built environment,

and are responding to an immediate market demand by a range of professions for professional development in climate change risk assessment and responses in particular. In Australia, for example, the University of the Sunshine Coast has a new postgraduate course on offer in 2007 focused specifically on either climate change adaptation or both climate change adaptation and mitigation³⁷, while The Natural Edge Project (in partnership with EA, The Australian National University and Griffith University) is currently building a short course focused on energy efficiency opportunities to augment climate change mitigation and adaptation content in the existing *Engineering Sustainable Solutions Program*³⁸.

Initially established in 1997 with funding from the UK Department for Environment, Food & Rural Affairs (Defra), the *UK Climate Impacts Programme*³⁹ (UKCIP) is an excellent educational and capacity building resource used by a range of stakeholders interested in accessing the latest research in climate change impacts and best practice in adaptation and risk assessment (see Box 21). While not an

Box 21: UK Climate Impacts Programme

The UK Climate Impacts Programme (UKCIP) provides scenarios that show how the UK climate might change and co-ordinates research on dealing with the UK's future climate. Set up in April 1997, UKCIP is funded by the Department for Environment, Food & Rural Affairs (Defra) and based at the University of Oxford, UK.

UKCIP shares their information, free of charge, with organisations in the commercial and public sectors to help them prepare for the impacts of climate change. It also facilitates forums for dissemination information and building capacity and alerts users to other relevant events.

Example of a UKCIP Capacity Building Forum:

Managing the weather: climate change and the civil engineer 1 March 2006
For those wishing to know how our buildings, power and water supplies will be affected by the impacts of climate change.

Source: <http://www.ukcip.org.uk>



Nevertheless, the apparent lack of an EfS emphasis in recent professional educational initiatives in climate change adaptation suggests that there is much room to improve the quality of professional development activities in climate change adaptation to ensure that such education is more effectively able to build capacity for successful action beyond raising awareness and building knowledge. Identifying pathways for effectively embracing climate change adaptation in the context of both Education *about* and *for* Sustainability in professional development programs, particularly via accredited tertiary courses, is the core objective of this project and is investigated in the subsequent sections of this report.

example of a formal education program, UKCIP offers regular capacity building services, including workshops and up to date resources targeted at different stakeholders (civil engineers, planners and local government decision makers) in climate change adaptation. Based on comments made in the first workshop in this project by the professional institute partners, such a resource is also likely to be highly valued in Australia and would be particularly useful for teachers of climate change adaptation in formal professional courses⁴⁰.

While there have been a growing number of initiatives aimed at addressing climate change adaptation and an evident shift in the content of climate change education, it is still too early to evaluate the degree to which these initiatives collectively or individually have contributed to building capacity in climate change adaptation for the built environment professions. To date initiatives have largely focused on raising awareness about the need to prepare for climate change impacts and the types of tools and skills that are likely to be required. Whether this is leading to a more concrete change in attitude within built environment professions and educational institutions about the importance of climate change adaptation, relative to the myriad of other development and management challenges facing built environments, is unclear from this scan of initiatives and beyond the scope of this study.



PLA Climate Change Workshop 2007 (Image courtesy of PLA)

4 Opportunities to improve professional responses to education for climate change adaptation

4.1 Findings of action inquiries of project partners

This section summarises the findings of the action inquiry process for each of the project partners. The outcomes of the project for each organisation were discussed in Section 1.2.6. Box 22 provides a snapshot of the responses to each core question for each profession and is followed by a more detailed consideration of the findings.

4.1.1 Planning – PIA

The Planning Institute of Australia (PIA) is the peak professional organisation for urban and regional planners and related professions. The Institute has around 5,000 members in Australia and internationally. Around half of the members work in the private sector (i.e. in consultancies) and the other half in government, predominantly local government. The PIA undertakes the following roles that are of relevance to this project:

- ◆ accreditation of tertiary planning courses
- ◆ delivery of professional development
- ◆ facilitation of the Young Planners Network
- ◆ policy development
- ◆ advocacy and communication on key issues important to planning
- ◆ facilitation of *chapters* of special interest e.g. environmental planning, urban and regional planning and social planning.

The PIA undertook to respond to the core questions of this study through:

- ◆ alerting key stakeholders to the project and its core questions
- ◆ running a questionnaire targeted at all members through its electronic media
- ◆ follow up discussions with individuals with an interest in this area
- ◆ facilitating a workshop on this topic with 30 planners from the ACT Government.

While there were some limitations associated with their inquiry, particularly associated with the time of year that the action inquiry was carried out (Christmas and New Year), PIA was able to tap into other activities and forums running at the time, including: the Climate Change Seminars for Planning Practitioners that PIA is running with the Australian Greenhouse Office (AGO) around Australia⁴¹; meetings such as the PIA National Policy Committee, the National Education Committee and the National Council; and other partner forums. The following summarises PIA's findings associated with the five core questions.

Question 1: How skilled are planning graduates/young practitioners in climate change adaptation?

There was a variation of responses to this question but an overall indication that the knowledge and skill level of planning graduates and young practitioners was inconsistent at the present time. While planning courses offer a common set of skills to students, courses often specialise in various elements of planning such as urban design or environmental planning. Thus some courses have

Box 22: Summary of responses to core questions

Professional Discipline	<i>1. How skilled are our graduates and young practitioners in climate change adaptation?</i>	<i>2. How are our members able to gain knowledge and skills in sustainable climate change adaptation?</i>	<i>3. How is climate change adaptation being incorporated into professional development courses?</i>	<i>4. What are the needs of the profession's teachers?</i>	<i>5. How are the Institutes/accrediting bodies able to respond to these needs?</i>
Planning	Inconsistent level of knowledge and skills	Through an eclectic array of information with variable quality and access.	There are no professional development courses on climate change adaptation for planners.	Teachers qualified in climate change adaptation. More resources. Sharing of expert climate change adaptation practitioners.	Integrate climate change adaptation into all courses. Develop partnerships and resources.
Architecture	Very limited practical skills in climate change adaptation and sustainability.	Through traditional sources such as continuing education, university programs, newsletters, forums, own reading.	Courses on sustainability but not climate change adaptation; tokenistic or superficial coverage, if any at all	Consistency in approach to climate change adaptation education with a practical bent. More resources - time and money.	Review accreditation competencies to include climate change adaptation. More rigorous accreditation process.
Engineering	Generally good, relevant generic skills with sustainability (but not climate change adaptation) systematically addressed in all UG degrees.	Through PDP and CPD programs, conferences, journals, magazines, accreditation, and learning modules developed by EA	Underpinning skills but climate change adaptation not specifically mentioned.	Knowledge of science, practices, policy implications and societal impacts of climate change.	Include climate change adaptation as a contextual factor in any engineering activity, design task or project life cycle management process.
Landscape Architecture	Either somewhat skilled (a half) or unskilled (a third)	Self research, conferences, AILA website, related publications.	Minimal or no inclusion of climate change adaptation in most courses, although some university landscape studios were incorporating climate change adaptation.	Education in climate change adaptation. Access to up-to-date resources, science and innovative case studies.	Focus on accrediting courses and awards on integrating sustainability principles (including climate change adaptation) into the landscape design process.

a heavier emphasis on planning for sustainability and the environment than others. It was apparent that the issues associated with climate change are firstly, being dealt with irregularly across Australian planning programs, and secondly in a variety of ways within university courses. This is reflected in the variable responses to this question (Data point 1).

