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CRC

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Finally, thanks to each of the interviewees and to the participants from the 2014 LCL CRC Participants Forum for contributing and offering your honest perspective and contributions to help improve Australian built environment CPD.

DISCLAIMER

The report findings are based on primary and secondary data collected and analysed by the researchers from Swinburne University of Technology from various sources and do not necessarily reflect the views of the Commonwealth Government, industry groups or any companies involved in the Project Steering Committee.

Although the authors of this report have taken great care, neither Swinburne University of Technology nor the authors accept any liability from actions or decisions made based on the information provided in this report.

PEER REVIEW STATEMENT

This report has been reviewed and approved for public release by the Project Steering Committee and the CRC LCL. If corrections are needed, please contact the CRC LCL via email.

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EXECUTIVE SUMMARY

This report presents the research findings and advice framework from the Cooperative Research Centre for Low Carbon Living (CRC LCL) Research Project (RP) 3022, *Policy impediments and incentives to effective education and training*.

The aim of this report is to create awareness about the incentives and impediments to Australian education policies aligned to sustainability, energy efficiency and low carbon living in continuing education and training targeted at trades and professionals practicing in the built environment. As most often referred to, engagement in continuing professional development (CPD) is typically beyond a primary qualification such as a Certificate III or a bachelors degree in the built environment. The CPD policies investigated as part of this research offer insights from the perspective of government, industry and vocational education policies and associated programs.

Section 2 reports on the analysis of the qualitative data gathered from desktop research, interviews and a focus group. This analysis identified a number of policy incentives encouraging engagement in CPD and impediments that discourage engagement. The analysis concluded that impediments or disincentives are stronger in comparison to the incentives for engagement in CPD.

The two main incentives that stimulate engagement in CPD are:

- Professional standing
- Risk minimisation

The four impediments to CPD engagement are listed in order of importance as identified by key project informants:

- A lack of government leadership and adequate long-term policy
- A lack of research cooperation, communication and implementation of findings
- CPD policy and program synchronicity deficits
- A lack of adequate industry engagement in CPD, limited mutual recognition and human capital adaptation.

In addition to the Australian CPD polices, this report also highlights examples of international policies and practice related to carbon reduction in the built environment. The report recommendations were drawn from these four international case studies:

1. The South African Council for the Built Environment Act;
2. German Energy Council – DENA;
3. United States Department of Energy's Office of Energy Efficiency and Renewable Energy; and
4. Lessons from Alternative European Union Policy Methods.

This report includes a suite of response options drawn from the review of current Australian policies, participant engagement and the international case studies related to policy strategies and implementation methods as described in section 3, International Policies. The response options support an advice framework to inform the framing and implementation of long-term policies and programs to stimulate engagement in CPD and practices aligned with energy efficiency and carbon reductions in the Australian built environment.

Response Options

In an effort to overcome the current impediments and stimulate engagement in CPD to achieve a low carbon built environment, a multifaceted educational policy integrated with a mix of supply-side drivers (regulatory compliance paired with social, educational and economic policy strategies) is required. The policies need to be complemented by increasing demand driven pressures as indicated by the recent National Energy Efficient Building Project (NEEBP) report (p&s and Swinburne, 2014, p xxi). The continuing education policy response options highlighted in Section 4 focus on CPD policy, programs and incentives that aim to foster greater uptake of CPD by leveraging partnerships with built environment professional and industry groups and aligning the programs to building regulations or professional or industry based standards beyond regulations, such as Green Star. Another aim is to reduce confusion and contradictions that limit the implementation of knowledge and skills into practice. In summary, the recommended education policy response options are:

1 Sharing Leadership: Industry and government driving national capacity building

The first recommendation is for the Commonwealth Government to initiate the development of an independent national built environment education and CPD council in partnership with industry stakeholders representing each sub-sector of the built environment. However, at present due to the current Commonwealth Government's focus on reducing the number of councils and committees, this response option may need to be leveraged as part of a CRC LCL project to foster national capacity building. Such a project would need to develop a steering group with the inclusion of representatives from research and education, government and industry partners representing each sub-sector of the build environment. Such a group would be well placed to develop a clear set of integrated built environment educational policy objectives and establish a set of working groups to enable implementation. The working groups would focus on the remaining recommendations in this report, such as the mapping or development of an industry wide education framework from a Certificate III through to post qualification CPD, enabling mechanisms, communication strategies and feedback loops for the longer term.

2 Bridging the Divides: Research, CPD and policy programs

Key stakeholders in government, research, education and the built environment have the potential to eliminate the gaps, confusion and inconsistencies in CPD programs and develop a collaborative CPD policy framework by bringing key CPD stakeholders and decision makers together over a two-day workshop. The aim of the workshop would be to identify the priority knowledge and skills sets to foster a low carbon built environment specific to each identified role within the supply chain, explore and identify ways to eliminate the knowledge and skills gaps in the current policies and programs, and streamline future CPD opportunities and engagement incentives. Over the two-day workshop, a facilitator would initiate discussions to develop a collective framework and pathway program with complementary policies across the building supply chain. The education framework and pathway program would aim to underpin a set of integrated supply chain CPD policies and programs to be implemented or delivered autonomously based on the key report findings and other key industry recommendations. The group should also aim to continue their work by establishing an ongoing council with representatives from industry, government, research and education to establish an ongoing method of engagement, communication, monitoring and evaluation to 2025.

3 Integrating CPD: Enabling the development and coordination of integrated CPD programs

As a continuation of response options 1 and 2, this response focuses on the implementation. A national systemic built environment industry capacity building program is an opportunity to enable the development and delivery of an integrated education framework with the potential for CPD programs to be facilitated autonomously by education providers and peak bodies. In addition, as recommended by the study participants, the program could also explore the opportunity to facilitate the sharing of resources and cross sector delivery to support industry-wide consistency and foster relationships between practitioners, peak bodies and educational institutions. This type of system could foster mixed practitioner capacity building aiming to reduce market competition, and minimise or eliminate inconsistencies and inefficiencies across the built environment supply chain. This approach should be further explored and mapped in a 2-day workshop to be handed over to an industry working group with CPD representatives from each of the peak bodies, in collaboration with government, vocational and higher education representatives.

Another key option to be considered for development responds to the limited availability of time practitioners have, and tight margins related to meeting project and client expectations. There is an opportunity to facilitate the provision of an internet based searchable, on demand or just in time information system for built environment practitioners. This system would aim to offer key facts, evidence, diagrams and visual demonstrations with links to further in-depth CPD programs or groups, etc. This particular response option recognises that formal education and training is only one facet of a set of CPD policy options. This facet would ideally support the development of a publically available and trusted information system aiming to remove some of the barriers related to accessing the right information (evidence based) in an easy to understand format when needed in day to day practice.

4 Preparing the Workforce: Enabling a flexible and responsive education system

As a continuation of the prior recommendations, representatives from across the built environment, in particular Commonwealth Government representatives from education, labour and employment departments, need to be engaged to explore the potential of implementation strategies and communication feedback loops to align the provision of programs with current and projected demand. Up till now, formal programs have been ad-hoc in response to demand based on perspective of peak industry groups. However, due to research advancements in technology, product and building innovation, the sustainable built environment sector is progressing rapidly, opportunities that require more collaboration potentially through mentoring are being presented due to the development and delivery of CPD programs becoming increasingly complex. Therefore, without a proper forecasting system in place, practitioners and organisations risk being unprepared to meet future knowledge and skills demands. In response, there is an opportunity to enhance the capacity for skills forecasting within the existing systems, but it needs to be explored further.

1 CONTINUOUS PROFESSIONAL DEVELOPMENT FOR A LOW CARBON BUILT ENVIRONMENT

Introduction

The purpose of the Cooperative Research Centre for Low Carbon Living (CRC LCL) is to lower the carbon emissions of the built environment while driving the competitive advantage for the Australian industry. The CRC LCL mission is to engage in collaborative research that provides social and technological solutions and policy evidence, to capture community imagination and facilitate the transition to a lower carbon built environment.

The aim of the CRC LCL Research Project 3022, *Education policy impediments and incentives to effective education and training* in continuous professional development (CPD), is aligned with preparing practitioners to meet the demands of a low carbon built environment. This report aims to create awareness about the incentives and impediments to Australian CPD and provide international education policy case studies to improve Australian CPD policies and programs to meet these challenges.

The government, industry and vocational education policies reviewed include those targeted at improving energy efficiency, sustainability and/or carbon reduction through continuing education and training or as it is denoted in this report, Continuing Professional Development (CPD). The CPD policies under review are those targeted at practitioners who hold a primary qualification (typically a national qualification above a Certificate III (trade level) or a university qualification). The CPD programs analysed are available to trades and professionals practicing in the Australian built environment. The first section of the report explores the Australian CPD polices.

Section 2, reports on the analysis of the information gathered from desktop research, interviews and a focus group. This analysis identified the policy incentives encouraging engagement in CPD and the impediments that discourage engagement. The analysis concluded that the impediments or disincentives are stronger in comparison to the incentives for engagement in CPD.

The two main incentives that stimulate engagement in CPD are:

- Professional standing
- Risk minimisation

The four impediments to CPD engagement are listed in order of importance as identified by key project informants:

- A lack of government leadership and adequate long-term policy
- A lack of research cooperation, communication and implementation of findings
- CPD policy and program synchronicity deficits
- A lack of adequate industry engagement in CPD and human capital adaptation.

Section 4 of the report presents a framework that includes a suite of response options with a proposed timeline for increasing participation in CPD. These options are drawn from the analysis of current Australian policies, participant engagement and the international case studies related to policy strategies and implementation methods as described in section 3, International Policies. Four international case studies are presented to inform the advice framework based on Australian suitability and needs:

1. The South African Council for the Built Environment Act;
2. German Energy Council – DENA;
3. United States Department of Energy's Office of Energy Efficiency and Renewable Energy; and
4. Lessons from Alternative European Union Policy Methods.

The report concludes with a summary and recommended areas for further research.

Approach to the Project

A project steering committee guided the project and the report findings that were derived from an analysis of primary and secondary data. The project methodology is detailed in Appendix A: Project Methodology.

Informed by the objectives of the CRC LCL, the CPD policies and programs analysis includes all those under the umbrella of low carbon living (LCL). The policies and programs associated with LCL, as expressed in this report, include those fostering sustainability, energy efficiency, green buildings and carbon reduction strategies and opportunities aligned to the built environment.

The secondary data were collected through desktop research to obtain critical information for analysis of Australian and international educational policies and programs related to CPD contributing to a low carbon built environment. These secondary resources were used for comparative analysis. Primary data were also collected through a series of eight semi-structured interviews with key built environment stakeholders and a focus group with key CRC informants in the built environment sector in Australia. The thematic analysis enabled the identification of the policy incentives and impediments to effective CPD educational policy in the Australian built environment as described in section 2, An Analysis of CPD Policies Incentives and Impediments.

A desktop assessment of government, industry and vocational CPD policies was conducted. The policy assessment included the development and application of a set of criteria used for assessment as noted in section 1, Industry Perspectives. The comparative assessment of Australian CPD policies against the international case studies is detailed in Appendix B with an overview of the findings and implications in section 3, International Policies.

Continuing Professional Development

Definition

Continuing professional development (CPD) includes any activities and/or experiences undertaken throughout an individual's career, after gaining an initial qualification, aimed at further development of professional or vocational knowledge, skills, attitudes and/or values.

The definition and following description is reflective of the wide variety of descriptions and definitions provided by government, industry and professional groups. An example of some of the CPD policies assessed is summarized in Table 2: *Examples of Australian Built Environment CPD*.

Thus, CPD may be used to:

- Improve technical competence (e.g. learning about a new product, service or process and how to apply it);
- Develop values, attitudes, or skills (e.g. communication, conflict resolution, emotional intelligence);
- Improve workplace effectiveness (e.g. developing / implementing a new way of conducting business);
- Assist, influence or lead others (e.g. mentoring and leadership training or activities);
- Enable career changes or advancement (e.g. chartered engineer or advancing from a trades person to a builder or a builder to a building surveyor); and/or
- Serve the community (e.g. participation in industry and volunteer committees or a local or international groups).

CPD may take many forms:

- Formal or informal (e.g. committee involvement, presentation of papers at conferences / seminars, writing/editing journal articles or teaching a colleague a new skill);
- Structured or unstructured (e.g. learning new software or developing / implementing a new system);
- Public or private (e.g. TAFE, university, an industry / professional association, union, or an expert consultant/coach); and/or
- Inside or outside the workplace (e.g. an internal workplace presentation or a short course provided by a university or Registered Training Organisation (RTO)).

The Importance of CPD

Built environment practitioners require flexibility and the capacity to be adaptive to respond to rapidly changing demands and challenges of an industry facing continuous change and uncertainty. In addition to regulatory measures, the demand for energy efficiency in particular is a significant driver in almost all industry sub-sectors at present. Thus, the Australian built environment sector will require a workforce that possesses the skills, knowledge and experience to design, develop and deliver low carbon building projects and facilitate effective management of them post completion.

Several reports in the past five years have highlighted deficiencies in the delivery of adequate and coordinated education and training in the built environment sector (e.g. Winfree et. al., 2013; ASBEC, 2013; Fien & Winfree, 2012; Fien & Guevara, 2012). These deficiencies were confirmed in p&s and Swinburne (2014) research linking building performance failures to weaknesses in education and training systems, at least in part.

The Australian Sustainable Built Environment Council (ASBEC) Jobs and Skills Task Group identified five arguments underpinning the need for a sector-wide collaboration framework to advance the sustainability skills agenda:

- Sustainability leads to productivity gains;
- Significant sustainability skills gaps remain in the built environment sector;
- On-going learning is key to addressing sustainability skills gaps;
- Coordination of resources is required to efficiently address learning needs; and
- Collaboration is the most effective way of coordinating resources (ASBEC, 2013, p.7).

Policies related to CPD for the Australian Built Environment

Both internationally and within Australia, the built environment is being influenced and shaped by energy and carbon reduction policies based on extensive scientific research and supported by product and service innovation. Education and training policies are critically important to shaping Australia's future built environment. Some educational policies have been led by industry, others by government, although most have been joint initiatives initiated by government and implemented through industry collaboration based on market or academic research.

CPD policies offer leadership and direction along with coordinated implementation strategies to support provision of resources (such as support programs) to achieve government and/or industry priority area targets. A low carbon built environment requires an effective system to overcome the complex challenges as indicated by a collective report prepared by the eleven Industry Skills Councils. The report, released in 2009, concluded that:

Australia faces a range of challenges in order to equip the workforce with the skills needed for a future that will largely be determined by its environmental sustainability. VET's core business is supporting the major strategic shifts in the skills profile of Australia's workforce needed to meet Australia's economic and social policy. We will know we have succeeded when sustainable practice is embedded to the point of being invisible; when our practices are so smart that they are synonymous with and drive productivity growth; that as a country, we are seen as cutting edge not just in the skills of our people but in the system that builds our workforce. (Industry Skills Councils, 2009, p. 17)

The next section describes workforce capacity building based on the range of policies for built environment CPD aimed at enhancing energy efficiency, carbon reductions and sustainability. In turn, it describes the policy support offered by government, education and industry sectors.

Government policies

The government built environment initiatives described in Table 1, set out policy drivers for CPD supporting energy efficiency and carbon reduction opportunities and practices in the sector over the last 20 years. The summary shows that the building sector has had to respond to a constant stream of policy changes over the last ten years.

The Australian Government has initiated a large number of programs and projects but very few of these prioritised, facilitated or offered incentives to the industry businesses and practitioners to foster low carbon living or engage in CPD in general. The associated policy implementation or compliance costs are expected to be absorbed by the industry. However, with tight margins and high productivity demands, the little time available for upskilling is completed as needed, often informally an typically on the job based on the job requirements.

For the majority of respondents, there is an assumption that practitioners voluntarily upskill to meet changing market demand or regulatory compliance. For example, the Council of Australian Governments (COAG), Energy Council's Building Committee supported the State of South Australia to commission the *National Energy Efficient Building Project* (NEEPB). As part of the Phase I project, a NEEBP report was released in 2014, by pitt & sherry and Swinburne University of Technology. The findings indicate that the construction workforce isn't complying with the energy efficiency measures set out in the National Construction Code. And although other legislated actions, such as the BEED Act, may have driven industry improvements related to the energy efficiency and greenhouse gas emissions of commercial buildings, it doesn't necessarily confirm that the opportunities were successfully implemented. There is still a level of uncertainty as to whether policy and program measures are limited due to a lack of CPD incentives or could potentially be maximised by coupling CPD programs and engagement incentives.

The NEEBP report findings highlight a further research opportunity to investigate the impacts and effectiveness of the legislation, policy and programs in Table 1 related to the inclusion or exclusion of CPD incentives. Although policies may stimulate compliance or improvements in the built environment, without adequate program provision, financial incentives and evaluative feedback loops, uncertainty around the effectiveness of CPD may continue to be questioned.

Furthermore, opportunities may be lost or the industry is sometimes prone to push back political campaigns such as those highlighting the need to minimise 'red' and 'green' tape due to the costs associated with upskilling. Programs aimed at business improvements without CPD may fail to ensure the workforce is effectively trained to achieve the compliance measures aligned with low carbon buildings. As the NEEBP states, compliance measures must also be enforced to ensure the knowledge and skills gained formally or informally are put into practice to meet the regulatory or program requirements.

The National Workforce Development Fund (NWDF), part of the Australian Government Skills Connect initiative (2011-2014), sought to assist employers to up-skill and re-skill their workers in areas of critical skills shortages. The funding was centrally coordinated through the Construction and Property Industry Services Skills Council (CPSISC), but operated on a co-contribution model between government and industry to demonstrate a shared commitment to training through identifying and addressing current and future workforce development needs. Unfortunately, there were very few, if any, programs aligned with energy efficiency given the competing priorities with other industry skills needs. The CPSISC has also released the Certificate IV for NatHERS assessors, a specialised program aimed at a very small portion of the building industry. However, the new accreditation requires those already accredited to be re-accredited under the new national certification system without any financial incentives to support re-training and accreditation.

Of all of the Australian Government initiated policies and programs in Table 1, the National Strategy for Energy Efficiency (NSEE) is the only one that is still ongoing and directly supports education or CPD. However, at present, no CPD programs are being supported. CPD programs and incentives were recommended as part of the Phase I NEEBP Report recommendations to the COAG Energy Council's Building Committee for Phase II of the NEEBP. Although the NEEBP Phase II projects have been completed, there were no CPD programs or related incentives to increase CPD engagement in the built environment.

There is also a low level of state and territory action, as few regulatory authorities require CPD in any field. There are two exceptions. Tasmania requires all key built environment practitioners to engage in 12-30 hours per annum of CPD in 'practical skills, business competencies, laws affecting the industry or personal development'. However, it did not mandate specific topics and excludes tradespeople from the requirement (Tasmanian Department of Justice, 2014). Only in New South Wales are both builders and some trades required to engage in annual sustainability related CPD. Under the Home Building Act 1989 and the Director-General's *Guidelines For Continuing Professional Development*, the Department of Fair Trading (2014) requires CPD in at least one of two areas related to low carbon living:

- Sustainability (sample topics):
  - BASIX
  - Waste management
  - Green building
  - Water management
  - Accessible Buildings
- Building - Technical issues (example topics):
  - Waterproofing
  - Sealing of timber doors.

In 2007, the Australian Government Department of Environment and Water Resources supported the Australian Research Institute in Education for Sustainability (AIRES) to identify the professional development needs of the construction industry in relation to climate change adaptation. AIRES found:

- Variable levels of existing skills and access to professional development
- A need for government leadership to set new benchmarks and new support for professional development initiatives
- A need for education in both climate change adaptation and mitigation
- A need for rapid adoption of education about and for climate change adaptation in accredited programs and on-going professional development
- A need for quality control and competency standards in climate change adaptation education
- A need for a national strategy for the sharing and dissemination of climate change information and resources (Lyth, Nichols, and Tilbury, 2007).

Table 1: Milestones in Australian Built Environment Policies and Initiatives

Date	Title	Organisation Responsible	Type
1997	Measures for Improving Energy Efficiency in Commonwealth Operations	Commonwealth	Policy
1998	Australian Building Greenhouse Rating launched in NSW	NSW	Policy Program
1998	National Australian Built Environment Rating System (NABERS)	Commonwealth	Policy Program
2003	Residential energy efficiency standards for new buildings in the National Construction Code	Commonwealth	Legislation
2004	National Framework for Energy Efficiency (Ministerial Council on Energy)	Commonwealth	Policy
2006	Energy Efficiency in Government Operations (enhances and replaces Measures for Improving Energy Efficiency in Cwth Operations) Energy Efficiency Opportunities Program	Commonwealth	Program
2008-2011	AusIndustry Green Building Fund	Commonwealth	Program
2008	Strategic Review of Australian Government Climate Change Programs	Commonwealth	Report with policy recommendations
2009	Environmental Sustainability: An industry response	Industry Skills Councils	Report with policy recommendations
2009-2011	Living Sustainably: the Australian Government's National Action Plan for Education for Sustainability	Commonwealth	Policy
2009-2011	Green Skills Agreement & Implementation Plan	Commonwealth	Policy Programs
2009-2020	COAG National Strategy on Energy Efficiency (NSEE)	Commonwealth	Policy
2010	Residential energy efficiency standards for new buildings and renovations were strengthened in the National Construction Code	Commonwealth	National Construction Code
2010 - 2021	Building Energy Efficiency Disclosure Act 2010 (Commercial Buildings) using NABERS	Commonwealth	Legislation
2011	Clean Energy Future Package (Clean Energy Act 2011) established long term goals to reduce emissions by 80 per cent from 2000 levels by 2050	Commonwealth	Legislation Programs
2011-2014	Workforce Development Fund (part of the Australian Government Skills Connect)	Commonwealth and Industry	Policy Programs
2012	Built Environment Industry Innovation Council (BEIIC)	Industry	Report with policy recommendations
2012 - 2013	Energy Efficiency Skills Gaps and Training Needs Project	Industry	Report with policy recommendations
2013	Sustainability Skills Collaboration Framework (ASBEC Jobs and Skills Task Group)	Industry	Report with policy recommendations
2014	Replacement of the carbon pricing mechanism and other elements with Direct Action Plan including the Emissions Reduction Fund	Commonwealth	Policy Programs
2015	Release of the Energy White Paper with a commitment to develop a National Energy Productivity Plan	Commonwealth	Policy Programs

Industry perspectives

As Table 2 shows, most industry and professional groups have developed CPD policies. However, most of the available CPD programs are voluntary with very few on-going requirements related to low carbon strategies. It was reported by participants that only a very small number of practitioners actually enrol and complete CPD related to sustainability, energy efficiency and/or carbon reduction topics, further indicating it is a niche market lacking widespread uptake. Indeed, regardless of the levels of engagement, many industry leaders and association members are ambivalent about the actual effectiveness of the CPD in terms of improved practices.

Table 2: Examples of Australian Built Environment CPD Descriptions

Industry/Professional Group	CPD Policy Description
Planning Institute of Australia	Professional Development: Addresses the need for lifelong learning in the workplace / professional environment.
Building Designers Association (Victoria)	CPD: Enables members to continually up-skill their knowledge.
Australian Institute of Architects	CPD: Any learning activity that systematically enhances an individual's professional knowledge, skills and competency relevant to the practice of architecture. Activities defined as learning outcomes linked to one or more of the four Architects Accreditation Council of Australia National Competency Standards in Architecture. The four units of competency are: • Design • Documentation • Project Delivery • Practice Management.
NSW Architects Registration Board (one example of a state board requirements under the Architects Accreditation Council of Australia)	CPD: To improve professional knowledge and competence. Each year at annual renewal of registration architects are required to report on their Continuing Professional Development (CPD) activities in the previous year. The Board considers that 20 hours of activities of which at least 10 hours are formal should be the minimum amount of activity undertaken by an architect in each year.
Engineers Australia	CPD: Activities are designed to extend or update your knowledge, skill or judgment in your area(s) of practice, and enable you to: • Maintain technical competence • Retain and enhance effectiveness in the workplace • Be able to help, influence and lead others by example • Successfully deal with changes in your career • Better serve the community.
Construction – Master Builders Association	Training: Industry requires a skilled and flexible workforce with growing demand for qualified tradespeople and professionals able to move between the commercial and domestic sectors. Meeting future workforce needs requires a comprehensive approach encompassing apprenticeships and pre-apprenticeships, skilled migration, upskilling of the existing workforce, and creating opportunities for mature workers to enter or remain in the industry.
Australian Institute of Building Surveyors	CPD: Lifelong learning is part of the equation so that people re-skill, stay up-to-date with current legislative requirements and adapt to industry change. Regularly gaining new sets of competencies and skills means people can move more freely between work arrangements to suit their aspirations and economic conditions. Education is a means to practical work-related skills while learning the theory that underpins those skills. Lifelong learning equips people to operate effectively within the ever-changing context of the workplace and society.

A number of participants indicated that designers, architects and engineers are believed to participate in CPD more often than builders, tradespeople, facilities managers or property services professionals. However, others indicated that the type of CPD that builders and trades often engage in to support knowledge and skills development typically involves product suppliers or manufacturers and takes place during informal industry nights or on building sites. It was also noted that informal meetings with other trades on building sites, sometimes referred to as 'toolbox meetings', is often when information and experiences are shared based on new methods, products or services. These are often complemented by information and advice from suppliers, sales people and/or manufacturers with the aim of marketing or selling specific company products over the competition. Therefore, this type of informal CPD has the potential to lead to misinformation and myth creation about products or methods. Due to the demanding nature of construction projects, not all builders and trades have the time or inclination to critically review or conduct additional unbiased research on the information being provided by these 'trusted' sources.

Compliance with the National Construction Code is a key driver for industry engagement in CPD. For example, when energy efficiency was integrated into the code the workforce was provided with free and on-going CPD to ensure compliance with these new regulations. Consumers can be another driver as indicated by one of our interviewees who reported that, "at the time that Australia was facing a severe drought the demand for training in water efficiency skyrocketed." However, this is not common and direct feedback from a key industry group representative is, "the lack of clear policy here and in fact the move backwards is not sending a clear signal to consumers. In the domestic sector this translates to energy efficiency being a low priority to people buying houses and therefore this is not seen as a priority to industry (draft report feedback, Apr 2015)."

A more in-depth analysis is provided in Table 3, which identifies:

- CPD requirements including any specifically related to low carbon design and construction;
- An example of low carbon design and construction CPD programs;
- Status: being compulsory or voluntary for the member group; and
- Provisions for mutual recognition of provision and engagement by external providers (members only).

The Status (column) in Table 3 relates to CPD Policy Description as follows:

1. Description of the CPD Policy
2. Response to the questions: Does the CPD include compulsory or voluntary aspects of energy efficiency (EE), carbon abatement (CA) or sustainability (Sus) for members?
3. Response to the question: Is on-going participation in CPD a legislative requirement for the group of practitioners? yes / no

Furthermore, in Table 3 the last column Program Insights highlights key CPD aspect relative to the research aim but outside the scope of this study:

1. Mutual Recognition: Does the organization accept CPD points for training with provider(s) outside of their organisation? Yes / No
2. What's the uptake and completion rate?
3. What are the outcomes of evaluation of the policy or program?

However, as the lack of information in the last column of Table 3 indicates, further research is required to determine the level of uptake of the programs stemming from these policies and to evaluate the effectiveness. This research direction was outside the scope of this particular project.

One best practice Australian example is the Australian Institute of Building Surveyors Education Strategy. This strategy is used to drive CPD with the existing workforce, while ensuring the emerging workforce has the same knowledge and skills by:

- Contributing to educational excellence through the National Education Committee's performance engaging with educational institutions, professional associations and the government's at the local, state and federal level and other stakeholders;
- Promotion of lifelong learning for building surveying professionals.
- Development and oversight for the course assessment protocol ensuring direct influence on course content and issues to reflect the Benchmarks and core competencies.
- Promoting an approved course listing of providers based on providers whose course content meets the Benchmarks and core competencies under the National Accreditation Framework.
- Facilitating research in the higher education community (AIBS Education Strategy 2014).

In addition, industry peak bodies have also contributed feedback to government over the last decade. The two leading built environment industry groups, the Australian Sustainable Built Environment Council (ASBEC) and the former Built Environment Industry Innovation Council (BEIIC) have made significant recommendations with CPD implications. In 2012, the BEIIC National Industry Education and Training Vision and Action Plan for the 21st Century (Fien and Winfree, 2012, pp. 14-16) called for:

- Stimulation of continuing professional development requirements based on national licensing reforms, as the Certificate III not Certificate IV (trade qualification) is the most widely studied level - signifying a lack of any further trade learning.
- A centralised accreditation system with curriculum standards supported by national and international accreditation bodies for education and training (vocational, higher education and CPD) to minimise quality assurance issues.
- A centralised clearinghouse of information to minimise the fragmented approach to curriculum development that varies by institution and exploring opportunities to share resources and technology.
- Learning and demonstration centres to support real life experiences, collaboration and standardisation.
- Development of quality certification for non-accredited CPD to minimise quality assurance issues.
- Better pathways to formal tertiary education and training from non-accredited CPD.

In addition, both ASBEC and BEIIC recommended the establishment of a collaborative advisory body to oversee education and training as a Built Environment Skills Advisory Group (ASBEC, 2013, p. 3) or a Tertiary Education Advisory Group (BEIIC, 2012, p. 8).

Table 3: Example of Analysis of Australian Built Environment CPD

Group	Status 1. CPD Policy Description 2. Is CPD compulsory or voluntary with aspects of energy efficiency (EE), carbon abatement (CA) or sustainability (Sus)? 3. Is CPD a legislative requirement? yes / no	Program Example and Description	Program Insights 1. Mutual recognition 2. Uptake and completion rate 3. Evaluation outcomes
Planning Institute of Australia	1. Professional Development: Addresses the need for lifelong learning in the workplace / professional environment. 2. CPD is compulsory and includes a program on EE and CA for full members and strongly recommended for others. The full members are required to achieve 60 PD points in a consecutive two-year period, and the CPP Course units will count significantly towards PD. 3. No, CPD is not legislated in most states/territories for planners.	Certified Practising Planner (CCP) program requires a Climate Change course as part of the program. Successful completion of the CPP program is required to be eligible for Industry Professional Recognition as a Certified Practising Planner.	1. Yes 2. Not known 3. Not known
Building Designers Association (Victoria)	1. CPD: Enables members to continually up-skill their knowledge. 2. CPD is compulsory for members, but only Thermal Performance Assessors are required to undertake EE related content. 3. No, CPD is not legislated at this time for design practitioners.	There are no CPD requirements specifically linked to energy efficiency, carbon reduction strategies or sustainability although there is a wide range of 38+ voluntary programs available in these subject areas.	1. Yes 2. Not known 3. Not known
NSW Architects Registration Board (one example of a state board requirements under the Architects Accreditation Council of Australia)	1. CPD: To improve professional knowledge and competence. Each year at annual renewal of registration architects are required to report on their Continuing Professional Development (CPD) activities in the previous year. The Board considers that 20 hours of activities of which at least 10 hours are formal should be the minimum amount of activity undertaken by an architect in each year. 2. CPD is compulsory for registered practicing architects under the Architects Act 2004, however the compulsory content does not include EE, CA or Sus. 3. Legislative requirements vary by state and territory, but most do not have legislated CPD requirements for practising architects to undertake CPD – however CPD is mutually recognised across states, territories and in New Zealand. ***Only NSW & TAS have a legislated requirement for CPD for architects, with only NSW requiring EE.***	Activities should relate to practice as an architect and be in addition to activities already undertaken in the normal course of the architect's practice or employment. Activities in each year should relate to a minimum of two units in the National Architecture Competency Standards – Design, Documentation, Practice Management and Project Management. The National Competency Standards in Architecture (NCSA) © Architects Accreditation Council of Australia, may be downloaded from the AACA website. Currently there are no CPD requirements specifically linked to energy efficiency, carbon reduction strategies or sustainability although there are a number of voluntary programs available for uptake.	1. Yes, CPD activities may be provided by a number of organisations and individuals. The Board does not accredit providers of CPD. The Australian Institute of Architects provides information for CPD as well as providing a listing of formal and informal activities available. The Association of Consulting Architects also provides advice to their members on these matters. 2. Not known 3. Not known
Engineers Australia	1. CPD: CPD activities are designed to extend or update your knowledge, skill or judgement in your area(s) of practice, and enable you to: • Maintain technical competence • Retain and enhance effectiveness in the workplace • Be able to help, influence and lead others by example • Successfully deal with changes in your career	An individual's CPD records must demonstrate a minimum of 150 hours of structured CPD in the last three years. Of the 150 hours: • at least 50 hours must relate to the individual's area of practice; • at least 10 hours must cover risk management; • at least 15 hours must address	1. Yes 2. Not known 3. Not known

Group	Status 1. CPD Policy Description 2. Is CPD compulsory or voluntary with aspects of energy efficiency (EE), carbon abatement (CA) or sustainability (Sus)? 3. Is CPD a legislative requirement? yes / no	Program Example and Description	Program Insights 1. Mutual recognition 2. Uptake and completion rate 3. Evaluation outcomes
	• Better serve the community. 2. CPD is compulsory for Chartered members of Engineers Australia and Registrants on the National Engineering Registers, including non-members 3. Legislative requirements vary by state and territory, but most do not have legislated CPD requirements for practising engineers to undertake CPD. Queensland is the exception (see Professional Engineers Act 2002 legislates for practising engineers to engage in CPD).	business and management skills; and • the remainder must cover a range of activities relevant to the individual's career. Currently there are no CPD requirements specifically linked to energy efficiency, carbon reduction strategies or sustainability although there are a number of programs available for uptake.	
Construction – Master Builders Association	1. Training: industry requires a skilled and flexible workforce with growing demand for qualified tradespeople and professionals able to move between the commercial and domestic sectors. Meeting future workforce needs requires a comprehensive approach encompassing apprenticeships and pre-apprenticeships, skilled migration, upskilling of the existing workforce, and creating opportunities for mature workers to enter or remain in the industry. 2. No compulsory CPD requirements for MBA members, but the MBA does require compulsory annual voluntarily reporting for Green Living Builders to maintain branding. 3. Legislative requirements vary by state and territory, but most do not have legislated CPD requirements for builders or contractors. Only NSW & TAS have a legislated requirement for CPD for builders and some licensed trades, with only NSW requiring EE.	Voluntary: 2 day Green Living short course for members and non-members Compulsory Green Living short course when studying a Certificate / Diploma of Building and Construction with MBA	1. No 2. Approx. 1200 per annum from 2006 to mid-2013 3. Not known
Australian Institute of Building Surveyors	1. CPD: Lifelong learning is part of the equation so that people re-skill, stay up-to-date with current legislative requirements and adapt to industry change. Regularly gaining new sets of competencies and skills means people can move more freely between work arrangements to suit their aspirations and economic conditions. Education is a means to practical work-related skills while learning the theory that underpins those skills. Lifelong learning equips people to operate effectively within the ever-changing context of the workplace and society. 2. Yes, CPD is compulsory for members: High level of CPD hours / points per annum for all 'members' – 30 hours/points (est. 2009). 3. Legislative requirements vary by state and territory, but most do not have legislated CPD requirements for building surveyors. Exceptions: Only NSW & TAS have a legislated requirement for CPD for building surveyors, with only NSW requiring EE.	Option of engaging in CPD on Building Related Science: • Basix understanding of issues involved in sustainable urban development and design, reuse and durability of building and building materials and minimisation and disposal of construction waste. • Basic understanding of thermal performance of building in terms of energy efficiency and human comfort.	1. Yes: The AIBS maintains an approved course listing from education providers whose course content meets the Benchmarks and Core Competencies under the National Accreditation Framework and is used by the AIBS State Chapter staff to verify the educational status of a person applying for membership. 2. Not known 3. Not known

Vocational education perspectives

As a result of the 2014 Vocational Education and Training Reform (VET Reform), the Australian Government Department of Education and Training released findings on the national consultations with representatives from industry groups, businesses, registered training organisations and students. Although the consultation findings did not directly offer insights into CPD issues in the built environment, concerns were expressed about the state of the vocational education system and the occupational standards used to provide accredited CPD to the built environment industry. The findings, which align with the scope of this project, include:

- Industry dissatisfaction with the ways in which skills and standards are assessed causing a lack of alignment between VET, licensing and the actual skills required for a job.
- A lack of industry leadership in setting standards for the skills required in the workplace.
- Lack of timely updating of Training Packages with many being too slow and others suffering from change 'overload'.
- Patchy national data collection (VET Reform, 2014).