Question 2: How are PIA members able to gain knowledge and skills in sustainable climate change adaptation?

Responses to this question revealed that knowledge and skills in sustainable climate change adaptation were predominantly being gained through an eclectic mix of information sources (Data point 2). Beyond the recent PIA/AGO Climate Change Seminars, which most respondents were aware of, most respondents sourced information about climate change adaptation on their own initiative. The information sourced ranged in quality from scientific reports and publications to general media articles.

This finding confirms the findings from the study undertaken by Queensland PIA⁴² who found that Queensland planners were relying on a range of information some of which was of questionable quality or practical usefulness to planners.

The feedback from PIA about the usefulness of their PIA/AGO Climate Change Seminars has been positive. The seminars have attempted to draw on practical examples of planning for climate change and have focused on local circumstances of relevance to seminar attendees (see Data point 3). What appears to be missing in the suite of education opportunities beyond accredited university planning courses, however, is some sort of quality control of information that is useful to planners, and continuing professional development courses that focus on enhancing existing skills and knowledge through active learning. This was explained by one respondent (Data point 4).

Question 3: How is climate change adaptation being incorporated into professional development courses?

Because there was a perceived lack of professional development courses available to planners on climate change adaptation as noted in Question 2,

Data point 1

“Some planning courses don’t cover climate change at all.”
“... others (other courses) don’t treat it as a prime issue.”
“I think graduates are knowledgeable about the issues of climate change”.

Source: Un-named respondents, PLA Report to ARIES p3

Data point 2

Other sources of knowledge and training:

- *their own reading, professional journals and self motivated research*
- *the PIA website*
- *AGO and CSIRO publications and websites*
- *specialist conferences*
- *general media*
- *in-house knowledge sharing (talking to peers)*

Source: PLA Report to ARIES p4

Data point 3

“Most respondents knew about the seminars run by PIA/AGO and many had attended and cited these as useful training.”

Source: PLA Report to ARIES p4

Data point 4

“There are very few sustainability planning tools around at the scale required by planners. One of the difficulties in using these tools to plan for climate change is that there is a lack of data/information on climate change at the scale of regions and lower.”

Source: PLA Report to ARIES p4

Data point 5

“Education will form a big part of climate change adaptation strategies as planners try to promote and accommodate changing behaviour through design of urban environments – travel behaviour, energy efficiency, water sensitive design etc.”

Source: Un-named respondent, PLA Report to ARIES p4

respondents largely focused on what they would like to see in such courses. This was predominantly a focus on practical training of how the science translates into planning practice and what planning tools could be applied. Consequently the answer to this question is that climate change is not currently being well incorporated into professional development programs.

Question 4: What are the needs of the profession's teachers?

The important role of planning teachers was largely recognised, while it was also pointed out that planners themselves will need to be teachers themselves and thus builders of capacity (Data point 5).

There was concern, though, about whether it was possible to find enough suitably qualified teachers when there is already a shortage of teachers in planning. One submission suggested that having a sound understanding of sustainability principles should assist teachers to embrace climate change adaptation. Another suggested that what was needed for academics were good teaching resources (Data point 6).

The difficulty of teaching in light of uncertainty about the impacts of climate change and in the context that changes are likely to be non-linear and need to be considered in a variety of timeframes (25, 50, 100 years) was also raised. The possibility of sharing planning academic 'experts' amongst a number of planning schools to address scarce teaching skills in this area was also suggested as an option.

Question 5: How is PIA able to respond to these needs?

There was a range of ways in which PIA considered that they could respond to identified needs, including via divisional and national conferences, partnering with other organisations to package useful resources (e.g., toolkits or information packs), requiring that climate change adaptation is included in curriculum of accredited planning courses, and lobbying activities. They are listed in full in Data point 7.

Data point 6

What is needed for academics is ...
"...good teaching resources and somewhere they can easily update their knowledge, as the whole scene is changing pretty fast."

Source: Un-named respondent, PIA Report to ARIES p5

Data point 7: Suggested actions for improving professional development in CCA

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1. *PIA should ensure climate change is integrated into all areas of planning study when accrediting planning courses and also advocate for similar coverage at TAFEs, and schools.*
 2. *PIA should facilitate discussion between course coordinators.*
 3. *PIA should shape agendas with other peak bodies such as the Council of Australian Governments (COAG), the Development Assessment Forum (DAF) and the Business Council through lobbying, presentations, conference papers etc.*
 4. *PIA could team up with others e.g. CSIRO or AGO to provide technical courses for climate change.*
 5. *PIA could make it mandatory to have this issue in the certified planner core units.*
 6. *PIA could consider greenhouse toolkits with information packs.*
 7. *PIA should ensure that division and national conferences address the issue in some manner and that all divisional professional development programs should cover this issue as well. These should be locally based and consider the assessment of impacts and the implications of this in terms of land use planning and use of resources.*
 8. *PIA should become affiliated with well known and active climate change organisations and use their knowledge base to help better our education system.*
 9. *PIA should promote best practice in this area.*
 10. *PIA should run yearly environmental programs such as the 'Sunrise' news program, to encourage targeted action.*
-

11. Source: PIA Report to ARIES p5

4.1.2 Architecture – RAI A

The Royal Australian Institute of Architects (RAIA) is the professional organisation that registers architecture practitioners in Australia and jointly accredits architecture courses with the Architects Accreditation Council of Australia (AACA). Currently the RAIA has about 9,000 members throughout Australia and overseas. At the national level, the RAIA has a number of units with the following responsibilities:

- ◆ Education - reviews policy, coordinates the National Education Committee (NEC), manages education related activities and events and responsible for facilitating the Australia Architecture Accreditation and Recognition Procedure
- ◆ CPD - organises a range of formal and informal CPD activities
- ◆ Knowledge Services - develops and publishes a range of products essential for the practice of architecture, including building contracts, client and architect agreements, sub-consultant agreements and practice books
- ◆ Sustainability - coordinates the RAIA National Environment Committee and delivery of the Environment Design Guide (EDG)
- ◆ Student Organised Network for Architecture (SONA) - advances the interests of architectural students, architectural education and of architecture through the development, promotion and appreciation of undergraduate student work, thinking and communication.

The RAIA undertook to respond to the core questions of this study through targeting key stakeholders such as several SONA members, academics and a representative of the Chair of the National Environment Committee for in-depth qualitative answers to the core questions.

There were some limitations associated with their inquiry, particularly associated with the time of year that the action inquiry was carried out and a change in RAIA personnel involved in the project.

Data point 8

"It would be fair to say that many current practitioners claim to a level of knowledge ... (in: understanding effective climate change design for different building types, skills to enable seamless and effective collaboration in multi-disciplinary teams, understanding the fundamentals of materials assessment)... however in reality, this is typically very limited."

Source: Un-named respondent, RAIA Report to ARIES p7

"At present most schools offer ecologically sustainable development (ESD) as a stand alone subject but the quality is varied especially when ESD is integrated with other subjects such as technology and design; as a result it can often be tokenistic."

Source: Un-named respondent, RAIA Report to ARIES p8

"Sustainability competencies are not commonly addressed at undergraduate and postgraduate level at universities. One of the reasons why this is not being addressed is because cross disciplinary education is difficult, and culturally unfamiliar in Australia."

Source: Un-named respondent, RAIA Report to ARIES p7

"Sustainable design is a core part of many university programs, some are teaching the subject well, some are not doing such a good job; it should be a staple and well taught part of every course that has anything to do with the built environment, and not delivered as an extra subject, but as a philosophy across the board."

Source: Un-named respondent, RAIA Report to ARIES p10

Question 1: How skilled are architecture graduates/young practitioners in climate change adaptation?

From the information provided by RAIA's report to ARIES, it is apparent that architecture graduates have limited practical skills in climate change adaptation and variable exposure to sustainability practice more broadly. This was partly explained in the report as being due to the variable existence and quality of teaching on sustainability issues at universities, and the increasing focus on employing academics for their qualifications and research skills rather than for their practice experience. The comments outlined in Data point 8 support this.

Question 2: How are RAlA members able to gain knowledge and skills in sustainable climate change adaptation?

Like PIA the RAlA report revealed that there was an array of ways by which architects are able to gain knowledge and skills in climate change adaptation. At the present time responses suggested that knowledge, information and skill development was through lectures, professional practice forums, independent research, journals, newsletters and other information resources such as posters and interactive CDs. It was noted that some universities were taking a more proactive role and offering specialist seminars on the topic of climate change but that this was largely ad hoc and not widely accessible.

Question 3: How is climate change adaptation being incorporated into professional development courses?

Professional development programs regularly offer workshops or lectures on sustainability but there has been nothing on climate change adaptation. There is at present a large gap in the professional development area. While courses that had embraced sustainability tended to focus on the 'issue' in an introductory way and did not provide detailed follow through for students and/or practitioners due to lack of expertise of teaching staff, it was also stated that professional development courses needed to be accessible to a wider range of practitioners and that sometimes courses were cost prohibitive to small practices and early career practitioners (see Data point 10). RAlA recommends additional attention to this area in the immediate term.

In addition to this response it was also pointed out that, while graduates of university courses may be educated in sustainability principles and practice, their subsequent employment in firms where sustainability is not readily embraced limited their exposure to good practice in sustainable development (Data point 11). This point was also raised by EA as an issue and confirms the importance of professional development opportunities beyond university courses.

Question 4: What are the needs of the profession's teachers?

It was stated by a number of respondents to this question that there is a need for a more thorough understanding and discussion about what the actual implications of climate change will be for the architectural profession in order to progress thinking about the adaptation solutions (Data point 12). This discussion is needed to develop further teaching and learning about and for climate change adaptation.

Data point 9

"Some universities are taking a more active role by offering seminars, however, some universities have shown no interest or simply have no resources to support sustainability initiatives. Interactive workshops, lectures, seminars, field visits, publications all have roles (in developing knowledge and skills); face to face, interactive, practical/direct application have the most immediate effect."

Source: Un-named respondent, RAlA Report to ARIES p7

"In architectural education it is not clear if climate change adaptation is being addressed at a university level. Most if not all, architecture schools devote some time to sustainability"

Source: Un-named respondent, RAlA Report to ARIES p8

Data point 10

Whilst there are some independent courses that are quite informative and well run the costing is prohibitive, and out of the price range of small practices and young graduates."

Source: Un-named respondent, RAlA report to ARIES p8

Data point 11

There is also an issue when graduates leave university. While there may be opportunities to practice ESD during their studies, it is an unfortunate fact that unless they are personally driven to investigate and continue working with sustainable ideas, these issues are not emphasised when they enter firms. Emphasising the necessity of incorporating ESD principles into the heart of practice...this could be done by having a compulsory allocation of CPD points dedicated to sustainable design."

Source: Un-named respondent, RAlA Report to ARIES p11

Data point 12

"Perhaps there is a lack of understanding about what the actual impact of climate change is going to be, in both the consumer and professional areas. With more understanding comes a desire to adapt, and also the understanding of what needs to be done to adapt."

Source: Un-named respondents, RALA Report to ARIES p10

Understanding is needed in:

- *"... emerging climate change science fundamentals*
 - *schematic understanding of projected climate change shifts over the next 50 – 100 years*
 - *an understanding of effective climate change design (active and passive) for different building types and the degree to which climate change readiness can be built into projects*
 - *skills to enable seamless and effective collaboration in multidisciplinary teams including landscape, engineering services etc and sharing of each discipline's language in order to work productively and understand what they don't know/add value/exploring possibilities in a project context*
 - *an understanding of key emerging but presently unfamiliar technologies (e.g. green roofs);*
 - *an understanding of fundamentals of materials assessment*
 - *an understanding of sustainable system fundamentals assists the identification of the characteristics of a range of sustainable systems*
 - *the risk and liability and contractual issues raised by climate change, new rating tools, likely future regulatory environmental changes etc."*
-

Source: Un-named respondent, RALA Report to ARIES p6-7

The RALA National Environment Committee suggested that few teachers are likely to have the knowledge and skills (theory and practice) in climate change adaptation⁴³. An educator in a design school outlined what he thought there needed to be greater understanding of within the architectural profession. His list is outlined in Data point 12.

It was also explained that information is needed in the areas of 'real' experiences with buildings or products that meet sustainability criteria (Data point 13). Thus, the profession's teachers need to be more highly qualified in sustainable design issues and practical skills than in the past. Attaining well practised academic teachers, however, was seen to be a problem as universities had a tendency to focus heavily on academic research credentials of teachers. It was suggested by SONA that a possible solution to the availability of well practised teachers could be in engaging a team of practising professionals who are experts in sustainable design as an adjunct to university units.

Data point 13

"Good design includes knowledge of materials, systems and what works in situ."

Source: Un-named respondent, RALA Report to ARIES p10

Data point 14

"The architecture profession's teachers are a diverse group and many know nothing about climate change and some may see it irrelevant to architecture. For those who are teaching in the area, some focus on the architectural science aspects of climate changes/sustainability while others address cultural/society/philosophy/design aspects. Therefore some agreed structure within architectural education that begins to frame the key issues might be useful. The matter is too important and too complex to be left to a few enthusiasts within each school of architecture."