Prior to the 2014 VET reform findings, the Industry Skills Councils responded to calls from the Australian Government to integrate sustainability and energy efficiency skills into VET. Thus, in 2009, the eleven Industry Skills Councils collectively reported on their response to environmental sustainability issues, identifying five challenges that the vocational education workforce faces:

1. Environmental sustainability is an evolving field of expertise.
2. Environmental sustainability requires a range of learning outcomes.
3. Teachers will also be students.
4. New technologies will need new learning resources and facilities.
5. The VET sector already faces a skill shortage (Industry Skills Councils, 2009, pp. 13-15).

The Industry Skills Councils indicated their response would include enhanced professional development policies in an effort to:

1. Upskill trainers and assessors and industry practitioners to take on training roles;
2. Develop a life-long learning approach to professional development;
3. Enhanced resources quality and sharing; and
4. Support for a whole sector approach to quality improvement through Centres of Excellence (pp. 15-17).

In 2009, similar to BEIIC and ASBEC, the Industry Skill Council supporting the built environment the Construction and Property Services Industry Skills Council (CPSISC) also recommended that a Centre of Excellence would have particular benefit across the sector, specifically to:

… provide a forum for research, analysis, dissemination and development of best practice models and resources. They offer a bird's eye view with a global perspective and provide an opportunity to forge partnerships with research centres, universities and other development organisations. Centres of Excellence can provide an RTO [Registered Training Organisation] context and information hub for professional development opportunities. They also ensure that those less well resourced, still have access to quality information and resources. (CPSISC, 2009, p. 17).

The 2011 CPSISC report identified the importance of competencies to support a sustainable built environment, and recommended a three-strand approach:

- 'standalone' units that build awareness and good practices;
- technical units that address specific elements of environmental sustainability in particular occupations; and
- the weaving of green skills and knowledge that are required for the effective performance of a vast array of workplace functions throughout a raft of units (CPCISC, 2011, p.2).

Actions by the Construction and Property Services Industry Skills Council (CPSISC) have led to the development of numerous sustainability and energy efficiency units of competency as indicated in the project reports which are available in qualifications, but also as stand alone units to support engagement in the form of CPD. These include:

- Skills for Sustainability and Training Packages: Final Report (CPSISC, 2011); and
- Energy Efficiency Skills Gaps and Training Needs Project which stimulated the development of new units of competency at the Certificate IV and Diploma of Building and Construction (CPSISC, 2013).

The report also alluded to the potential future needs of the industry with a growing role related to business, planning, communication and human resource management skills for new or enhanced units including:

- Researching sustainable solutions;
- Training for sustainability and engendering workforce commitment;
- Communicating sustainability advantages to customers;
- Pricing and quoting services (recognising sustainability processes and materials);
- Marketing services to reflect a business's green credentials; and
- Working with customers to achieve 'low impact living'(CPSISC, 2011, pp. 10-11).

Consequently, within the national vocational education sector, CPSISC has continuously improved the availability and flexibility of units of competency to support low carbon living. However, availability of training standards does not readily lead to training programs, nor implementation or integration of opportunities and practices into day-to-day built environment work methods.

Summary

This section has: offered an overview of CPD, including the definition used in this report; identified the benefits of engagement in CPD and the range of government, industry and VET CPD policies and perspectives particularly those related to carbon reduction in the Australian built environment sector.

Despite the varying policy perspectives and programs available, the respondents all indicated that there is a strong view that CPD is vitally important to industry quality, progress and sustainability. However, there is little synergy or coordination between groups, very few government or industry policies to stimulate uptake with very low levels of engagement in CPD beyond professional or licensing requirements and even lower levels of engagement in CPD related to low carbon living.

ASBEC, BEIIC and CPSISC have identified a number of policy options to stimulate educational policies and programs aligned with complementary stimulus. However, these cannot be developed and implemented in isolation. Therefore, a joint policy package with contributions, responsibilities and feedback from a multi-stakeholder group with representation from across the built environment supply chain and government at the national and state levels is required.

The next section examines the CPD policy incentives and impediments to identify the consequences of these patterns.

2 AN ANALYSIS OF CPD POLICY INCENTIVES AND IMPEDIMENTS

Introduction

The purpose of this section is to analyse the data collected and presented in the previous sections used to identify the policy incentives for CPD and the impediments that undermine the uptake and effectiveness of CPD. Unfortunately, as Section 1 showed, the former – policy incentives – are extremely weak and few in number in relation to the impediments. Only two incentives were identified: a desire to maintain professional standing and to reduce risks – and these come primarily from a small number of industry associations. Despite this, the examples of the policy incentives they provide are models that could be more widely applied throughout the built environment industry sector.

By contrast, the policy disincentives are very strong, and include:

1. Leadership and adequate long-term Government policy
2. Collaboration: Research cooperation, communication and implementation of findings
3. Synchronicity deficits
4. Adequate industry engagement and human capital adaptation.

The next sections explore the incentives and impediments to CPD engagement in depth and the resulting issues.

Incentives for CPD

The two incentives used to stimulate engagement in CPD are:

- **Professional standing** – At present, the main incentive to engage in CPD is to maintain one's professional standing, licensing, accreditation or association membership.
- **Risk minimisation** - Minimising risk through CPD was identified as a key incentive for businesses, professionals and trades to build knowledge and skills by industry associations and government agencies to meet or exceed regulatory compliance measures and product specification and installation issues related to liability.

Professional standing

Currently, the main incentive to engage in CPD is to maintain one's professional standing, accreditation or association membership. However, 'professional standing' is typically only relevant to those who have attained a Certificate IV or university qualification.

In Australia, most industry associations use membership to increase business efficiencies like pooling resources for legal services, insurance, marketing and training to both improve the service quality or as a form of branding. Alternatively, an interviewee indicated that some industry and professional associations are profiting from the exercise without any real benefit to the members themselves. In contrast, HIA states that they "require that all existing and proposed CPD schemes be subjected to independent review to confirm whether there are sufficient benefits to justify the significant public and private costs involved (CPD Policy Interviewee, 2014)."

There are few associations that mandate CPD in low carbon living related knowledge and skills (sustainability, green buildings, energy efficiency) and even then, the uptake is generally quite low.

These are four examples:

- Master Builders Association (MBA): The MBA in Victoria (MBAV) has the highest voluntary engagement in their Green Living short course, although it is available in other states and territories. The MBAV aims to influence the workforce by integrating the Green Living training as a core component of the Certificate IV and Diploma in Building and Construction that they deliver. Those who complete the training and report annually are able to promote themselves as a Green Living Builder.
- HIA Green Smart: Similar to the MBA short course, this short course is aimed at builders and trades in the housing sector, although it is viewed as a niche specialisation.
- The Australian Mechanical Contractors Association spokesperson indicated that anything to professionalise the industry is worthwhile, particularly CPD. The association's aim is to improve construction efficiencies particularly at the time contractors, builders and design professionals engage with a focus on integrated training programs. The industry as a whole benefits from this type of training by developing integrated work practices well suited to establishing and achieving opportunities early on in a project while using building information modelling in addition to energy efficiency or sustainability approaches to design and construct a built environment.
- The Building Designers Association of Victoria also supports best practice through mentoring designers and energy assessors by reviewing designs and plans. During a typical review mentors offer insight into opportunities related to energy efficient or sustainable designs. The feedback from most assessors and designers has been positive with those involved welcoming the opportunity for constructive feedback to improve individual practices.

Although professional standing is a key driver, with the exception of the Australian Mechanical Contractors Association, the approaches are typically ad hoc and segregated across the construction supply chain reducing the advantages and efficiency gains awarded to collaborative industry wide approaches and education programs. This is with the exception of a recent memorandum of understanding between the Green Building Council of Australia and the Australian Institute of Architects. These groups aim to work to collaboratively to jointly recognise the CPD programs delivered by either group.

Minimising risk

Stakeholders indicated that minimising risk through CPD was identified as a key incentive for businesses, professionals and trades by building the knowledge and skills required to evaluate the effectiveness of products and apply them based on the manufacturer guidelines and technical specifications. CPD aligned with changes to compliance with building regulations is also a key incentive aligned with minimising the risks associated with design and construction in the built environment.

However, the building materials market in particularly is poorly regulated with numerous ineffective and inadequate products being manufactured and sold to unsuspecting practitioners, building firms, businesses, developers and consumers. Interviewees identified that many building products available in the current market do not meet Australian standards, but are continuing to be sold or imported into Australia.

The current view is that many practitioners do not have the time, inclination or resources available to research the effectiveness of products, nor the ability to identify copies. They also assume that major distributors are selling products that meet Australian Standards and typically trust the manufacturer's claims and advice.

Labelling systems like WaterMark, CodeMark and Forest Stewardship Council (FSC) timber and associated labelling and product review websites like Global GreenTag as part of Eco specifier and the Green Environmental Choice Australia have had positive impacts in the industry. As trusted labels they minimise the risks and enable practitioners to ensure the quality of some building materials. Appliances labels related to energy and water efficiency have also had a positive impact. However, labels linked to LCL products, such as air and moisture barriers (building wraps), window systems, ventilation and systems solutions supported by innovative insulation, facade, or pre-fabrication manufacturers are urgently needed.

Practitioners are demanding trusted and accessible sources of information and CPD related to weeding through the abundance of inferior products and systems available. Practitioners are asking for industry associations and government regulators to lead the agenda underpinned by university led applied research related to both sourcing product based on evaluations and effective implementation methods.

In response, CPD providers are creating CPD about key energy efficiency and low carbon living principles and offering 'myth busting' about the ineffective products on the market, such as the 2013 MBA Green Living Building Conference. A key incentive for businesses, professionals or trades to engage in CPD is to minimise their risks based building knowledge and skills to critically assess and determine the effectiveness of products in the market.

In the future, the abundance of new materials and products increasingly entering the market will continue to lead to the demand and communication based on applied research. The research needs to account for not only the effectiveness and reliability of the product/material, but also demonstrations and coaching 'how to' instructions to minimise the need for corrections and litigation due to failing buildings.

In addition, a small but growing number of property owners are also looking for established metrics and returns on investment to minimize financial risks. As one stakeholder acknowledged, the Green Building Council of Australia has successfully identified the commercial building metrics and measured key areas of investment and return which enables building practitioners to easily communicate these to building owners to minimize the investment risks. This information is disseminated through various forms of CPD to stimulate market demand for green buildings stimulating consumer and practitioner trust. However, the housing market still requires a trusted, robust, easily understood and reliable energy rating for houses before industry and consumers will invest further in education and changed methods. Further investigation into the uptake and effectiveness of CPD programs leading to improved practices could indicate a need to reallocate funds to stimulate improved industry compliance with established regulatory measures.

Impediments to CPD

In contrast to the limited and uneven incentives for CPD outlined in the previous section, the impediments are significantly reducing the uptake of CPD in the BE. Section 1 identified the many recent reports that highlight deficiencies in the delivery of adequate and coordinated education and training in the built environment sector. Central to these deficiencies is the lack of synchronicity and alignment in educational policy planning, regulations and compliance measure based on low levels of development between key agents, namely, government agencies, industry bodies and education providers.

The *National Energy Efficient Building Project* (NEEPB), by pitt & sherry and Swinburne University of Technology (2014, p. xx & 140), found that the majority of the built environment workforce has a 'satisfier' culture where minimum compliance is the accepted norm instead of a culture of excellence. Although there are a number of industry leaders and excellent CPD opportunities to foster a culture of excellence, these are not widely accessed. There are minimal if any legislative or professional requirements to engage in sustainability, energy efficiency or carbon minimisation up-skilling programs.

The NEEBP findings indicated that information and training provision alone is not likely to bring about the desired changes, as this is only one dimension of a multifaceted policy framework. In addition to trusted sources of information and quality CPD provision, a complex mix of supply-side drivers (regulatory compliance paired with and social, educational and economic policy strategies) complemented by increasing demand driven pressures that together are needed to provide the conditions for appropriate cultural and behaviour change. Although community awareness and education are outside of the scope of this project, the report indicates that these demand driven pressures could be stimulated through policies supporting "widespread community consumer awareness of energy efficiency measures and an increased emphasis on mandatory disclosure and other aspects of consumer rights in the construction industry (p&s and Swinburne, 2014, p. xxi)".

The NEEBP report identified four strategies to guide the reform program being recommended for the built environment:

- 'Being clear what is at stake' by identifying and communicating the benefits "associated with effective building energy performance policy, regulatory and knowledge management frameworks regulation, and what costs are associated with ineffective frameworks (p&s and Swinburne, 2014, p. xxii)".
- 'Getting the incentives right' by ensuring the incentives align to the intended outcomes, being low carbon buildings not purely focused on minimum compliance, but best practice and continuous improvement fostering a culture of excellence (p. xxiii).
- 'Delivering quality outcomes' across the supply chain by enabling practitioners to access the right knowledge and CPD and be provided tools and product information to enable effective decision making, communication and integration of best practice into day to day work practices (p. xxiii).
- 'Empowering the community' to ensure that building owners and users understand the value of an energy efficient building, what they should expect from practitioners and the building and assurances that these expectations are met (p. xxiii).

The impediment themes were identified through the desktop research, eight interviews and the November 2014 CRC LCL Participants Forum. The CRC LCL Forum Participants were asked to rank the impediments in order of significance to prioritise the themes resulting in the following list from the most significant impediment to the least:

- Leadership
- Synchronicity Deficits
- Collaboration
- Engagement and Adaptation

Four impediments were identified and are listed in order of priority as identified by stakeholders:

1. **Leadership: Inadequate leadership and long-term government policy**

   The low and uneven adoption of CPD policy and program opportunities results from a lack of government leadership related to both legislative requirements or incentives to engage in on-going CPD, low levels of compliance audits or repercussions linked to enforcement and non-compliance. In addition, currently there is no long-term policy driving the transition to a low carbon built environment in Australia.

2. **Synchronicity Deficits: Industry fragmentation and disjointed CPD**

   The literature identified CPD policy and programmes lack both synchronicity and alignment which has led to *ad hoc* CPD programs and disorganised training and skill development processes across the supply chain. This is particularly acute in relation to the built environment LCL sector where synchronicity deficits curtail the implementation and delivery of CPD programs by creating confusion within industry about the importance and prioritisation of carbon reduction opportunities, terminology, application methods, product selection, etc. This confusion as lead to missed opportunities due to uncertainty about product selection and implementation methods.

3. **Collaboration: Low level of research cooperation, communication and implementation of findings**

   Although extensive research is being conducted in key built environment areas, poor communication within and between universities and research institutions, industry groups, practitioners, and the general public is commonplace. The respondents indicated that these communication issues arise from: the complexity of the language used by academics; limited sharing of data or findings in formats accessible to industry or the general public and even between research groups; very limited, if any, uptake by industry, practitioners or government policy makers of research findings; and slow to develop partnerships between these key groups due to frequent staff changes limiting the development and implementation of collaborative projects.