Source: Un-named respondent, RALA Report to ARIES p8

It was further stated in the RAIA report that it is likely that employers in the future will demand design skills in sustainable design but this is not happening to any great extent at the present time. Therefore in the future there will be a need for sustainability skills. It was acknowledged, however, that teaching about and for sustainability was quite variable at present as the focus and interpretations of sustainability by architecture teachers can vary markedly. This pointed to a need for some agreed structure in courses (Data point 14).

In addition to these points about increasing the degree of understanding about climate change adaptation throughout the profession, and comments about the variable nature of teaching sustainable architecture more generally, there was also attention paid to the issue of resources in universities. In particular, resources for architecture schools are needed to readily embrace greater attention to climate change adaptation in their curricula. It was suggested by one group of respondents that in order to better teach sustainability and embed climate change adaptation in courses there will need to be financial commitment provided to support the schools and their teachers (Data point 15).

This said, however, it was also pointed out that professional curriculum was already full and that climate change adaptation could not necessarily be easily embedded in the immediate term.

Question 5: How is the RAIA able to respond to these needs?

RAIA acknowledged that the accrediting body (RAIA/AACA) could take a more directive and proactive role to encourage universities to take the development of skills and knowledge in ESD and climate change adaptation more seriously. At present the accreditation and recognition system is not rigorous enough and is open to interpretation. For example, competency in sustainability is included as part of its accreditation and recognition requirements but details are lacking. A major review of competency standards is not due until 2011 (the last one took seven years to complete) so the best opportunity for change lies with initiatives by the RAIA, AACA and the Architects' Boards of each state and territory outside of this process.

Data point 15

"While accreditation bodies can definitely embed the topic of climate change more explicitly into their requirements there is no way to ensure that universities have any resources to teach such topics. Tertiary education in Australasia has suffered more than a decade of budget cuts These cuts have had a major impact on architectural education which is funded at a lower rate than comparable built environment professions (engineering in particular). This means that if teaching of climate adaptability is to be taken seriously then it needs serious additional financial resources."

Source: Un-named respondent, RAIA Report to ARIES p9

Some examples include:

- ◆ modifications to the content and delivery of courses
- ◆ incorporating sustainability clauses into building contracts
- ◆ encouraging collaboration with other built environment professionals in project management.

4.1.3 Engineering - EA

Engineers Australia (EA) is the peak professional organisation for engineers in Australia and comprises about 80,000 members. It has the responsibility of accrediting engineering degrees and administering the registration of competent practitioners. The accreditation process is described in detail in Section 3.1 and uses criteria that are built on the Stage 1 Competency Standards. Stage 1 competencies define expectations of technical competence, engineering application skills, underpinning skills and knowledge and personal and professional capabilities, attributes and values for engineering graduates at the level of Professional Engineer, Engineering Technologist or Engineering Officer. They provide a generic framework and reference for engineering educators to establish a graduate outcomes specification for an engineering education program in any particular discipline.

Due to the comparatively large size of the organisation, EA proposed that it would be too



photo: Neil Gould

cumbersome and time consuming to target all relevant stakeholders through, for example, an online survey. The approach taken therefore focused on interviews with senior representatives of the engineers' assessor community, selected Engineers Australia College Chairs, and academia. A selected sample of engineers in the ACT, Sydney and Melbourne attending interviews as part of assessment for Stage 2 Competency also contributed to the action inquiry process. EA stressed the difficulty in recruiting a representative sample of its 80,000 members across the country in such a small scoping study.

In the project's first workshop the EA representatives stressed the importance of not just focusing on the development of skills of fresh graduates but also on the climate change adaptation competencies of established independent practitioners. They were keen to ensure they considered both in their inquiry. It was recognised that it was often the younger practitioners and new graduates that had been exposed to education on matters of sustainability generally and that practitioners who were educated prior to the mid 1990s had much less educational grounding in sustainability or issues associated with climate change.

Data point 16: Example of Stage 1 Competencies relevant to climate change adaptation

Appreciation of the interactions between technical systems and the social, cultural, environmental, economic and political context in which they operate, and the relationships between these factors

Ability to engage with ill-defined situations and problems involving uncertainty, imprecise information, and wide-ranging and conflicting technical and non-technical factors

Source: EA Report to ARIES Annex A p1-2

Data point 17

*"Climate change adaptation is not on the radar
.....mitigation is."*

Source: Comment from EA

Question 1: How skilled are engineering graduates/ young practitioners in climate change adaptation?

Environmental responsibilities, and sustainability obligations, are key imperatives that are addressed in Stage 1 Competencies through emphasising the importance of setting student problem solving, engineering design and project work within a broad context that considers environmental, safety, sustainability, economic, social and legal factors. Environmental consideration and sustainability are expected therefore to be systematically addressed in all undergraduate engineering programs. There are a large number of competencies that impinge on climate change adaptation that engineering graduates are expected to achieve (see Data point 16).

From accreditation visits evaluating engineering education programs in Australian universities over the past 10 years, EA has concluded that almost all current programs do attempt to address these matters. However, in most instances environmental factors and sustainability are considered from a climate change mitigation viewpoint (Data point 17). The emphasis tends to be on developing awareness and a commitment to minimise the impact of engineering activities, rather than taking projected changes into account in lifecycle analysis and design.

Question 2: How are EA members able to gain knowledge and skills in sustainable climate change adaptation?

Engineers Australia is currently engaged in member activities that could include climate change adaptation. Examples include:

- ◆ regular divisional seminars
- ◆ monthly member magazine
- ◆ review of engineering texts
- ◆ journals (seven titles for EA and more from EA's 30 technical societies)
- ◆ conferences

There is the opportunity to include climate change adaptation issues in the Engineers Australia PDP programs as well as in the CPD activities for Chartered members - in particular to encourage the wholly owned business unit of EA, Engineering Education Australia, as a broker of CPD programs to run professional development courses on climate change implications for engineering practice.

Question 3: How is climate change adaptation being incorporated into professional development courses?

EA points out that many of the underpinning skills and knowledge associated with climate change adaptation can be found in current undergraduate courses and in professional development activities for practising engineers without, however, a specific climate change adaptation identification labelling or focus. However, a random sample of engineers from the ACT, Sydney and Melbourne interviewed for the action inquiry indicated that climate change was both poorly addressed in tertiary engineering courses and in continuing professional development programs (Data point 18). Data point 19 suggests how climate change adaptation could be better addressed in existing programs with minimal restructuring of curricula.

Question 4: What are the needs of the profession's teachers?

The EA action inquiry identified a need to draw to the attention of engineering educators the need for building climate change in as an active, contextual variable applied in a risk management, design or project life context. The specific needs of the profession's teachers are listed in Data point 20. They range from understanding the fundamental

Data point 19

"Problem-based learning is a good basis for Education for Sustainability and CCA. Courses don't need to be built from scratch but rather improved and stretched in this direction."

Source: Comment from EA

Data point 18

A group of respondents ...

"...indicated that climate change per se was not addressed in engineering courses. This group also feels that professional development opportunities since graduation have not meaningfully addressed climate change, let alone climate change adaptation."

Source: EA Report to ARIES p2

science basis of climate change and climate impacts to understanding the implications of this for specific contexts and engineering applications.

Question 5: How is EA able to respond to these needs?

The EA report strongly states the educational needs associated with climate change adaptation (Data point 21) and identifies a number of things it might do to respond to the issues raised in their action inquiry. These include:

- ◆ developing an educational module on climate change adaptation that could be disseminated to universities free of charge. This would be dependent on external funding, however.
- ◆ consideration could be given to recommending to EA's Education and Assessment Board that the next review of the Stage 2 Competency Standards for practising engineers and the PDP should consider incorporating climate change adaptation material.

the Review of Engineering Education in 2007 should provide valuable input in turn to the review of Stage 1 and Stage 2 Competency Standards, and reiterate the expectations of engineering graduates, particularly at the level of professional engineer. Climate change phenomena should be a key contextual parameter that influences each of these review processes and should be identifiable in

Data point 20

Engineering educators need to:

- *understand the hypothesis, or the concept and science behind climate change*
- *understand past and current practices contributing to climate change*
- *be able to articulate and promote the importance and benefits of applying the principles of climate change adaptation to university stakeholders, including students, industry partners and various sections of society*
- *understand the policy implications of climate change, and potential governmental responses*
- *understand the factors affecting business' view of climate change, and strategies to both mitigate and adapt*
- *be able to identify various climate change adaptation strategies and select appropriate ones in relation to specific contexts and engineering applications. For instance, environmental and civil engineering students need to comprehend the impact of climate change on the Australian Rainfall and Runoff formulae and design chart; mechanical and electrical engineering students need to interpret climate change in terms of the design of power stations and manufacturing plant that are likely to generate CO2 gases*
- *be able to develop and analyse case studies on climate change adaptation approaches and how engineering systems interact with them*
- *understand how to incorporate climate change adaptation principles into continuing professional development programs for fellow academics and engineers in industry*
- *understand the impact of climate change on various aspects of society and how engineering critical thinking and problem solving can be applied to develop appropriate adaptation strategies.*

Source: EA Report to ARIES p5

published graduate capability targets and associated performance indicators.

This could be done by explicitly identifying what capability in climate change adaptation really means and incorporating it, as a performance indicator, under the current competency that covers understanding of environmental responsibilities and commitment to sustainable practices. This process would then flow through to changes in curriculum design and to accreditation criteria, which include the educational environment, curriculum and assessment processes and quality control systems for graduates.

Data point 21

Adaptation to climate change needs to become a stronger imperative underpinning the design of engineering education programs. The consequences of climate change need to be included as an additional contextual factor in any engineering problem solving activity, design task or project life cycle management process. The current emphasis is on sustainability and environmental awareness in engineering education. Programs need to extend sustainability to embrace the recognition, mitigation and management of climate change.

Source: EA Report to ARIES p5-6



photo: Anna Lyth

4.1.4 Landscape architects – AILA

The Australian Institute of Landscape Architects (AILA) provides the primary leadership, structure and network to effectively harness and focus the intellectual energy of Australian landscape architects in the creation of more meaningful, enjoyable, equitable and sustainable environments.

As the membership of AILA is small compared to the other project partner institutions at 1,000, an online survey of all members was considered appropriate by the AILA and the ARIES project team. In addition, stakeholders chosen randomly from a list of academics and members serving on accreditation panels and some recent graduates were also interviewed by phone in order to delve more deeply into issues.

Question 1: How skilled are landscape architecture graduates and young practitioners in climate change adaptation?

Responses to AILA's survey confirmed that their practitioners had variable skill levels in this area and there were considerable skill inadequacies. Of a total of 52 respondents, almost half considered that graduates/new practitioners are 'somewhat skilled' in preparing for climate change impacts and responding professionally to them. However, around one third of participants considered graduates/new practitioners as being 'unskilled'. Only a few respondents considered that new practitioners were 'skilled' in preparing for climate change impacts and responding to them (Data point 22)



photo: Anna Lyth

Data point 22: Landscape architects' skill level in CCA

Skill level	% of respondents
• Skilled	6
• Somewhat skilled	48
• Unskilled	33
• Unsure/don't know	13

Source: AILA Report to ARIES p2
AILA online survey

Data point 23

"I am not aware of any climate change prevention landscape related technique. Do they really exist? I would be happy to hear more of that and learn it."

Source: AILA associate member AILA Report to ARIES p4

Data point 24

"AILA's ability to provide knowledge and skills is limited. The AILA Environment Sub-committee has limited time and getting a quorum of volunteers to attend meetings is an ongoing challenge."

Source: AILA associate member AILA Report to ARIES p4

Data point 25

RMIT ran a vertical studio (with 2nd, 3rd and 4th year students) two years ago with a focus on sea level rise and coastal communities. This was a collaborative community project between RMIT, local councils and a state environment department. One academic mentioned that water sensitive urban design was being explicitly taught in some courses.

Source: AILA Report to ARIES p5

Data point 26

A recent graduate claimed "...there were a few CPD events but otherwise it's mainly self-research based."

Source: AILA Report to ARIES p4



ARIES Project Partner Workshop

Question 2: How are AILA members able to gain knowledge and skills in sustainable climate change adaptation?

A number of ways in which information on climate change adaptation can be gained by landscape architects were identified. These include:

- ◆ through CPD seminars and talks
- ◆ the AILA website and climate change policy
- ◆ conferences
- ◆ publications such as the *Environment Design Guide* and the *Landscape Charter* although generally this information is limited
- ◆ personal research.

However, one third of respondents stated that they were unsure about where to get information, or that information on climate change adaptation was limited in their professional circles. This required personal initiative in seeking appropriate information (Data points 23). Other AILA members pointed to the current limited capacity of AILA itself to

offer professional development and information on climate change adaptation, due largely to its limited resources (Data point 24).

Question 3: How is climate change adaptation being incorporated into professional development courses?

The AILA action inquiry found that there is not much evidence that climate change adaptation is currently being incorporated into professional development courses, although climate change was being addressed in landscape studios at some universities (Data point 25). However, design projects were often flexible allowing students to focus on a particular issue of interest, such as climate change. This means that students are exposed to learning about climate change adaptation.

While there have been a range of climate change adaptation focused learning initiatives in courses (Data point 26) initiatives in climate change adaptation learning were clearly *ad hoc* and not always pertinent in programs.

Question 4: What are the needs of the profession's teachers?

Almost half of the AILA respondents indicated that teacher education in climate change was required. One respondent's comment elaborated further (Data point 27). In summary, the needs of teachers were found to be:

- ◆ access to up-to-date resources
- ◆ access to contemporary thinking
- ◆ access to modeling information about climate change impacts
- ◆ access to innovative case studies
- ◆ exposure to more practical experience, holistic perspectives and more creative thinking.