4. **Engagement and Adaptation: Inadequate industry engagement and human capital adaptation**

   Australia's workforce is seen as highly skilled by international standards. However, much more needs to be done to enable the workforce to adapt to present and future opportunities and challenges. As new technologies have emerged and continue to be developed and introduced, the need for carefully integrated planned training and re-training programs is required.

Leading up to the Forum the theme 'Government Leadership and Adequate Long Term Policy' had not been identified as a strong theme. However, it did emerge as the most significant due to the present absence of national and state government policies and programs as identified in the desktop research and interviews.

Leadership: Inadequate leadership and long-term government policy

In the past, a number of Commonwealth, State and Territory policies and programs were aimed at improving occupational standards, educator upskilling, workforce upskilling, resource development and sharing. However, it is currently unclear what was specifically or is still being funded as part of government policies and programs. In particular, further information needs to be collected and analysed based on the outcomes, evaluations and efficacy of these policies and programs.

The impediments identified relate to long-term policy, inadequate industry engagement and the resulting issues within the built environment are highlighted in Table 4 and explored in this and the next section.

Indeed, the only relevant CPD program developed with support from the Australian Government is the NatHERS Cert IV qualification, although for many individuals it may be the first qualification attained. Additional support provided by the Australian Government is the Energy Efficiency Exchange website, but it only provides information to enable sharing of energy efficiency practices within medium and high energy-using companies, including best-practice information on energy efficiency, case studies and resource materials from Australia and overseas.

Table 4: Adequate Long Term Policy, Industry Engagement and Human Capital Adaptation Issues

Impediments	Resulting Issues
A lack of long term properly resourced policy and programs to support CPD. Minimal legislation related to CPD requirements. Low level of requirements for CPD to contribute to carbon and energy reductions. Limited mutual recognition of program providers. A younger newly trained workforce. Skill shortages and a low level of human capital adaptation.	Low level of support, engagement and uptake of CPD to enable the workforce to efficiently transition to a low carbon built environment. Minimal, if any, implementation of new methods, products and technology, resulting in inadequate implementation into work practices. Opportunities being negated due to a lack of understanding of intent due to confusion in the market. Challenges traditional industry practice Workforce is unable to adapt to rapidly changing industry demands to respond to demand and prepare for the future. High research, development and delivery costs due to repetition, lost opportunities, integration issues resulting in an inadequate and fragmented industry wide approach.

Other CPD focused policy initiatives that are no longer supported to stimulate CPD are summarised in further detail. A Green Skills Agreement across all Australian and state and territory governments, employer and employee representatives, the VET sector, and many community organisations was signed in 2009. The aim of the agreement was to build the capacity of the VET sector by:

- Developing national standards in skills for sustainability within the requirements of the national regulatory framework
- Upskilling VET practitioners so they can provide effective training and facilitation in skills for sustainability
- Undertaking a strategic review of Training Packages (sets of nationally endorsed standards and qualifications for recognising and assessing people's skills) to embed sustainability knowledge, skills and principles
- Implementing a transition strategy to re-skill vulnerable workers.

Several programs were developed to meet these aims as noted previously. These include:

- *A National VET Sector Sustainability Action Plan* (NVSSAP) was developed in 2009.
- *A Skills for the Carbon Challenge* program provided national leadership in building the capacity of the tertiary education sector to supply the skills needed for workers and businesses to prosper in a low-carbon economy. Beginning in 2009, this involved:
    a) investing in research to develop a better understanding of the underlying skills issues associated with the transition to a
    b) low-carbon economy and appropriate responses
    c) presenting the Skills for Sustainability – Educational Institution Award to encourage excellence in the delivery of education and training for sustainability.
- *A Clean Energy and Other Skills Package* invested $32 million over 4 years to enable tradespeople and professionals in key industries to develop the skills needed to deliver clean energy services, products and advice to Australian communities and businesses.
- NWDF (2011-2014) was part of the Australian Government Skills Connect initiative aimed to assist employers to up-skill and re-skill their workers in areas of critical skills shortages. Although this was seen as a good model by industry and government, it was viewed as onerous and it is not clear that any programs funded were actually aligned with energy efficiency, lowering carbon or sustainability.

However, since late 2013, changes in government attitudes to energy efficiency, and carbon reduction are proving to be a strong disincentive. This includes:

- Ceasing all programs in the Green Skills Agreement and Implementation Plan and not publicly releasing the findings of an evaluation of it.
- Redirecting Workforce Development Funds to foundational skills and specific industry needs in priority areas.
- Excluding the built environment as a priority industry under the newly released Industry Skills Fund (Australian Government, 2015)

It is believed that the low and uneven adoption of CPD in energy efficiency and carbon reduction opportunities is a result of a lack of government leadership, compliance enforcement and long-term policy. Many of the issues discussed above would be diminished if effective regulation by government authorities were closely monitored and enforced. The authors of the NEEBP report argue that:

Overall, we formed the view that regulators tend to see energy efficiency aspects of the Code as relatively unimportant, and perhaps a distraction from more important matters. This may in turn reflect a consistent view that governments are uninterested in energy efficiency matters, combined with resource constraints. The predominant concern of the policy advisors appeared to be managing the overt opposition to higher standards (or other regulatory reforms) by industry groups, and the consequent lack of support for regulatory change from governments (p&s and SUT, 2014, p. 40).

At the state level, a building regulatory representative interviewed indicated "that CPD doesn't align with the organisation's current objectives and there are no incentives to engage in the costly exercise of developing, maintaining and offering CPD. CPD is in the interest of the industry and professional associations, not the regulators". However, another interviewee offered examples of "the most prominent non-compliance issues (p&s and SUT, 2014) that are occurring due to a lack of clear definitions of a 'healthy building', 'thermally broken' rather than 'thermally improved', testing metrics to determine the air changes per hour and the ability to identify the threshold to trigger mechanical ventilation as specified in the NCC due to a lack of practitioner understanding of the regulatory requirements and associated definitions".

In consideration of Australia's built environment future skills needs and CPD opportunities, a key interviewee stated that, "there is confusion across government departments on the acquisition of data to determine skills shortages. There are currently three different sets of skills shortage lists being used by the Department of Immigration, the Commonwealth Department of Industry and the Industry Skills Councils (RP3015 Interview, 2015)." Fien and Guevara (2014) argue that a limitation faced by the education sector is the ability to understand the skill requirements of occupations in industry resulting from, "the ongoing environmental changes and the evolving nature of green technology and practice, as described in the context of transition, will need to be met with urgent yet appropriate skills development responses informed by an inherent ability to utilise a combination of qualitative and quantitative data for skills forecasting (Fien and Guevara, 2014, p. 16)."

Synchronicity Deficits: Industry fragmentation and disjointed CPD

One factor behind such perceptions is industry and professional segregation, which restricts practitioners in the built environment from engaging in training with practitioners from across the supply chain that may otherwise stimulate innovation and achievement of energy efficiency opportunities. Table 5 describes the impediments identified and the resulting issues due to industry fragmentation.

As previously identified, a number of reports have highlighted the ad hoc and disorganised nature of BE CPD. Occupational standards are believed to drive industry segregation, whereas education policy and programs could be used to minimise the fragmentation using collective policies and programs. This is particularly acute in relation to the built environment LCL sector where synchronicity deficits impact negatively on the implementation of methods gained through CPD.

As one interviewee stated, *"An overarching issue and major shortcoming has been that the building industry sector has over the decades evolved in a fragmented way, in which many of its key industry agents operate in a 'siloed' cultural setting. This has given rise to a proliferation of training and retraining courses that lack coordination and continuity, thus posing a major coordination challenge for industry and educational providers."*

Table 5: Industry Fragmentation Issues

Impediment	Resulting Issues
Siloed cultural paradigm	Education programs developed ad hoc in a fragmented and disjointed manner
No national CPD framework and skills sets to support green skills	Incoherent and uncoordinated educational policy framework
No national or industry wide policy, action plan, provision or recognition of CPD.	Low success in achieving opportunities to reduce energy and carbon due to workforce confusion based on: • Language inconsistency, • Conflicting prioritisation of opportunities • Opportunities being negated due to a lack of knowledge, experience and understanding of the intent.
Disjointed policy and programs within professional and industry associations	Industry fragmentation & disaggregated CPD with uncoordinated and disjointed training courses
Disaggregation: Sub-sector specific programs are disconnected from the whole building process	Low understanding of what green skills are and how they could benefit practitioners
Lack of communication and coordination between agents	Unnecessary duplication of effort and inefficiencies.
A lack of consistency across the built environment	
Inefficient education provision and program availability to transition to LCL future.	

In general, the CPD providers interviewed indicated that cooperation with other providers to support integrated CPD is likely to diminish their market share of CPD products. This derives from members being loyal to the organisation given the need for CPD engagement to support membership and professional standing. A few of the interviewees indicated that they prioritise their members' interests and market survival over those of the wider BE industry.

However, these same interviewees indicated improved CPD alignment with other industry providers through common recognition of CPD programs would be supported through sharing program content and delivery modes to benefit the industry as a whole. Thus, a synchronised model of CPD could lead to benefits for industry and professional associations and practitioners in the form of:

1. Reduced content development and delivery costs
2. Reduced consumer transaction costs
3. Increased information sharing and transparency of industry priorities and role expectations aligned with green buildings

The end result is that there is no encompassing source of foundational information within which policies, programs and resources can be anchored and aligned to enable implementation across the sector to enable efficacy between all job roles. The sector also requires a shared language and coordinated systems to enable effective communication and assessment of opportunities and prioritisation of strategies and methods.

Collaboration: Low level of research cooperation, communication and implementation of findings

Although extensive research is being conducted in key built environment areas, the view is that little is communicated both within universities and research institutions and externally to industry groups, practitioners, and the general public. While there are examples of research co-operation between industry and the University sector, such as the CRC for LCL, more action

is required to improve the transfer of research outcomes into the market. Current impediments in this area include:

- A lack of the type of applied research that can build industry trust;
- Limited communication about research findings, outcomes, opportunities, and transferability to industry; and
- Insufficient uptake of findings

In particular, research is needed to determine the ways in which skills development can effect labour efficiency improvements to underpin CPD in the built environment. Such cooperation will not only improve workforce skill and expertise, but also but also bring a competitive edge for the Australian industry in local and international markets. As Fien and Winfree (2012) argue:

Australia's international reputation for excellence for construction products and services is dependent on the tertiary education sector being an integral component of the overall system. This includes both the vocational training and higher education sectors. The Australian research, education and training sectors, as well as government and industry groups have an opportunity to collaborate to move the construction sector into a productive and sustainable future as a global leader based on an integrated approach. Australia must support a consistent approach to education and workforce development to ensure seamless delivery of future training needs (p. 16).

Engagement and Adaptation: Inadequate industry engagement & human capital adaptation

As identified in section 1, the government led and collaborative government and industry led policies and programs no longer support industry led CPD aimed at low carbon living. Therefore, Australian professional, building and trade CPD policies and programs are most often managed by a professional groups or industry associations to support membership, accreditation or professional standing (see section 2.2 CPD Incentives: Professional Standing). Due to the CPD market being highly competitive, some practitioners and industry stakeholders perceive the government licensing or industry accreditation requirements driving engagement in CPD simply as moneymaking scheme resulting in relatively low levels of implementation or changed practices in the industry. As Antoniades and Algeo (2012) state, "the richness of the CPD must ensure that education is not just a mass production of accumulated hours or points to satisfy merely the licensing requirements (p. 6388)".

Based on the ongoing review and continuous improvement of VET, including the integration of sustainability and energy efficiency into core curriculum for newly emerging apprentices or those attaining a higher qualification such as a Certificate IV or Diploma over the last decade there is an industry perception that the new methods are challenging traditional practice. This challenge is in part due to a lack of or inadequate industry engagement for practitioners who have little or no CPD incentives, which mainly occurs at the trade or post Certificate III level. However, the collaborative Plumbing Industry Climate Action Centre initiative supported by the Plumbing Trades Employees Union, Master Plumbers and Mechanical Services Association of Australia, National Fire Industry Association, Air Conditioning and Mechanical Contractors Association, United Association and Plumbing Joint Training Fund engages not only industry practitioners and the public, but in the last few years has begun working closely with RTOs to ensure apprentices have the same training as existing industry practitioners minimising occupational discrepancies.

As new technologies emerge, evolve and are therefore introduced, there is likely to be an increasing need for synced training and re-training programs. While Australia's workforce is highly skilled by international standards, much needs to be done to enable the workforce to readily adapt to future opportunities. A highly skilled workforce should be able to adapt to the introduction and development of new technologies. For example, twenty highly skilled, but redundant, car industry engineers, designers and managers have been employed by the Melbourne-based Hickory Group to work on the design and manufacture of prefabricated commercial buildings and components for residential buildings (The Australian, 2014). The industry will also continue to experience strong levels of skill shortages resulting from an ageing population and workers moving to other industry sectors further increasing the requirements for rapid deployment of job ready practitioners that continue to build skills and advance knowledge over time while working.

Conclusion

The strong impediments to CPD and the weak incentives has resulted in a lack of engagement in CPD, which has major impacts industry wide. These include irregularities, mismatches and asymmetries leading to the rise of a variety of substantial industry wide costs. These costs fall into three main categories (Hirschey, 2009, p. 715):

- productivity,
- efficiency costs, and
- transaction costs.

These costs include coordinating expenses, legal costs, poor workmanship costs arising as a result of deficient and poor training, project completion delays, lack of consistent regulatory practices costs and other related expensive productivity costs (Pitt and Sherry, 2014). One such source of costs in LCL occur when the standard of work is questionable, potentially defective or not quite meeting the owner's expectations. In the 2011-2012 financial year there were 4,726 complaints made to the Queensland Building Services Authority (BSA) for defective or in-complete works (Levy, 2014). The issue of poor workmanship has a negative impact on both project completion and increasing efficiency and transaction costs. For example, work by Love (2002) found that rework resulting from poor workmanship "… contributed to 52% of a project's cost growth and that 26% of the variance in cost growth was attributable to changes due to direct rework" (p. 18).

One way of responding to this challenge is by upgrading and updating national qualifications and educational programs in vocational and higher education. Although education is only one response option, it is imperative to respond to the three identified by Dalton et al. (2011) as major labour market bottlenecks in the housing sector:

- Worker supply shortages in the housing sector labour force are associated with the national resources sector employment and the broader construction industry and are compounded by a persistent gender imbalance that effectively excludes a large potential workforce.
- Skill levels and their utilisation vary across the housing sector labour force, as within the broader construction industry, and this has implications for quality and productivity of housing production. The availability of skilled workers is associated with the structure of work and the way labour is utilised within the industry.
- A major long-term education and training issue has been the high proportion of apprentices that do not complete their apprenticeship. This is associated with a lack of appropriate supervision in the workplace, poor training, bullying and abuse and low wages. There is also evidence of low levels of investment in continuing workplace training (p. 59).

To tackle these bottlenecks, strong leadership from government, industry and the education sector is required. As BEIIC (2012) proposes:

Australia's built environment must be seen as the 'lead customer' for design-driven innovation in products, materials, technologies and services. This embraces the fields of graphic, fashion, industrial and digital design (interaction and user experience), as much as the core built environment skills of architecture and urban design, landscape architecture, engineering and town planning (p. 9).

Although, enforcement with regulatory requirements is necessary, at a minimum CPD provision should enable practitioners to comply with these regulations, standards or meet targets aligned to policy. Therefore, the existing workforce requires the capacity to:

1. Understand what is being required based on compliance;
2. Be informed about the best methods and the evidence to fulfil the requirement(s);
3. Be offered flexibility and resources to innovate to meet the demand;
4. Be supported with communication and dissemination of information about new methods, products or technology on a common platform for continuous improvement;
5. Be monitored and supported by experts to minimise poor practice and liabilities associated with practices, products and technology; and
6. Be provided constructive feedback mechanisms to improve the policy, programs and implementation methods over time.

Section 3 presents case studies of international policy and the CPD programs that help job creation, carbon reduction and economic stimulus in an effort to draw attention to the implications for Australia.

3 INTERNATIONAL POLICIES

Introduction

The Australian built environment is influenced by national and international policy and industry practices which arise out of exchanges driven by globalisation. Many local businesses are linked to international companies, products and pre-fabricated materials as well as government policies that arise out of trade agreements, best practice strategies, and political agreements. One of the most recent examples is the potential impact the recent U.S. – China Joint Announcement on Climate Change (The White House, 2014) focusing of collaboratively advancing research, innovation and education programs might have on the Australian built environment.

Other countries are also facing built environment education challenges with many lessons to be learnt from international examples. The case studies present examples of government and industry educational policy aligned with energy efficiency and carbon emissions reductions in the built environment. Four international case studies with partial reference to the low carbon policy challenges identified in Australia are:

1. The South African Council for the Built Environment Act;
2. German Energy Council – DENA;
3. United States Department of Energy's Office of Energy Efficiency and Renewable Energy; and
4. Lessons from Alternative European Union Policy Methods.

Appendix B presents the full cases, while Table 6 highlights the key points.

Implications

Australian requires long-term policy responses based upon a spirit of cooperation, dialogue and experimentation based on achievable long-term positive and adaptable policies. As highlighted in Case Study 2, Germany's experience indicates various opportunities for Australia, including:

- *The three pillars approach - a clear legal framework; strong subsidy and loan programs; and promotional information advice and support; …*
- *Public policies aim to refurbish the entire housing stock and all public buildings in Germany by 2030;*
- *Energy savings targets are aggressive with respect to both new and existing homes and inspire innovation in energy technologies and building practices;…*
- *DENA's extensive access to experts, including architects, planners, researchers, increases its influence on clients. The agency's guidance and expertise reach a very large audience via local agencies.*

The multidisciplinary nature of projects in the built environment requires design, construction and facilities management experts to work closely together to meet the challenges posed by a low carbon future. This is similar to the challenges faced by the health sector where the high degree of medical specialisation generates competing priorities and power differentials often undermining effective treatment. Thus, Newhouse and Spring (2010, p. 9) argue that:

"the professions need to learn to communicate, understand each other's language, ideally develop a shared language, and learn to coordinate their actions as a team. As we move forward, power differentials typically encountered in organizational life will proliferate, requiring support from national and organizational leadership to set expectations for the various disciplines to work together".

The evidence-based behavioural practice (EBBP) from Case Study 4 is based on the transdisciplinary model of EBBP could enable a more efficient method of collaboration across the built environment supply chain by incorporating shared decision making into planning and construction processes. As such, the EU peer learning activities (PLAs) method described in Case Study 4 could contribute to the development of a long-term built environment vision that ensures continuity of foresight, collaboration and commitment from government and industry groups. Such a set of policy responses would create a climate of certainty and confidence for the future of the industry.

However, at this time, Australia lacks a government legislated or voluntary built environment council with the proper resources to lead and implement CPD policy or programs through industry and government collaboration. An adequately resourced group with representation from across the built environment including practitioners, researchers, educators and policy makers could lead to the identification of cross-sectorial priorities and opportunities. As a matter of priority, the group could aim to reduce the current industry segregation, improving the industry's professionalism, education provision, sustainability initiatives while focusing on consumer awareness and protection to improve the quality of the built environment in Australia.

In an effort to develop a shared leadership model as described in Case Study 1, an Australian built environment council should also consider inclusion of representatives from planning, design, specialist trades (i.e. energy/sustainability contractors and assessors, mechanical service engineers) and facilities managers, unlike the South African model. These roles can have significant positive impacts on energy efficiency and carbon abatement.

The section on responses in the Table 6 are a summary of the response these governments are making to the challenges faced in the built environment.

Key messages include:

- *Provision of qualified expert advice so that work is carried out to a high standard and promised energy gains are achieved*
- *Adoption of a "whole house" approach to energy saving…so people can prioritize and plan; …*
- *Development of new ideas through pilots and models, as this allows for experimentation and innovation in the public eye. In particular, apply retrofit methods to public buildings such as schools, nurseries, and children's centres, which can also provide educational benefits;*
- *Changing attitudes and behaviours, which is almost as important as, retrofit measures (Power and Zulauf, 2011, p.13-14).*

Only marginally similar to Australia's National Strategy for Energy Efficiency, Case Study 3 from the USA highlights the benefits of a long-term centrally managed national energy policy. However, the USA policy and programs are much more robust, suitably resourced, managed and integrated with other national agencies including support from key industry groups. This policy is implemented through a set of collaborative industry, government and community led programs. It is underpinned by a number of other key government agencies and industry partners to ensure they are monitored for future improvements and regularly communicated to industry and community stakeholders linked to:

- building codes,
- research and education,
- the environment, energy efficiency and energy independence,
- the economy and market competition and
- the general public.

The American case study indicates that a complex set of integrated policy and implementation programs aimed at numerous stakeholders is required. Key stakeholder groups must collaborate together to drive the required changes in the industry through shared leadership with government by taking responsibility for various components of the whole policy approach.

Table 6: International Case Study Overview: Built Environment Challenges and Responses

Case Study 1: South African Council for the Built Environment

Challenges	Responses
South Africa's challenges are: • human capacity building and skills development is a critical factor; • no clear government agency responsible for energy efficiency; • energy efficiency is crowded out by more pressing needs; • long-term environmental needs don't align with short political planning time-frames; • a lack of technical proficiency and a lack of public awareness; • high up-front & technology costs and weak incentives; and • a lack of applicable building codes (only a voluntary standard currently).	In response to these impediments, the South African Parliament passed the Council for the Built Environment Act in 2000 based on the Greenhouse Gas Mitigation Support Strategies in the Building Sector. The set of policy guidelines underpin the continuous professional development and the accreditation of built environment programmes. The policy guidelines set out principles and practices of sustainable development and greenhouse gas (ghg) mitigations strategies and implementation measures to incorporate into the building sector.

Case Study 2: German Energy Agency – DENA

Challenges	Responses
Germany's challenges are: • 75 percent (29 million) of homes were constructed before 1979; • 9 million have been retrofitted to high energy-efficiency standards; • 80 percent or roughly 20 million homes still require refurbishments; • The current rate of refurbishments is around 200,000 buildings a year; and • To complete the refurbishment process by 2030 the rate or refurbishments needs to double.	In response to this challenge, DENA tests and implements innovative projects and campaigns at the national and international levels on energy saving. DENA's five activities are: • Information and motivational campaigns to stimulate demand and spread information; • [CPD] Training experts (engineers, architects, craftsmen) document evidence and techniques, organize events, and maintain online databanks in new energy saving skills: o measures to achieve target energy efficiency levels in different buildings; o refurbishment of rented homes; and o best practices for residential and non-residential buildings (new and existing) • Increasing transparency in all energy standards and certification (e.g., validated Energy Performance Certificates (EPC), a voluntary Quality Mark, Energy Efficient Building Displays) • Developing and promoting model projects to demonstrate quality standards, implement best practice, and develop regional know-how • Simplifying methods and increasing the reliability of renovation."

Case Study 3: United States Department of Energy, Office of Energy Efficiency and Renewable Energy

Challenges	Responses
America's challenges are: • Energy dependency and greenhouse gas emissions; • Decentralised regulatory systems; • Ineffective career advisement, job connections and building block pathways from primary school to post-secondary qualifications; • The current job market; • Implementation of continual research, development and application of new methods, products and technology in a diverse range of settings; and • Rapid diffusion of information, methods, and products based on evidence based research.	The American policy initiatives led by the United States Department of Energy's Office of Energy Efficiency and Renewable Energy support a national, distributed, self-organising system that is anchored in effective policy and programs. These were established through collaboration, coordination and communication with industry and professional groups and local government agencies, specifically: • Building codes increasing the stringency through collaborations across government agencies; • Ongoing support for national research centres; • Industry led strategies supporting standards, guidelines with feedback loops and monitoring systems (i.e.) through joint initiatives; • Freely available information and support resources for all the various climates and regions or strategies derived from evidence based research; • Practitioner education or CPD - independently delivered and accredited supported by mutual recognition of participation; and • The policy and programs are stimulated by continuous evaluation of outcomes, monitoring and communication to partners and the general public.

Case Study 4: Alternative Policy Methods

Challenges	Responses
The European Union (EU) requires: • policy transparency and accountability based on broad, • generic regulatory processes and • targets to support trust-based environmental regulations The EU has a diverse range of autonomous governments centrally working to achieve similar goals across the EU. From a policy perspective the impediments are: • Ineffective policy implementation • Lack of trust based regulations and policy accountability and transparency • A diverse range of settings	The EU has developed new forms of governance to support joint working between governments, business and stake-holders and minimising traditional hierarchical command and control regulations. The European Commission, Directorate-General describe one of the new methods for Education and Culture as peer learning activities (PLAs) which are being used in the context of the Education and Training 2010 work programme. Another alternative method is evidence-based behavioural practice (EBBP) based on the transdisciplinary model of EBP, which reflects shared decision-making among stakeholders such as the community, practitioners, patients, and researchers. It is an interdisciplinary conceptual model commissioned by the National Institutes of Health Office of Behavioural and Social Science Research.

However, as Power and Zulauf (2011, p. 13-14) have indicated, there are also risks when considering the adoption and transfer of these strategies to other countries. In particular, the considerations for Australia include:

- *The German legal framework for energy efficiency buildings is complex, requiring considerable support and strong enforcement; …*
- *Few grasp the whole national picture because of Germany's highly decentralized system and regional variations;*
- *Frequent new developments require energy advisers to translate information for public understanding and action. DENA's aim is to summarize, simplify and standardize this process…*

Conclusion

There are many implications for Australia from international case studies profiled. However, leading built environment organisations, CPD providers, research institutions and government policy advisors require the development of a well-resourced complete policy package. The complex policy package needs to include aspects related to research, education, compliance, monitoring, feedback loops and communications supported by industry and government with continuous communication to the general public. Section 4 describes the response options required to harness the potential incentives and improve the current market to overcome the Australian challenges to effective low carbon built environment education.

4 RESPONSE OPTIONS

Introduction

The outcomes of this project include the development of an advice framework and recommendations for industry and government policy advisors to facilitate CPD to foster a low carbon built environment in Australia. The framework aims to stimulate further discussion and to initiate collaborative opportunities to support a long-term integrated CPD policy package and supporting programs. The advice is aimed at professionalising the industry and enabling the wider adoption and implementation of energy efficiency and carbon reduction opportunities based on a common education framework, communication between researchers, policy makers, educators and key industry stakeholders and groups.

This section offers a set of response options that have the potential to cultivate an integrated built environment workforce with synchronised specialist knowledge and skills to foster innovation and excellence for high performance buildings through continuing professional development in Australia. As Andrew McAfee states in his TED2013 talk, What will future jobs look like? (Feb 2013),

"[The future] gives us a chance to imagine an entirely different kind of society, a society where the creators and the discovers and the performers and the innovators come together with their patrons and their financiers to talk about issues, entertain, enlighten, provoke each other…We are seeing an amazing flourishing taking place. In a world where it is just about as easy to generate an object as it is to print a document, we have amazing new possibilities. The people who used to be craftsmen and hobbyists are now makers, and they're responsible for massive amounts of innovation. And artists who were formerly constrained can now do things that were never, ever possible for them before."

The policy and programs require:

- flexibility enabling rapid implementation;
- monitoring and continuous improvement through real time monitoring; and
- ongoing feedback and communication strategies suited to a wide range of audiences.

In addition, the policy programs need to foster general awareness, generic cross cutting built environment skills, knowledge and collaborative action, as well as specialised skills and knowledge in key opportunities areas. The recently released National Energy Efficient Building Project report recommendations are very similar. The report indicates that the built environment workforce requires policy mechanisms aligned with:

- 'Being clear what is at stake' by identifying and communicating the benefits "associated with effective building energy performance policy, regulatory and knowledge management frameworks regulation, and what costs are associated with ineffective frameworks (p&s and Swinburne, 2014, p. xxii)".
- 'Getting the incentives right' by ensuring the incentives align to the intended outcomes, being low carbon buildings not purely focused on minimum compliance, but best practice and continuous improvement fostering a culture of excellence (p. xxiii).
- 'Delivering quality outcomes' across the supply chain by enabling practitioners to access the right knowledge and CPD and be provided tools and product information to enable effective decision making, communication and integration of best practice into day to day work practices (p. xxiii).
- Continuous feedback loops through evaluation and communication of the CPD policy and other complementary stimulus.

Policy makers, regulators and industry leaders have a responsibility to take the necessary steps to ensure industry practitioners, government advisors and consumers are provided integrated information, support, protection and open methods for feedback. Stakeholders need to fully understand the policy and program system(s), specifically:

- To be clearly informed, understand and have the ability to implement the policy or regulatory requirements, comply with the requirements, and be fully aware of the consequences for non-compliance;
- To receive communication about how the policy and programs are being managed and monitored and the expected outcome(s);
- To have access to and the ability to access trusted support resources to enable change (information, research outcomes, expertise, technology and financial support);
- A full understanding of why the policy and programs are in place using simple public awareness campaigns such as how the objectives are being met, the evaluation methods and metrics and the methods used to develop new policy or programs and the next steps over a long period of time.
- Feedback and continuous improvement loops to manage and resolve disputes, develop new methods, technology, policies or programs aimed at specific key areas, such as practitioners, government advisors, researchers or the general public.

The Advice Framework summarised in Table 7, gives an indication of the response options for CPD in response to the identified policy impediments, opportunities, the required enablers, a proposed timeframe and the potential benefits based on these strategies. The supporting mechanisms aim to enable ongoing oversight, evaluation and feedback for continuous engagement and progress toward a low carbon built environment.

The four recommendations are:

1. Sharing Leadership: Industry and government driving national capacity building;
2. Bridging the Divides: Research, CPD and policy programs;
3. Integrating CPD: Enabling the development and coordination of integrated CPD programs; and
4. Preparing the Workforce: Enabling a flexible and responsive education system.

Support Mechanisms

A key driver for CPD is consumer demand; therefore, a public communication plan should be a key inclusion in an education policy. For example, during times of drought CPD for builders and trades increased dramatically as the demand for water saving products increased. However, energy saving, renewables and energy efficiency has yet to initiate the same level of demand for CPD. In South Africa, the nightly news updates the public on the energy supply similar to Australia's dam capacity that aims to raise awareness about the need for water conservation measures. Public energy monitoring could be used similarly in an effort to minimise peak consumption and communicate the importance of energy conservation to the public.

The public and the workforce must be engaged and prepared to enable the Australian built environment to transition to a low carbon future:

- the impediments must be addressed to enable engagement in CPD;
- additional incentives are required and must be tailored specifically to individual segments of the workforce; and
- the policy package must be complemented by a number of additional regulatory and demand driven stimulus in other sectors and within the general public.

1 Sharing Leadership: Industry and government fostering national capacity building

The current CRC LCL members, plus additional peak bodies and groups, have the potential to develop a legacy body to foster applied research and education for the built environment industry. This one-stop-shop should create linkages between industry, research, vocational, university and continuing education or CPD to engage the Australian built environment workforce.

Prior to establishing this group, one key action would be to using the CRC LCL partnerships to establish an industry wide built environment education framework based on existing programs and low carbon living research outcomes, see Recc. 2. Once the framework is established, implementation programs, monitoring and continuous improvement systems and an ongoing communication strategy to suit a diverse set of stakeholders including the general public will need to be developed, see Recc 3 and 4. If successful, a business case for continuation beyond the life of the CRC would be required.

The first priority, to establish a business case, would determine the underpinning resources required to enable and ensure ongoing support in partnership with government, but identifying ways to reduce the ongoing need for government funding. The group would need to establish a clear set of policy objectives for long term, including implementation programs, monitoring and continuous improvement systems (feedback loops) and an ongoing communication strategy to suit a diverse set of stakeholders including the general public.

Alternatively, without support from the CRC LCL, a built environment centre of excellence with a focus on industry continuing education and applied research would be a worthwhile pursuit for a collective group made up of government, research, industry and educational representatives, as well as the general public.

In an effort to bring stakeholders together, an opportunity presents to strengthen the partnerships already in operation through CRC LCL leadership to foster a productive and innovative low carbon future for the industry. A number of opportunities are available to respond to the current challenges with the most widely recommended one being the development of a national industry and government led research and education council for the built environment.

The first priority being to establish the business case for a national built environment research and education council based on a clear set of policy objectives to determine the financial, technological and human resources required to foster a long term set of policies, implementation programs, monitoring and continuous improvement systems and an ongoing communication strategy to suit a diverse set of stakeholders including the general public.

This council would ideally be established with matched funding resourced from government, private investment and industry levies for the first few years as highlighted by the BEIIC (2012). HIA has also indicated on the HIA website under 'Policy Position on CPD (2014)', that "HIA shall continue to support the need for training in the housing industry - both entry level training and ongoing professional development. HIA shall not oppose training levies and will work positively and co-operatively with Governments and levy bodies provided that a number of key criteria are met."

The establishment of a built environment education council would benefit from participation of representatives, not only from industry and professional associations requiring CPD, but other levels of education provision (vocational and higher education), being researchers, government regulators and policy advisors, financiers (leading investment banks, the Clean Energy Finance Corporation) and leading groups stimulating innovation and entrepreneurship, such as the Energy Efficiency Council, ASBEC, CRC LCL, etc.

The council with representatives from each sector could potentially lead the development of a long-term continuing education policy using PLA methods to contribute to Australia's transition to a low carbon society through collaborative leadership. The policy requires achievable targets though collaborative industry and government responsibilities and contributions. A combination of methods need to be utilised to foster policy design, tools and implementation is to use the EU PLA methods to explore a model proposed by Fien and Guevara (2012) to co-create policy options. They propose a strategic framework that could assist in developing innovative sector skill strategies, recommendations and guidelines to boost employment and skills in growth industries, including for green skills and jobs. The framework is based "on the argument that Greening Skills for a Greening Economy is an on-going process that is driven by a dramatic change in the global context, in particular in the spheres of the economy and the environment, and eventually the social sphere" (p. 2). This model is represented in Figure 1.

The model in Figure 1, encapsulates Clemans and Guevara's (2013) idea that green skills may be adapted into a solution to a current industry setback or difficulty and thus can be transformed into an on-going process of engagement. To this end, it is possible to respond to new industry opportunities arising out of a context of continuous change. Thus, the model proposed in Figure 1 attempt to generate change in an industry that depends on new ideas and ways of doing things (p.36).