The opportunity for students to work with other professions was also considered valuable (Data point 28). It was recognised that voluntary inclusion of a climate change adaptation aspect into design activities could be fairly simple and therefore quite easy to embed into existing curriculum (Data point 29). AILA's findings confirmed the need for built environment professions to operate within a framework of sustainability thus having consequences for course curriculum (Data point 30).

Question 5: How is AILA able to respond to these needs?

AILA suggested a number of prioritised initiatives, with timelines that it was considering implementing in the future, to address the issue of climate change adaptation. These are outlined in Data point 31. The initiatives in climate change adaptation are wide ranging and include revising policies, undertaking further research, strengthening CPD opportunities, publishing articles and facilitating national cross-disciplinary seminars.

Data point 27

University teachers required an "...understanding of solutions landscape architects can implement to prevent climate change damage."
 "...backgrounds in ecology, horticulture, design, understanding of energy issues and natural resource economics, familiarity with water sensitive urban design including stormwater treatment and storage, grey water etc. re-use, knowledge of climate systems."

Source: AILA Report to ARIES p6

Data point 28

Teachers need to be "...savvy, to have a holistic perspective and combine interdisciplinary knowledge. For example, students should have the opportunity to work with other professions like hydraulic and civil engineers, soil scientists and horticulturalists at the undergraduate level."

Source: Telephone interview with AILA educator, AILA Report to ARIES p7

Data point 29

"Open spaces need more trees as carbon sinks rather than just grasslands and to be considered as recreational areas."

Source: Un-named respondent, Workshop 2, 5 March 2007 Canberra

Data point 30

An academic said that the landscape architecture profession requires "repositioning within a sustainability framework."

Source: Un-named respondent, AILA Report to ARIES p7

4.2 Summary of common findings

The individual findings from each professional sector have been outlined above. From these there are some findings of commonality. These can be summarised as:

- i. a variable existing skills base and some evident significant skill gaps for climate change adaptation;
- ii. variable access to, and availability of, professional development in climate change adaptation;
- iii. a need for quality assured information/resources for practitioners;
- iv. apparent needs of teachers/educators to better deliver education for climate change adaptation:
 - » resources and information on the fundamentals of climate change science and impacts
 - » professional training opportunities for teachers
 - » assistance in the review of whole programs and curricula to embed climate change adaptation (requires funding and models of teaching and learning ideas)
- v. a need for collaborative efforts across the built environment sector to facilitate:
- vi. the sharing of information;
 - » CPD for the built environment;
 - » team teaching.

Data point 31: Responding to the need for climate change adaptation

- *revise existing environment policies to incorporate climate change adaptation and submit to National Council*
- *continue research into climate change adaptation and mitigation and employ a full time research assistant for this purpose to also set up a database of research into climate change by landscape architecture academics*
- *publish articles on the AILA website on climate change adaptation and mitigation, in Landscape Architecture Australia and in Landmark, AILA's official newsletter.*
- *devise a national CPD program for climate change adaptation and mitigation to include state forums on climate change and liaise with other institutes regarding their CPD programs in the area*
- *hold a national two day seminar for educators based on Education for Sustainability principles (December 2007) in association with the other professional institutes that have been involved in the action inquiry process and request funding from universities, DEW and other institutes*
- *hold a national one day conference (October 2007) with climate change issues as the dominant theme as set out in the Landscape Charter.*

Source: AILA Report to ARIES p11-12





5 Summary of findings and recommendations

The findings confirm the commitment of the four project partners to progress change in this area. Key recommendations that emerged via the process of this study are of relevance to a range of stakeholders including the Australian Government (DEW), the professional institutions themselves, educators, employers and other levels of government.

Finding 1:

Variable existing skills and access to professional development

All professional institutions identified that there was a variable skills base in the area, with some significant skill gaps. There was variable access to, and availability of, professional development in climate change adaptation.

Finding 2:

Need for government leadership to set new benchmarks and new support for professional development initiatives

The professional institutions involved in this project recognise the important role of governments in leading the way, setting new benchmarks and altering operational environments (practice environments and systems in which built environment practitioners work).

Recommendations:

That the Australian Government:

- a. *release clear statements about the critical and urgent need for Education for Sustainability in all*

higher education programs associated with the built environment, and the critical need for education for both climate change adaptation and mitigation.

- b. *take a lead in incorporating sustainability and preparedness for climate change into any future built environment project briefs for which it is responsible.*
- c. *demonstrate leadership and commitment to implementing action in climate change adaptation through the monitoring and reporting of indicators in climate change adaptation professional development initiatives.*

Finding 3:

Need for education for both climate change adaptation and mitigation

While there was clear recognition that professional education for climate change adaptation was limited and urgently needed, it was strongly stated by the professional institutions and their members that it should be integrated with education about and for climate change mitigation, as they are complementary and of equal urgency.

Recommendation:

The study recommends that education about and for climate change adaptation in accredited courses be addressed in an integrated way with education about and for climate change mitigation.

Finding 4:

Need for rapid adoption of education about and for climate change adaptation in accredited course programs and ongoing professional development initiatives

It is important to ensure that education about and for climate change adaptation is incorporated into the core curricula of accredited programs. The study found, however, that it can take from three to five years for all established course programs to be reviewed, modified and re-accredited. Therefore, given the urgent need to address this issue, voluntary adoption is also encouraged, while professional development activities in climate change adaptation, such as short courses, are required in the meantime to meet existing demand for skill development.

Recommendations:

To assist with the voluntary adoption, the study recommends:

- a. *That the accrediting bodies amend their education policies to reflect climate change adaptation requirements in the short term.*
- b. *Formation of partnerships to facilitate an integrated approach to professional development.* The professional institutions are able to promote the need for climate change adaptation education in their professions and implement a range of actions that will help build capacity. The formation of structures to enhance the already established partnerships, within and between professional sectors, to identify ways of raising standards and implementing them in the built environment sector (i.e. regulatory environments, building codes, government policy development and strategic planning) is one area for urgent attention. Further, it was suggested that a national series of cross-disciplinary seminars on climate change might be supported to:
 - » maximise scarce resources for professional development
 - » avoid duplication of professional development efforts
 - » allow the sharing of knowledge and case studies across a range of professions

- » demonstrate the collaborative intention of the major built environment professional institutions.

Building on existing partnerships such as the Built Environment Design Professions' Environment Design Guide (BEDP – EDG)⁴⁴ was seen as one vehicle for continued collaboration.