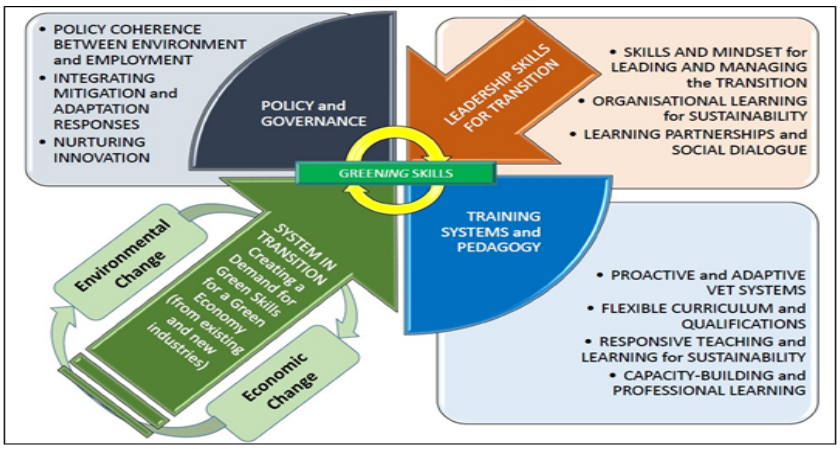


Figure 1: Strategic Framework: Greening Skills for a Greening Economy

(Source: Fien and Guevara (2012, p. 7)

2 Bridging the Divides: Research, CPD and policy programs

As part of a shared leadership model, a representative body for the Australian built environment could be established or benefit from an education policy working group with industrial, governmental, research and educational representatives. This group could jointly oversee the development, monitoring, evaluation and communication of a set of education policy objectives, including setting targets and accreditation methods to communicate achievements to practitioners, government and the general public during an initial two-day workshop.

In order to achieve this, the industry requires the formation of a collaborative culture with key industry representative that can serve as a model to other industry sectors requiring a new way of operating and doing business potentially through action learning methods similar to PLAs. Such cooperation may smooth the path for knowledge transfers and efficiency gains not only within the industry, but also across different industry sectors.

Ideally, the workshop would be facilitated using the PLAs methods described in the section on International Case Studies. The stakeholders would need to be briefed accordingly to determine the most effective transdisciplinary methods to transition Australian's built environment to a LCL future. Regardless of the facilitation methods, the agenda needs to include the establishment of effective communities of practice using peer learning activities (PLAs) to continue to engage representatives from key research organisations, industry groups, education, government, practitioner representative groups, policy makers and the wider public in a set of ongoing programs to facilitate and update the required changes to stimulate future engagement in CPD activities.

The policy programs should also consider implementation of the opportunities set out in the 2013 ASBEC Skills Collaboration Framework, the 2012 BEIIC National Industry Education and Training Action Plan, the CRC LCL Education Scoping Study findings and the recommendations in this report, all of which set our response options to the current Australian industry needs.

Overall, the key priorities are:

1. The process needs to begin with the development of a stakeholder brief using PLAs methods to determine the most effective transdisciplinary methods to support an industry transition. In an effort to transition the Australian built environment to a LCL future through applied research and education, the first step is to hold a two-day workshop. The workshop should include a diverse group of industry representatives and be facilitated using the peer learning activities (PLAs) methods to develop complementary policies, frameworks and programs based on the key report findings and other key industry recommendations.
2. Survey peak bodies to see what they currently have in place and then ask if they would collaborate and partner to initiate projects to:
   a) Collectively identify the core competencies, language and key priority areas required for the sector similar to the national education / qualifications framework and national licensing
   b) Identify the sub-sector specific and specialist competencies, knowledge, skill sets and priorities areas to contribute expertise based on specific for contractors and professionals across the whole building cycle from planning to facilities management or regional climatic variation
   c) Identify multidisciplinary target audiences based on themes or specialised knowledge or skills sets
   d) Develop content in packages to suit various audiences such as face to face or virtual classroom, on demand videos or tutorials, or on the job site information sessions or workshops
3. Establish an industry and government partnership to form an Education Advisory Group to develop a partnerships to support the development and implementation of
   a) Upgrading and updating of the education programs in primary, secondary, vocational and higher education based on current industry based CPD for continuous improvement.
   b) Promote industry pathways to contribute to an innovative culture of excellence in the Australian built environment highlighting opportunities to build on existing skills and mentoring of others.

c) Professionally recognise groups based on areas of expertise similar to a Green Guild (See Theme 3: Research cooperation and implementation) from a centralise group, but with industry group-based autonomy.

4. Create and industry portal and develop communication strategies to market these new industry and government led policy programs. Communication plans should ensure educational themes are communicated to support these to dovetail into tertiary education (vocational and university level) and vice versa.

5. Enable effective communities of practice using PLAs to engage researchers, key industry groups, practitioners, government, alumni and the wider public through:

   a) Vocational and University led CPD based on the frameworks established, but suited to regional and sub-sector needs;

   b) Updates about current or ongoing research to connect people for collaborations including applied research or 'living labs' which could continue to be used for education and CPD programs;

   c) Presentation of research and report findings for mixed groups within and from outside the institutions and industry practitioners; and Public engagement to promote technology, products and innovation for new and renovations of commercial and residential buildings and public spaces, based on research evidence

3 Integrating CPD: Enabling the development and coordination of integrated CPD programs

As a continuation of response options 1 and 2, response option 3 aims to foster industry capacity, reduce market competition, minimise inconsistencies and inefficiencies. This response was identified by key stakeholders to support resource sharing and program delivery in response to the current ad hoc nature of green skills programs to develop and deliver nationally integrated CPD across the built environment supply chain. In addition, the aim is focused on sharing resources and program delivery to benefit industry associations by improving efficiencies and freeing up time and resources to direct toward other member priorities. However, the resources and programs would need to be reviewed and endorsed by each association to enable branding and promotion to members.

The first step is to initiate an industry wide built environment project to work jointly with key industry groups as part of response option two in an effort to establish a set of built environment education competencies and implementation policies over a two day workshop. The competencies should be both generic and specialized and include the prioritisation of opportunities to minimise duplication and support mutual recognition of CPD programs by establishing a Low Carbon Knowledge and Skills (K&S) Taxonomy.

The potential project tasks required are:

1. ***K&S Taxonomy:*** Identify and define the K&S in detail.

   a) The universal core foundational competencies, principles, terms and definitions required by all practitioners in the built environment supply chain at the various levels from trade to professional.

   b) The specific specialised knowledge and skill sets and principles needed for each specialty trade or profession in the built environment cycle.

   c) The advanced skills sets required by experts in the industry, being those who lead project, consult as experts, delivery training to industry or advice to government.

2. ***CPD Module Matrix:*** Create a set of industry wide CPD modules similar to the Sustainability Curriculum Framework developed in 2010 by the Cwlth Department of Environment, Water, Heritage and Arts for K-12 recognising beginners, intermediate and advanced levels of knowledge, action and repertoires of practice and to recognise levels of expertise and specialisations but support the 'council' of industry and professional associations to deliver the training programs. Prioritise the key areas identified by the McKinsey & Company Australian Cost Curve for Greenhouse Gas (ClimateWorks Australia), specifically CPD to support:

   a) Foundational crosscutting principles and practices through mixed practitioner based training and mentoring.

   b) Specialised modules of information and training based on the specialist knowledge, skills and practices required to contribute to energy and carbon reduction originating from a set of agreed principles and priorities for the built environment but specific to individual job roles.

3. ***Provide alternatives to formal training and CPD:*** NOTE: Most professionals and trades will need a blended practical and theoretical approach and integrated application into work practices. Enable self-regulating competence based on experience and application in day-to-day practices similar, but less onerous than vocational Recognition of Prior Learning (RPL).

4. ***Share resources:*** Pool resources to improve technical and service efficiency within industry and education sector. Through the same partnerships, collectively establish a pool of resources (information, technological and human) available to industry and the public to enable transparency, consistency and to minimize expenditure and revisions by ensuring industry currency.

   a) Information: Support resources by promoting them freely through a just in time application of information, demonstrations with links to further experts and CPD training opportunities.

   b) Human capital: Identify the qualified experts or a plan to develop the capacity to deliver the training modules to mixed groups of practitioners in a session together in the immediate future. Then establish a pool of trainers, speakers and facilitators to enable consistency of language, communication, priority opportunities, strategies and training delivery promoted through individual industry and professional associations. Then identify and promote the qualified experts available to deliver the training and a plan to develop the capacity to deliver the training in the near future based on any identified gaps in expertise.

   c) Resource the delivery of cross industry training to enable communication and coordination between agents.

d) Mixed training: Coordinate and deliver integrated CPD programs based on the energy efficiency and low carbon competencies for generic, specialized and advanced training. Offer industry practitioners the opportunity to jointly learn from industry experts across the construction process to stimulate a culture of cross-sectorial communication and collaboration in the industry.

5. ***Practitioner Recognition and Labels:*** Provide practitioners with trusted and accessible sources of information and CPD related to weeding through the abundance of inferior products and systems available. Engage practitioners through outputs from university led applied research related to both sourcing product based on evaluations and effective implementation methods.

   a) Sustainable Material Labels: Harness the power and influence of labelling systems like WaterMark, CodeMark and Forest Stewardship Council (FSC) timber and associated labelling and product review websites like Global GreenTag as part of Eco specifier and the Green Environmental Choice Australia that have had positive impacts in the industry. As trusted labels, use these systems to further minimise the risks and enable practitioners to ensure the quality and application methods of particular building materials.

   b) Efficiency & Quality Labels: Use appliances labels related to energy and water efficiency have also had a positive impact. There is a related opportunity to use labels and further research to communicate findings related to LCL products, such as air and moisture barriers (building wraps), window systems, ventilation and systems solutions supported by innovative insulation, facade, or pre-fabrication manufacturers to practitioners and the general public.

6. ***An accreditation system:*** The development of an overarching system would allow for consistency with autonomous accreditation through the local authority or industry peak body.

   a) Profile learners to build on existing knowledge and skills and develop career mobility / pathway options to foster positive engagement in CPD based on the Low Carbon K&S Taxonomy.

   b) Industry and consumer recognition: This could be facilitated through a set of 'guild stamps' as a brand or logo for industry wide and consumer recognition of the various job roles across the built environment who have achieved competence in the agreed set of principles (in partnership with existing initiatives such as the Green Building Council of Australia, the Green Plumbers, the Green Painters, Green Building Institute, Clean Energy Council, etc.).

   c) The recognition of 'Master Trades' could also be addressed in recognition of lifelong experience and contribution to trade excellence, building quality, and leadership to foster higher levels of industry transparency and consumer trust.

7. ***Review and monitor using feedback loops:*** Create a continuous improvement system within which resources, experts and training providers are evaluated, particularly product manufacturers to ensure the knowledge and skills being presented are relative to the intent of the selection, installation and performance of the 'type' of product and not solely for the purpose of promoting a brand or manufacturer based on only their product(s) or service.

   a) Communicate the project outcomes to industry and consumers in a national multi-faceted communication strategy for transparency and consistency across stakeholder groups.

   b) Communicate lessons learnt by inviting advisors into the development and delivery process, such as:

      - Primary and secondary school (Science, Technology, Engineering and Mathematics – STEM or sustainability curriculum),
      - Vocational qualifications and
      - University qualifications

From the perspective of an industry led system, beyond the nationalised resources and training delivery model for generic and cross cutting training, independent organisations would benefit from tailored CPD solutions and informal learning based on expert assessment and development of integrate and rapid organisational change modes and support complex learning and workplace development environments.

4 Preparing the Workforce: Enabling a flexible and responsive education system

As a continuation of the prior three response options, these are the response options:

- ***Engage the whole education system:*** Recognise that the education and training system required to respond to the demand for green skills involves all levels of the formal and in-formal education systems.
- ***Enhance capacity for skills forecasting:*** Develop the capacity for skills forecasting as an essential element of a proactive and adaptive system, able to respond to the rapidly changing context of transition.
- ***Provision of just in time information and demonstrations:*** Develop a searchable system to facilitate open access to information, demonstrations and further expertise and CPD.

A government led education system, based on the international case studies provided, would offer an opportunity for the development of a transparent and responsive information system. The information system could be created based on a joint policy through the development of a working group with members from the Cwlth Department of Industry and Cwlth Department of Education.

The aim of the working group would be to establish a platform to support integrated electronic data sets based on the Australian Bureau of Statistics, labour market forecasts, international trends, current industry needs and education provision. The information would be linked to the built environment education council to be used for research, analysis and recommendations about education and training based on historical data and forecasting. This same platform could be openly accessed, updated and used for ongoing engagement and feedback to determine positive and negative feedback loops without the typical six months – one year consultation delays to identify and implement policies and programs.

Informal education programs could also be explored to support just in time delivery of information and skills development through a simple searchable system of information, demonstrations and further links to additional resources or formal CPD programs to develop knowledge and skills. Initially, the system could be developed based on the regulatory requirements of the NCC and sustainable design methods with later updates of techniques that stimulate best practice.

This type of flexible and responsive national system would stimulate transparency, coordination, trust, and efficient planning to enable the education system to adapt to rapidly changing industry demands, workforce mobility and more clearly defined career pathways based on multiple data sets and departmental evidence linked to online tools for more rapid capacity building.

Lastly, education and training costs related to process and product efficiencies could be a major incentive for engaging in CPD, if case studies with cost benefit analysis related to cost labour efficiencies are clearly communicated. In an effort to enhance the capacity for skills forecasting, the industry, government and education sectors need to develop the capacity for skills forecasting as an essential element of a proactive and adaptive system, able to respond to the rapidly changing context of transition by supporting:

1. Provision of just in time information and demonstrations.
2. Development of a searchable system to facilitate open access to information, demonstrations and further expertise and CPD.

Table 7: Advice Framework: Policy Response Options

Policy Impediment	Response Option	Enabler	Timeframe (by 2016, 2020, 2025)	Potential Benefits
Leadership: Inadequate leadership and long term government policy	Sharing Leadership: Industry and government fostering national capacity building (section 4.2)	Establishment of a BE group with representation from government and key industry groups representative of the BE supply chain to co-create an integrated policy package with key implementation programs based on shared responsibility, actions, continuous improvement and communication plans aimed at the general public.	2016	Industry and public trust and confidence to commit and contribute to a low carbon future.
Collaboration: Research cooperation, communication and implementation of findings	Bridging the divides: Research, CPD and policy programs (section 4.3)	Investment in strategic long-term research centres and projects. A key opportunity is multi-stakeholder research (e.g. design and construction and manufacturing) with adequate funding and resources to enable the development of communication and implementation plans and continuous improvement with researchers, education providers and key industry groups to implement the research findings and stimulate new innovation.	2020	Continuous improvement and realisation of innovative opportunities based adequate funding and communication models.
Synchronicity Deficits: Industry fragmentation and disjointed CPD	Integrating CPD: Enabling the development and coordination of integrated CPD programs across the built environment supply chain from planning, design, construction, management, financing, and real estate.	Establishment of a working group focused on national education for CPD as part of the newly formed BE Council. Co-creation of an industry wide stepped education program with a common language and understanding of opportunities (potential negative and positive contributions) of each role across the supply chain and a shift toward shared decision making and accountability from planning, design, construction and building management. These programs would require mutual recognition by industry CPD bodies and education providers.	2020	Simplicity in understanding the compliance requirements to enable rapid transition beyond compliance realising the opportunities of a low carbon future.
Engagement and Adaptation: Inadequate industry engagement and human capital adaptation	Preparing the workforce: Enabling a flexible and responsive education system	As part of the newly formed BE Council, establishment of an industry and education advisory group focused on national accreditation of CPD education and mutual recognition of CPD credits. The group would include educators and industry representatives from each of the key areas of the BE supply chain. The aim of each representative is to liaise with the key industry education providers and industry bodies (i.e. professional and industry groups, accreditation bodies, unions and regulators) to ensure the CPD programs are current and forward looking, professional, ethical and seamlessness based on the accredited under the national education policy and programs aimed at the creation of a low carbon built environment. Accumulation of opinions and advice based on practitioners views to develop recommendations for program developers on flexible delivery methods and opportunities to access resources.	2025	A prepared workforce with access to resources on demand and the ability to adapt as needed to industry expectations including contribution to multidisciplinary project teams stimulating innovation.

5 CONCLUSION

There are varying degrees of interest, incentives and impediments to CPD in the built environment. The incentives include professional standing, minimising risk and government leadership. The impediments include fragmented industry CPD programs and objectives, disconnected research and implementation, and inadequate industry engagement, resulting in low levels of human capital adaptation. Based on the findings, future practitioners will increasingly look to understanding how they can contribute to energy and carbon reduction strategies and sustainability. However, formal CPD may or may not be the method they engage in to collect information or develop skills to meet this demand. The four response areas for action to increase CPD engagement include the following four linked response options.

1 Sharing Leadership: Industry and government driving national capacity building

The first recommendation is for the Commonwealth government to lead the development of an independent national built environment education and CPD group in partnership with independent industry stakeholders representing each sub-sector in the built environment. However, at present due to the current Commonwealth government focus on reducing the number of councils and committees, this response option may need to be leveraged as part of a CRC LCL program to foster national capacity building. The CRC LCL program would need to include representatives from education, government and industry partners. Such a council or centre would be well placed to development a clear set of education policy objectives, implementations strategies and feedback loops for the long term.

2 Bridging the Divides: Research, CPD and policy programs

Government built environment policy, research outcomes and education policies have the potential to be streamlined by bringing key stakeholders and decision makers together over a two-day workshop to initiate discussions to establish complementary policies and develop a collective framework and pathway program to support collaborative or autonomous implementation and delivery based on the key report findings and other key industry recommendations.

The workshop could be facilitated using the PLAs methods and stakeholders briefed accordingly to determine the most effective transdisciplinary methods to transition Australian's built environment to a LCL future. Regardless of the facilitation methods, the agenda needs to include the establishment of effective communities of practice using peer learning activities (PLAs) to continue to engage representatives from key research organisations, industry groups, government, practitioner groups and the wider public in ongoing programs to facilitate the required changes to stimulate future engagement in CPD activities.

3 Integrating CPD: Enabling the development and coordination of integrated CPD programs

In an effort to foster a systemic industry capacity building program, share resources and implementation programs, and communicate successes and feedback necessary changes, an opportunity can be developed to deliver nationally integrated CPD shared across the built environment supply chain. This type of system would foster mixed practitioner and industry capacity building, reduce market competition, and minimise or eliminate inconsistencies and inefficiencies. This approach should be further explored and mapped in the 2-day workshop.

4 Preparing the Workforce: Enabling a flexible and responsive education system

As a continuation of the prior recommendations, representatives across the whole education, labour and employment system need to be engaged in communication feedback loops to align the provision of programs with current and projected demand. One opportunity is to enhance the capacity for skills forecasting within these systems. Another opportunity is the provision of a searchable on demand or just in time information system offering key facts, evidence, demonstrations and in-depth CPD programs, recognising that one facet of the education and training system is a response to the demand for green skills at the formal level, but with support from an informal information system accessible to the public.

Further Research

In effort to better understand how to enable practitioners to meet the demands of a low carbon built environment, further research is required. Further understanding about the formal and informal methods of engagement that Australian practitioners engage in to support continuing professional development is needed, including the reasons why particular engagement methods are chosen. An in-depth analysis of how changes in social practice have occurred and are occurring in the built environment is needed to help prepare the workforce to meet the demands of a low carbon built environment. These two key research areas could help stimulate the uptake of CPD or enable changes in practice to support a low carbon built environment in Australia. The key areas requiring further research include:

- Delivery and uptake: The level of participation in the built environment CPD aligned with energy efficiency and carbon reduction strategies needs to be undertaken, as well as an evaluation of the effectiveness, i.e. the rate of application on the job or integration into work practice and the value added to the business.
- Methods for increasing consumer knowledge and skills in comparing building and renovation quotes based on not only the construction costs, but also the operational savings over 5, 10 and 15 years dependent on the building plans and specifications The study should include an evaluation of the effectiveness of current public campaigns and behaviour change programs;
- CPD opportunities for intermediaries (sales people at home improvement and hardware stores, leasing agents, real estate agents, valuation and finance representatives, body corporates, etc.) to understand how they value and communicate about energy conservation, efficiency and carbon reduction strategies in the residential building sector;
- Case studies on the benefits of CPD on construction labour efficiency related to design and service innovation and the impacts of education and training, specifically prefabrication or changes to traditional construction practices and how these changes impact on the construction time and costs.
- A strategy for real-time information and up skilling as part of workplace development and learning in practice is also needed.

APPENDIX A: PROJECT METHODOLOGY

The CRC LCL RP3022 was led by a Steering Committee with representatives from:

- Commonwealth Department of Industry, Energy Division
- Australian Sustainable Built Environment Council
- Facilities Management Association of Australia
- Construction and Property Services Industry Skills Council
- The Frontline Group

The committee met three times during the project:

- Project initiation: The onset to review the objectives, methodology and outcomes and offer insight into their organisation's perspective of the CPD policy impediments and incentives to effective low carbon built environment education.
- Review of findings: Midway through the project to review the draft findings and guide the development of the response options being presented.
- Final report approval: At the conclusion of the project to review and finalise the draft report and offer approval to publish the final report.

The report findings were derived from a combination of research techniques. These include:

- Secondary data collection through desktop research to obtain information for analysis of Australian and international educational policies and programs related to Continuing Professional Development (CPD) contributing to a low carbon built environment. These secondary resources were used to identify Australian practice and international CPD policies and practice.
- Primary data was collected through:
    a) a focus group and
    b) a series of eight semi-structured interviews with key informants in the built environment in Australia.

In obtaining the data, the following qualitative research methodology was used.

Desktop Review

The literature review included a systematic review of recent CPD policies and programs. These documents were sourced from publicly available industry and government documents on related websites:

- Cwlth Department of Industry and Cwlth Climate Change Authority and
- industry and professional websites associated with:
    a) planning,
    b) architecture,
    c) design,
    d) construction, and
    e) facilities management).

Further information was sourced using academic databases, Google scholar and Google internet search engines to identify Australian and international education and training policy for the existing workforce aligned with energy and carbon reduction and efficiency in the BE using a combination of search terms outlined in Table 8.

Table 8: Search Terms for Inclusion of Literature in Study

'Built environment' and 'policy' in combination with:	Workforce search terms used in the searches included:
• Continuing professional development, • Legislated continuing professional development, • Adult education, • Sustainability, • Climate change, • Energy efficiency, • Energy reduction, • Carbon abatement.	• Planners, • Designers, • Engineers, • Architects, • Builders, • Contractors (i.e. electrician, plumber), • Facilities managers, • Project managers, and • Building surveyors.

International Practice

A comparative analysis of the Australian CPD policies was compared against the international best practice case studies described in detail in Appendix B with an overview of the findings and implications in Section 3: International

Key informant engagement

- Interviews: Key stakeholders from both industry and professional groups were invited to participate in a forty-five-minute interview. The interviews included representatives from commercial and residential construction peak bodies representing design, construction, specialist contractors (trades and consultants) and a product manufacturer.

Interview questions

A total of eight semi-structured interviews were conducted via phone using a combination of questions. The selection of questions varied relative to the individual's knowledge and expertise:

Current Australian Policy:

1. Are there any current Australian continuing education policies focused on upskilling the existing workforce through vocational or higher education and industry professional development?
2. Which key industry groups currently have an education policy aligned with the built environment?
3. Do they relate to low carbon living? If so, how?

Impediments and Incentives:

4. How are the current policies being implemented in Australia and who are the key stakeholders implementing them?
5. Are there any policy impediments? If so, what are they? Please give details.
6. Are there any policy incentives? If so, what are they? Please give details.

Improvements:

7. Do you believe they are effective? Why, why not?
8. What strategies are needed to improve Australia's low carbon continuing education policy for the built environment?
9. How can the policies be monitored and measured?

International context:

10. Do you know of any successful continuing education policies or programs (industry or government led) that effectively contribute to lowering carbon in the built environment?
11. Why is it successful?
12. How is it implemented?
13. Would it be applicable in Australia? Why / why not?

Focus Group

A 30 minute focus group session was held with key CRC LCL and industry stakeholders at the Nov. 2014 CRC LCL Participants Forum in which the researchers engaged seventeen individuals to review the identified incentives and impediments, add any others that had not been identified and prioritise them from greatest to the lowest on the incentives and impediments.

The focus group was given a discussion booklet summarizing the literature review findings describing the current CPD environment in Australia and were asked to:

- Rank the order of the impediments identified through the desktop research and identify and rank any additional impediments
- Identify the short term opportunities to overcome these impediments to 2020 and
- Identify the longer-term opportunities to overcome these impediments beyond 2020.

Analysis

The desktop assessment of the industry and government CPD policies included the application of a framework based on these criteria:

- Identification of the industry or professional groups and the relative CPD policy and description.
- Identify and provide a brief description of the program aligned with energy efficiency, carbon abatement or reduction or sustainability.
- Identify if the CPD policy and program(s) include compulsory or voluntary aspects and if these are available for members and/or non-members.
- Identify if participation in CPD is a legislative requirement for the practitioners being targeted to engage in the program.
- Determine if the organisation accepts CPD points for training with providers outside of their organisation.

Although the following set of questions were outside the scope of this project, they were included to draw attention to additional information required to support further analysis and therefore described as 'unknown':

- Identify the uptake and completion rate.
- Identify the evaluation outcomes of the policy or program.

The interviews and focus group findings were analysed to identify and rank the policy incentives and impediments to effective CPD educational policy in the Australian built environment. The findings were also used to inform the Advice Framework in addition to the findings related to International Best Practice.

APPENDIX B: CASE STUDIES

Case Study: South African Council for the Built Environment

Introduction

A Case Study on the *South African Council for the Built Environment* was selected due to the fact that they are facing similar impediments. CBE through the *Greenhouse Gas Mitigation Support Strategies in the Building Sector (2010)* has identified the following impediments for South Africa:

- no clear government agency responsible for energy efficiency;
- energy efficiency needs are frequently crowded out by more pressing needs such as pressure to provide housing quickly;
- long-term environmental needs are poorly aligned with political planning time-frames which tend to be much shorter;
- a lack of technical proficiency and a lack of public awareness;
- high up-front costs, high technology costs and weak incentives to improve energy efficiency;
- a lack of applicable building codes (through an energy standard SANS 204 has been published as a voluntary standard and may well in time be promoted to mandatory status); and
- human capacity building and skills development is consistently recognised as a critical factor in the success of GHG mitigation programmes.

Although, in response to some of these impediments, the South African Parliament has passed the Council for the Built Environment Act in 2000. The Council for the Built Environment (CBE) was established to "to address certain shortcomings in the built environment and to enable a climate for ongoing transformation and development of the professions. In terms of the CBE Act the Council is, amongst others, responsible for transforming the professions, acting as a conduit between Government and the built environment professions, fostering growth of the professions, and contributing to the creation of a dynamic built environment" (CBE, 2014).

The Minister of Public Works appoints a twenty member Council with the CBE Council members being appointed based on both their commitment to the advancement of the built environment professions and the depth of their experience in:

- Architecture
- Engineering
- Landscape Architects
- Project and Construction Management
- Property Valuation and
- Quantity Surveying

Evidence

In response, the Greenhouse Gas Mitigation Support Strategies is a set of policy guidelines [used] to incorporate principles and practices of sustainable development and greenhouse gas (ghg) mitigations strategies and implementation measures in the building sector through continuous professional development and the accreditation of BE programmes.

In 2007, CBE published its policy document Continuing Professional Development for the Council of the Built Environment according to which the purpose "is to provide a facilitative and enabling operational environment … to all members of the various professions in accordance with their legislation and voluntary association constitutions … for the development of professional competence in order to achieve quality services in the built environment sector and also contribute to national development goals" (p. 1). The policy framework is intended to set out guidance for development and strengthening of CPD policies and processes for its constituent councils. The CBE CPD policy framework takes cognisance of the fact that each profession is unique and encourages each council to develop its own discipline specific CPD process (p.8).

Although the report indicated that there is a need for discipline-specific needs, in contrast there are several topics that are clearly crosscutting:

- technological aspect (skills);
- addressing risk;
- management skills;
- interpersonal skills;
- revision/refresher;
- raise awareness on national objectives;
- legal matters;
- transformation and development agendas;
- marketing skills; and
- emerging issues (p.10).

Therefore, in an effort to foster collaboration and support smaller associations which do not have the capacity to develop and deliver CPD, SCABE encourages ""piggyback" on at least some CPD activities provided by their sister councils in order to cultivate an effective CPD culture in these councils to develop capacity and to enhance interdisciplinary engagement (p. 9)." Lastly, the CBE report finding indicate that CPD programmes should be regularly updated to maintain currency and relevancy based on the expectations that:

- voluntary energy standards will likely become mandatory
- green building rating systems uptake will be mainstreamed
- additional technologies will become available and
- retrofitting activities will increase.

Due to this significant commonality, a "generic basic core programme to all built environment programmes should be developed [and that] there may be sufficient congruence to warrant common accreditation (p. 11)."

Case Study: German Regulations and Capacity Building Policies

Introduction

The German Energy Agency (DENA) has been selected as a case study because of the centralised government leadership model that has resulted in significant economic, environmental and social improvements.

Germany ranks first among all G20 countries for its energy efficiency and wider measures to combat climate change. The case study highlights DENA's aims and achievements based on a study conducted by Power and Zulauf at the London School of Economics, Cutting Carbon Costs: Learning from Germany's Energy Saving Program, Mar 2011, relating to:

- Renewable energy
- CO2 Impacts
- Economic and employment impacts
- Gains in energy efficiency.

Although the case study highlights many of the outcomes of the overarching policy, particular attention should be direct toward the education and training aspects that underpin the successes of this policy package.

Germany's biggest challenge is that 75 percent (29 million) of homes were constructed before 1979, with 9 million retrofitted to high energy-efficiency standards it leaves 80 percent or roughly 20 million homes to be refurbished. The current rate of refurbishments is around 200,000 buildings a year, but the rate needs to double if Germany is to complete the refurbishment process by 2030.

DENA operates as an independent, but government-sponsored, company with 140 staff founded in 2000 through support from the federal government, KfW, and three other major German banks. It links together government activity, subsidy programs to promote energy efficiency, and market-oriented activities to spread the take-up of energy efficiency and renewable technologies.

DENA tests and implements innovative projects and campaigns at the national and international levels on energy saving. DENA's five activities are:

- Information and motivational campaigns to stimulate demand and spread information;
- [CPD] Training experts (engineers, architects, craftsmen) in new energy saving skills through documenting evidence and techniques, organizing events, and maintaining online databanks on:
    a) measures to achieve target efficiency levels in different buildings;
    b) refurbishment of rented homes; and
    c) best practices for residential and non-residential buildings (new and existing)
- Increasing transparency in all energy standards and certification (e.g., validated Energy Performance Certificates (EPC), a voluntary Quality Mark, Energy Efficient Building Displays)
- Developing and promoting model projects to demonstrate quality standards, implement best practice, and develop regional know-how
- Simplifying methods and increasing the reliability of renovation."

Evidence

The key target areas are:

Renewable Energy

Its main achievements in renewable energy development since 2000 have put Germany on pace to reach a renewable share of final energy consumption of 20 percent in 2020 (2 percent above Germany's EU target), 32 percent in 2030, and 54 percent in 2050.

CO2 Impacts

The use of renewable energy in electricity, heating, and transport has greatly reduced CO2 emissions positioning Germany to achieve an 80 percent reduction in CO2 levels by 2050.

Economic and employment impacts

The job impacts through the building refurbishment program have enabled about 240,000 new jobs a year since 2006 with the renewable energy generation sector increasing numbers of new jobs each year. Government estimates a 400,000 further jobs in renewable industries will emerge by 2020, with continuing expansion to 2030 and onwards.

Gains in energy efficiency

Energy efficiency investment has halved the energy use in the buildings treated since 2002 when the first energy efficiency building regulation (EnEV) came into force. There are 32,000 new and renovated "Passive House" examples using only 40 kWh per square meter annually, compared with the legal standard of100 kWh.34 The 8,000 model retrofitted buildings all over Germany demonstrate that it is possible to achieve a 30 percent reduction on already ambitious energy conservation standards.

KfW's activities have enabled the wider progress on energy efficiency in the built environment. Between 2006 and 2009, its funding programs led to:

- the energy saving refurbishment of 1 million homes and the addition of around 400,000 new highly efficient homes;
- around 240,000 new jobs per year in the building and building supply-related industries for energy efficiency programs, with a total over four years of 894,000; and
- around €27 billion in loans and grants distributed, leading to a total investment in energy efficient homes of more than €54 billion.

Case Study: The American Job Centre and Industry Collaboration

Introduction

This American case study was selected to highlight the importance of a coordinated, multi-prong, cross-sectorial approach to policy through partnerships and collaboration. The United States Department of Energy's Office of Energy Efficiency and Renewable Energy has led a number of policy initiatives with other government agencies and industry, education and research groups. The centralised coordination has ensured that the system is anchored in a centralised government policy approach with partner implementation programs and monitoring through a continuous evaluation of outcomes. The collaborative research, upskilling, monitoring and communication are linked to policies and programs supporting:

- The development and adoption of increasingly stringent building codes and regulations across jurisdictions
- National research centres stimulating the development and communication of new products and methods
- Industry led strategies, standards, guidelines and implementation programs with feedback loops and monitoring systems
- Information and resources continuously supplied (freely) through various trusted BE channels
- CPD aimed at industry practitioners

Evidence

Regulations

US Department of Energy, Building Energy Codes Program supports local and state jurisdictions to adoption compliance measures by increasing the stringency of the building codes aligned with energy efficiency. Awareness and upskilling is available for practitioners and consumers by developing and promoting best practice information, resources and assistance. The program is measured and monitored through the Building Energy Codes Program Impact Analysis:

- Building Code Adoption - https://www.energycodes.gov/adoption
- Building Energy Codes Program Impact Analysis https://www.energycodes.gov/about/results

National research centres have been established and are supported through industry and researcher collaboration with long term resourcing to stimulate and respond to the demand for theoretical and applied research and practice. Twelve national centres have been established focused in the key research areas contributing to energy efficiency and renewable energy, etc. with support from communication partners.