- c. *Using opportunities for immediate amendments to existing curricula and programs.* Professional institutions need to encourage university educators to begin to include relevant case studies and education for sustainability approaches into existing curricula and courses immediately. This process has already commenced through raising awareness of new teaching and learning possibilities in climate change adaptation with the various educators engaged in the action inquiry processes. There are also existing mechanisms which might be useful, such as The Natural Edge Project (TNEP)⁴⁵, which provides free online materials to assist rapid transitioning of curricula. In order to facilitate this, however, there will need to be a range of mechanisms and incentives provided by the professional institutions, universities and governments. These may include provision of:
 - » funding for teachers to study in a new area
 - » curriculum development grants for teachers to renew their existing programs/ subjects and develop new programs where appropriate
 - » university or government research grants for university staff to undertake practical research (thus contributing to research kudos for the teacher and the possibility of increasing 'research led teaching' in the curriculum).
- d. *Provision of support for professional development initiatives.* To fill an immediate gap in professional education and training and to complement university teaching in the longer term, support needs to be provided for professional development initiatives (particularly short courses) that emphasise education for climate change adaptation.

- e. *Participatory research approach to facilitate learning and change.* The Australian Government, in partnership with the accrediting bodies, needs to provide opportunities to review existing programs and the application and context for relevant competency standards to address education for climate change adaptation within professional courses. The professional institutions recommend a participatory research approach which is not threatening to stakeholders, enables them to take learning and change at their own pace and enhance their own competencies in the process of undertaking the study with the delivery of practical outcomes within the medium term.

Finding 5:

Necessary changes to form and content of education

There were some important issues raised that relate to the form and content of education about and for climate change adaptation in accredited courses and other professional development initiatives.

Firstly, the research indicated that professionals understand the need for climate change adaptation but not the practical implications. Therefore, professional development that focuses on *'what we should be doing on the ground'* is needed, supported by resources and processes. In order to support tertiary teachers, trainers and practitioners, it is essential to provide quality assured, up-to-date and useful teaching materials that provide information about climate change scenarios and interpretation of scientific information for use in practical applications across a range of professions.

Secondly, the project partners agreed that the ability to effectively respond to climate change adaptation challenges should be built out of a strong grounding in sustainability principles. They considered that, while there will be many specialist competencies to develop for each profession, there are a number of generic sustainability competencies that graduates and established practitioners need to develop (such as being able to work in integrated teams to solve problems, lateral thinking, and being able to engage with creative ideas outside practice norms).

Thirdly, it was recognised that educators (including program assessors) also need to review and develop their knowledge in climate change adaptation and skills in education for climate change adaptation. Providing new resources (i.e., teaching materials on climate change adaptation) alone is no guarantee that they will be used, or that they will be effective in developing a new mindset (although such resources are an essential basis). Participants strongly argued that the incorporation of new skills will also require the development of a new educational paradigm whereby teaching and learning is seen through the 'prism of climate change.'

Fourthly, it was acknowledged that there will be an increasing need for built environment professionals and students to work in cross-disciplinary teams to be able to understand problems related to climate change, collectively solve them, and share best practice case studies. This is likely to require partnerships between professional institutions (i.e. teams that include planners, landscape architects, architects and engineers) and increased resources (financial and time) to facilitate collaborative teaching and learning initiatives.

Finally and importantly, the professional institutions opposed the idea of a sole focus on specialised courses on climate change. It was agreed that such an approach would limit the ability to embed core competencies across the professions and might foster an inequitable distribution of competency across Australian communities, thus limiting adaptive capacity in some places and sectors.

Finding 6:

Need for quality control and competency standards in climate change adaptation education

There is an evident need for core competency standards and quality control of professional development for climate change adaptation. Professional institutions responsible for accrediting courses and setting competencies are the appropriate bodies to facilitate action in this area, but support is required to do this.

Recommendations:

That accrediting bodies:

- a. *Identify core competencies in climate change adaptation*
Accrediting bodies and other relevant professional institutions to work with stakeholders (university program directors, teachers, students and industry employers) to identify the climate change adaptation context for the application of competencies specific to each profession.
- b. *Integrate climate change adaptation as a core area within policies and procedures of accrediting bodies*
A review of accreditation policies and processes is needed. Accrediting bodies and relevant stakeholders need to embed the competencies within their systems.
- c. *Assure minimum levels of competence*
Accreditation bodies and professional institutions need to play a role in assuring climate change adaptation is a core area within formal accredited university programs and ongoing professional development.

facilitate multi-sector and specialist professional development activities. Online information and professional development courses would promote equitable access to training across the country, particularly for those practitioners unable to attend face to face professional development activities. For example, the BEDP-EDG⁴⁶ provides an immediate structure through which to deliver this. In addition, education for climate change adaptation could also be incorporated into the charter of the proposed Australian Centre for Climate Change Adaptation.

Finding 7:**Need for a national strategy for the sharing and dissemination of climate change information and resources**

Feedback via the action inquiry process re-iterated the need for quality assured and useful information and resources to be used by practitioners and teachers. The project partners consequently recognise the need for a national strategy for the sharing and ready access of climate change information and resources for practitioners and teachers (across sectors).

Recommendation:

The project partners support a national and multi-stakeholder strategy for identifying the mechanisms for sharing and disseminating climate change and adaptation information (including teaching resources). Mechanisms for dissemination might include the establishment of a clearinghouse which would disseminate resources, proffer advice on accessing quality assured information, and

6 Glossary

Action inquiry

The action inquiry process involves striving to understand a question(s), in this project related to climate change adaptation, which stimulates new ideas for further interrogation and action. Existing ideas, assumptions and practices are freely examined and, as a result, new ideas for further interrogation and action arise.

Adaptive capacity

The ability of individuals, groups or organisations to adapt to changes.

Built environment professionals

These professionals are responsible for: the development of urban form; urban, building and infrastructure design; infrastructure provision and maintenance; environmental protection; and amenity and safety in human settlements.

Capacity building

Capacity building is the process by which an individual or organisation develops the capacity to bring about change. The process consists of participative training which takes place either through a formal course, workshop or mentoring support.

Climate change adaptation

This process involves an adjustment in ecological, social and economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts, in order to alleviate the adverse impacts of change or take advantage of new opportunities

Climate change mitigation

This process involves reducing greenhouse gas emissions through, for example, increasing the use of renewable energy.

Continuing professional development (CPD)

This refers to opportunities that are provided to practitioners to develop their skills and professional expertise. This is traditionally characterised by formalised short courses run by universities, specialist education providers or professional institutions; and informal professional development initiatives in the form of information forums, and specialist or expert seminars showcasing better practice.

Critical thinking

Critical thinking is an essential part of learning approaches to Education *for* Sustainability. It challenges us to examine the way we interpret the world and how our knowledge and opinions are shaped by those around us. Critical thinking leads us to a deeper understanding of interests behind our communities and the influences of media and advertising in our lives.

Education about climate change adaptation

Education about climate change adaptation is the most commonly practised approach in climate change education. It focuses on developing key knowledge and understanding about natural systems and complex environmental issues as well as developing an understanding of how people interact with these systems and issues.

Education for climate change adaptation

Education for climate change adaptation moves beyond education about climate change adaptation approaches to focus on equipping learners with the necessary skills to be able to take positive action. The education for climate change adaptation approach promotes critical reflection and has an overt agenda of social change. It aims to promote lifestyle changes that are more compatible with sustainability. It seeks to build capacity for active participation in decision making for sustainability and climate change adaptation.

Envisioning and futures thinking

Envisioning a better future is a process that engages people in conceiving and capturing a vision of their ideal future. Envisioning, also known as futures thinking, helps people to discover their possible and preferred futures and to uncover the beliefs and assumptions that underlie these visions and choices. It helps learners establish a link between their long-term goals and their immediate actions. Envisioning offers direction and energy and provides impetus for action by harnessing peoples' deep aspirations which motivate what people do in the present.

Learning for sustainability

Learning for sustainability motivates, equips and involves individuals and groups in reflecting on how we currently live and work, in making informed decisions and creating ways to work towards a more sustainable world. Learning for sustainability aims to go beyond individual behaviour change and seeks to engage and empower people to implement systemic changes.

Professional Development Program (PDP)

A professional development program (PDP) is a structured program undertaken by new graduates. For example, the PDP run by Engineers Australia (EA) for its recently graduated engineers comprises a partnership between the young EA member, their employer and EA to provide the graduate with a range of professional work and development opportunities to assist them to rapidly attain the competencies expected of experienced engineers engaged in unsupervised engineering practice. The Australian Institute of Landscape Architects (AILA) runs a mentoring program along similar lines.

Professional institutions

A professional institution is an organisation whose purpose is to support the professional development of its members, provide registration services if appropriate and accredit undergraduate tertiary and TAFE courses.

Stakeholders

A stakeholder is a person or group with an interest in an activity and/or outcome. Stakeholders may be internal or external to a group or organisation and may be direct or indirect beneficiaries of an activity or outcome. Sustainable development promotes cross-sectoral stakeholder engagement in the planning and implementation of actions.

Strategy

A strategy is a long-term plan with a defined scope that identifies: measurable objectives; key actors and target groups for the achievement of outcomes aligned with its declared vision.

Systemic thinking

Systemic thinking is a type of thinking methodology based upon a critical understanding of how complex systems, such as environments and ecosystems, function by considering the whole rather than the sum of the parts. Systemic thinking provides an alternative to the dominant way of thinking, which emphasises analysis and understanding through deconstruction. In comparison, systemic thinking offers a better way to understand and manage complex situations because it emphasises holistic, integrative approaches, which take into account the relationships between system components and works toward long-term solutions critical to addressing issues of sustainability.

Systemic thinking offers an innovative approach to looking at the world and the issues of sustainability in a broader, interdisciplinary and more integrative way. Closely related to holistic and ecological thinking, systemic approaches help us shift our focus and attention from 'things' to processes, from static states to dynamics, and from 'parts' to 'wholes'.

7 Endnotes

¹<http://www.greenhouse.gov.au/impacts/nccap/index.html> (Accessed 22/3/2007)

²DEW 2007 p5

³IPCC 2007

⁴Stern 2007

⁵Adger *et al* 2005

⁶Based on Adger *et al* 2005

⁷IPCC 2007

⁸Stern 2007

⁹Paramount Classics & Participant Productions 2006

¹⁰DEW 2007a

¹¹DEW 2007b p5

¹²It should be noted that Engineers Australia also accredits courses run by Australian universities in Asia, in accordance with the guidelines of the Washington Accord agreement.

¹³Queensland PIA undertook a study of climate change issues relevant to planning practitioners (June 2004), while the PIA national body had, at the time of recruitment, just initiated a pilot workshop for planners on climate change adaptation sponsored by the Australian Greenhouse Office.

¹⁴<http://www.aila.org.au/charter> Accessed 18/09/2006

¹⁵<http://www.ewb.org.au/main> Accessed 2/5/2007

¹⁶Mah, Hunting & Tilbury 2006 p7

¹⁷Pers. comm Paul Varsanyi EA, Workshop 1, 3/11/2006

¹⁸Stern 2006 p416

¹⁹Adgar *et al* 2005

²⁰Based on Adger *et al* 2005

²¹Landscape architecture courses also include named landscape 'design' courses.

²²Planning courses have a variety of names e.g., Urban & Regional Planning, Environmental Planning, Urban and Regional Development.

²³Bachelor of Engineering & Bachelor of Technology degrees accredited by Engineers Australia. It should be noted that engineering is a large field with a number of specialist sub-professions, for example mechanical engineering, civil and structural engineering, environmental engineering (see EAs website <http://www.ea.org.au> for full details). It is acknowledged that engineers in all sub professions (i.e. including electronic and mechanical engineering) will have a role to play in sustainable practice and implementation of climate change adaptation solutions in consort with other built environment practitioners.

²⁴Pers comm. IPWEA personnel 13/9/06

²⁵Fenner *et al* 2005

²⁶Lyth 2006

²⁷Tompkins *et al* 2005

²⁸This assumption has been further supported through consultation with project partners (e.g. pers. comm Martin Dwyer EA, Workshop 2, 5/03/2007).

²⁹NSW Local Government and Shires Association, *Climate Change Mitigation and Adaptation Summit*, 27/11/2006 Sydney.

³⁰PIA Climate Change Workshops <http://www.planning.org.au/index.php?option=content&task=view&id=479> (Accessed 12/03/2007)

³¹This was a one day course for engineers working in the fields of river, coastal, stormwater and water supply engineering.

³²SCCG <http://www.sydneycoastalcouncils.com.au/> (Accessed 12/03/2007)

³³Examples are Sustainable Architecture, Environmental Engineering and Environmental Planning courses.

³⁴Batterham 2006; Taoussanidis & Antoniadou 2006

³⁵Klock 2005 p3

³⁶For example, Sustainable Architecture at UTAS, Master of Sustainable Practice at RMIT and the Master of Sustainable Development and Master of Environmental Planning at Macquarie University.

³⁷University of the Sunshine Coast has recently launched a Master of Climate Change Adaptation (<http://www.usc.edu.au/Students/Handbook/Postgrad/OnCampus/Science/SC702/SC702.htm>) (Accessed 11/10/2007)

³⁸See <http://www.csiro.au/org/ps18.html>; <http://www.nfee.gov.au/home.jsp?xcid+48> (Accessed 30/05/2007)

³⁹See <http://www.ukcip.org.uk> (Accessed 14/03/2007)

⁴⁰Pers comm Workshop 1, 3/11/2007

⁴¹At the time of the submission of PIA's report to ARIES, PIA had conducted seven such workshops with around 300 people attending.

⁴²QLD PIA 2004

⁴³RAIA Report to ARIES p8

⁴⁴<http://www.architecture.com.au/i-cms?page=1.21.60.233.2189> Accessed 30/5/2007

⁴⁵<http://www.naturaledgeproject.net/ESSP.aspx> Accessed 2/5/2007

⁴⁶<http://www.architecture.com.au/i-cms?page=1.21.60.233.2189> Accessed 30/5/2007

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