Industry led strategies, standards, guidelines

The outcomes form the national research centres are explored and developed in to industry led strategies, standards and guidelines with feedback loops and monitoring systems (i.e.) through joint initiatives, for example:

- Building Technologies Program with the US EPA - http://www.energystar.gov/about
- Better Buildings Challenge https://www4.eere.energy.gov/challenge/home
- Architecture 2030 - http://www.architecture2030.org/2030_challenge/the_2030_challenge
- American Institute of Architects, Committee on the Environment (COTE) 2050 Emissions Targets aims to drive organisational strategies, all of which are underpinned by compulsory CPD and a Continuing Education System with provider accreditation (AIA, 2014).
- National Association of Home Builders - International Construction Code and National Green Building Standards, practitioner CPD, and building verification and certification using third party assessors http://www.nahb.org/page.aspx/generic/sectionID=2510

Practitioner Education or CPD

Independently delivered, but centrally coordinated and accredited with continued communication methods supported by mutual recognition of participation for example:

- Building Performance Institute - http://www.greentrainingusa.com/bpi-training.html
- National Association of Home Builders Green Building Standard,
- US Green Building Council,
- American Institute of Architects.

Information and training

The education and CPD is underpinned by support resources

- Building Energy Codes Program Impact Analysis (https://www.energycodes.gov/about/results)
- Architecture 2030,
- Green Building Advisor,
- Building Science Corporation,
- Annual Conferences EEBA, AIA, etc.

Education Program Examples

US Department of Education and US Department of Labor joint initiative: America Job Centre aligning 6 US federal agencies, industry and education bodies through partnership with key industry associations to engage and prepare the workforce. The American Job Centre Network site provides a single access point for key federal programs and critical local resources to help identify CPD training program as a product of cooperative work from six US agencies, consisting of:

- the US Department of Labour;
- the Department of Education;
- the Department of Veterans Affairs;
- the General Services Administration;
- the Small Business Administration; and
- the White House (American Job Centre, 2013).

The aim of this joint cooperative effort is to strengthen the skills, abilities and knowledge of the American workforce in order to respond to a rapidly changing workplace. Having this type of cooperation and alignment across different agencies reduces red tape and makes access to information about training and retraining easily accessible and readily available to all Americans. With this system in place, Americans looking for work or seeking continuing professional development (CPD), skill upgrades or a new set of qualifications no longer go through a complex administrative process to access the services and training they seek.

"The American Job Centre Network site provides a single access point - open 24-7 - for key federal programs and critical local resources to help people find a job, identify training programs, and tap into resources to gain skills in growing industries. This site, and the nearly 3,000 federally funded brick-and-mortar employment centres that are part of the American Job Centre Network provide an easily-identifiable source for the help and services individuals and businesses need" Source: (http://jobcenter.usa.gov/about-us).

A Competency Model for Success

To implement a model that works the American Job Centre through the Employment and Training Administration (ETA) is working with business leaders, educators, and others to create comprehensive and readily accessible industry competency models that document the foundational and technical skills and competencies required for workplace success in emerging and rapidly changing industries. Industry competency models provide a resource for the development of curriculum, certifications, and the tests that assess work-related competencies.

How the Residential Construction Competency Model Actually Works

To make the model work government agencies, industry and education providers work in partnership to create a competency model that is up to date and relevant to the changing needs of the residential construction sector. A central plank of this model is the application of green building practices to the construction or renovation of residential buildings.

To develop a comprehensive competency model for the residential construction industry sector, the Employment and Training Administration (ETA) works in close consultation with peak US industry bodies such as the Homebuilders Institute (HBI), the National Association of Home Builders (NAHB), and other industry bodies to create a competency model that is relevant to the residential construction sector. The partners meet on a regular basis to ensure that the competencies are kept up to date and that training and retraining in the CPD is kept continually updated.

The Model's Building Blocks

The Building Blocks for Competency Models consist of a set of "building blocks" for competency model development. These "building blocks" are arranged in nine tiers with each tier containing a set of related competencies. The arrangement of the tiers in a pyramidal shape represents the increasing level of specificity and specialization of content.

The nine tiers are grouped into three categories, namely foundational, industry related and occupational related competencies. At the base of the model, Tiers 1 through 3 represent Foundational Competencies that provide the basis for success in school and in the world of work. These competencies are essential to a large number of occupations and industries. The middle of the model is made up of Industry Related Competencies, which consist of technical competencies. These competencies cut across industry sub-sectors making it possible to create career patterns where a worker can move easily across industry sub-sectors. This operationalizes the concept of employability skills.

A clear advantage of this system is that instead of following a restricted single occupational career pathway, this model supports the development of a flexible and adaptable workforce. At the top of the pyramid are Occupational Competencies, which consist of Tiers 6, 7, 8, and 9.

Green Competencies in the Building Sector

Central to the success and currency of this competency model are technical competencies describing the importance of 'Green Building Competencies' for Low Carbon Living. Detailed in Table 1, these describe a set of knowledge and application of green building practices to the construction or renovation of residential buildings and are created to design competency-based curriculum, to articulate the requirements for an occupational credential such as a license or certification.

An advantage of this model, is that "Building Blocks for Competency Models Tool enables the user to build industry competency models that can serve as the foundation for important human resource functions such as recruitment and hiring, training and development, career planning, and performance management". It can also assist in understanding labour market change and can provide insights into skill and knowledge requirement changes that are occurring in the labour market.

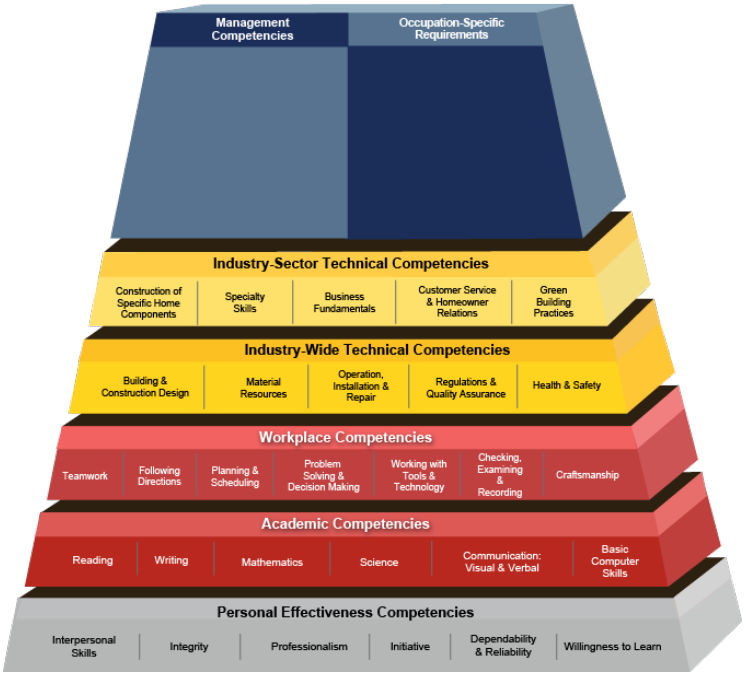
This model is flexible and usable enough allowing for the introduction of 'green competencies' at the industry level. The example in Table 9 was obtained from the Residential Construction Competency Model and forms part of the middle sector of the pyramid, known as the "Industry-Sector Technical Competencies.

Table 9: Industry Related Green Building Practices, Residential Construction

Knowledge and application of green building practices to the construction or renovation of residential buildings.

Construction Trends	*Siting*	*Efficiency*	*Waste Management*
Recognize and research green building trends in the residential construction industry including use of new materials, technologies, and processes Understand the growth and impact of green building practices Explain the environmental and economic benefits of green building practices New methods and materials into design and construction of residential buildings Meet requirements to verify that a building project meets the highest green building and performance measures	Select sites well suited to take advantage of mass transit when possible Protect and retain existing landscaping and natural features Select plants that have low water and pesticide needs Use compost and mulches	Perform home energy audits to determine the energy efficiency of a structure Develop strategies to provide or increase natural lighting Select sustainable construction materials and products Minimize wastewater by using water conserving fixtures	Follow waste management plans per contract requirements Minimize construction waste and demolition debris Understand waste management terminology including: construction waste, demolition debris, land clearing debris, disposal, recycling, salvage, reuse, deconstruction, commingled, source separation Reuse or recycle materials, e.g.: concrete, masonry scrap, metals, clean wood, plastics, insulation material, un-tempered glass, carpet and carpet pad, ceiling tiles, plumbing fixtures and equipment, lighting fixtures and electrical components, cardboard packaging

Source: Reproduced from Careeronestop, available at: http://www.careeronestop.org/CompetencyModel/pyramid.aspx?CONR=Y



Foundational Competencies	*Industry-Related Competencies*	*Occupation-Related Competencies*
Tier 1: Personal Effectiveness Competencies Tier 2:Academic Competencies Tier 3: Workplace Competencies	Tier 4: Industry-Wide Technical Competencies Tier 5: Industry-Sector Technical Competencies	Tier 6: Occupation-Specific Knowledge Competencies. Tier 7: Occupation-Specific Technical Competencies. Tier 8: Occupation-Specific Requirements. Tier 9: Management Competencies.

Figure 2: Representation of Building Blocks for Competency Models: Residential Construction

Source: US Department of Labor, Careeronestop, 2013

Case Study: Alternative EU methods

Introduction

These European Union (EU) methods were selected to highlight the processes available to learn as policies and programs are implemented using open methods and a continuous improvement process. Similar to the Australian Commonwealth and State and Territory based government system, Bettina Lange and Andy Gouldson identified that the European Union (EU) requires policy transparency and accountability based on broad, generic regulatory processes and targets to support trust-based environmental regulations (Lange, 2010, p. 5236).

Evidence

EU Open Methods for Coordinating Education Policies

The EU process facilitates EU Directives that must be "operationalized in a diverse range of settings… [and that] trust also matters because it is part of a broader shift in environmental regulation towards new forms of governance that rely less on the hierarchical application of command and control regulations and more on joint working between governments, business and stake-holders" (p. 5236). These findings were based on Anne Schneider and Helen Ingram (1990, p. 527) development of the following framework in Table 10 to identify the behavioural assumptions of policy tools.

Bettina Lange and Nafsika Alexiadou have further explored the use of policy learning tools in relation to governance of education policy in the EU using open methods for coordination (OMC) (2010). Based on their analysis of co-construction between the European Commission and member states their findings have determined how policy learning and governance transform each other. The findings indicate that there are four distinct learning styles:

- mutual learning
- competitive learning
- surface learning and
- imperialistic learning (2010, p. 443).

As described by Lange and Alexiadou, *"OMC processes seek to strengthen the EU dimension in member states' policies through: (1) the fixing of European guidelines to which timetables for achieving specific goals are attached; (2) the translation of these guidelines into national and regional policies associated with specific targets; (3) the development of indicators and benchmarks in order to compare best practice among member states; and (4) the periodic monitoring, evaluation and peer review of member states' practices organised as mutual learning processes (European Council 2000, para. 37). …the OMC is envisaged to be a 'flexible means of working towards shared European objectives', and attempts to define policy priorities, (desirable) outcomes and frameworks for action, instead of using legislation or the convergence of institutional structures (Pochet 2005, 41; Souto-Otero, Flecken-stein, and Dacombe 2008)" (2010 p. 444).*

The European Commission, Directorate- General for Education and Culture describe the role and planning of peer learning activities (PLAs) in the context of the Education and Training 2010 work programme as:

Peer learning is a process of cooperation at European level whereby policy makers and practitioners from one country learn, through direct contact and practical cooperation, from the experiences of their counterparts elsewhere in Europe in implementing reforms in areas of shared interest and concern. PLAs should take place at two broad levels: at a policy level, addressing the critical factors for policy change; and at a more practical level, addressing the opportunities and constraints for policy implementation. (European Commission, 2006, p.2)

The Commission further sets out the:

- Objectives of PLAs
- Organising PLAs
- Participating in PLAs - The role of participants (host country, "peer learning" countries, Commission, and consultants) and
- Dissemination and impact of the results. (2006, p.2-6)

Table 10: Behavioural Assumptions of Policy

(Source: Reproduced from Schneider and Ingram, 1990, p. 527)

Policy tool	Underlying motivational strategies
Authority tools	Rely on the inherent legitimacy found in hierarchical arrangement
Incentive tools	Assume individuals are utility maximizers who will change their behaviour in accord with changes in the net tangible payoffs offered by the situation
Capacity tools	Assume individuals may lack information, resources, skills, and may rely on decision heuristics (shortcuts or rules of thumb), but that these biases and deficiencies can be corrected by policy
Symbolic and hortatory tools	Assume individuals are motivated from within, and that policy can induce the desired behaviour by manipulating symbols and influencing values.
Learning tools	Assume agents and targets do not know what needs to be done, or what is possible to do, and that policy tools should be used to promote learning, consensus building, and lay the foundation for improved policy

Achieving fundamental changes in research and practice

Similar to the PLA methods and complex design and construction collaborative practices, those in the medical field are currently supporting transdisciplinary research to translate research into practice. Recent nursing research has identified:

"Evidence-based behavioural practice (EBBP) is an interdisciplinary conceptual model and process commissioned by the National Institutes of Health Office of Behavioural and Social Science Research (Newhouse & Spring, 2010). EBBP is based on the transdisciplinary model of EBP, which reflects shared decision-making among stakeholders such as the community, practitioners, patients, and researchers. Additional results of that collaborative group are available on its training Web site (www.ebbp.org)…

An interdisciplinary research team has developed the Queen's University Research Roadmap for Knowledge Implementation using a planned action approach (Harrison & Graham, 2012). The plan has three phases: issue identification and clarification; solution building; and implementation, evaluation, and nurturing the change. The phases overlap one another along a continuum, and the steps of each phase are discussed in detail with an accompanying exemplar. That method of knowledge implementation consists of more than just investigator-initiated research; it seeks to improve patient care from the initial practice question through long-term follow-up." (Schreiber, 2013, p. 208).

In an American Academy of Nursing article, Interdisciplinary evidence-based practice: Moving from silos to synergy, has indicated that although the philosophy is "that we can do more together than separately, health care professions have tended to be more exclusive than inclusive when it comes to educating in a collaborative approach to interdisciplinary evidence based practice" (Newhouse and Spring, 2010 p. 10). Similarly, practitioners in the built environment have an opportunity to explore integrative methods to achieve greater outcomes. However, to foster these types of relationships and partnerships to contribute to a low carbon built environment, the principles and priorities need to be aligned through knowledge and skills programs to set the foundational approach while allowing flexibility based on each individual's disciplinary expertise.

APPENDIX C DETAILED STAKEHOLDER RESPONSES

The following themes were identified through the desktop research, eight interviews and the seventeen participants at the November 2014 CRC LCL Participants Forum.

The Forum Participants were asked to rank the impediments in order of significance to prioritise the themes. Although at that time of the CRC Forum, the theme 'Government Leadership and Adequate Long Term Policy' had not been identified as a theme, it did emerge as the most significant due to the current absence of national and state government policies and programs.

The impediment themes are listed in order as prioritised by at CRC LCL Forum from the most significant impediment to the least. The key points listed under each theme emerged out of the analysis of the desktop research, interviews and the Forum.

Incentives

These incentives could potentially lead to wider uptake of industry CPD

- CPD should be commanded and controlled through client and contract management, particularly for contractors
- Rewards and incentives for productivity should be further investigated
- Sharing of resources and course delivery to mixed members of industry / professional groups and even non-members could benefit the professional and trade associations in minimising their time and resources required to develop and ensure information and experts are up to date
- Metrics to measure and track individual uptake, expertise, etc. would be useful to consumers and industry professionals and trades to enable a value added benefit of time and cost investment

Impediments

Theme 1: Government Leadership and Adequate Long Term Policy

- The general public and individuals are lacking knowledge and understanding of opportunities, processes, ways to engage experts, purchase products and make decisions based on cost, benefits and payback periods
- Industry professionals and trades often do not have the knowledge and skills to be able to communicate what they know/learn to householders to drive consumer demand
- A lack of CPD requirements nationally and in most states and territories in general, but also in this specific area for
- all professionals and trades, not just the members of specialist groups
- A lack of industry leadership to support the required changes
- A lack of government leadership and support, but not through a high level group like COAG. The issues relate to the lack of an industry wide collaborative partnership between peak industry groups. A national building council with representatives from industry, providers and users' needs to be at arm's length from the government to minimize the risk of disappearing with changes in government structure, representatives, funding, and/or priorities

Theme 2: Synchronicity Deficits: Industry Fragmentation and Disjointed CPD

- Financial competition between peak bodies for CPD uptake contributes to a lack of unity increasing inconsistencies and fragmentation between professional/trade groups
- Industries are fragmented and can't seem to change or overcome this
- Inconsistent use of language and the abundance of information is leading to industry confusion, but CPD might not be the way to cut through it

Theme 3: Research Cooperation, Communication and Implementation

- The public doesn't understand home energy ratings or sustainability features and these features are not being valued by lenders, real estate agents or consumers which leads to a workforce with a low interest in improving these aspects with no added value to their business
- Proliferation of cheap low cost CPD modules that don't integrate with other CPD providers
- Quality of education key - values instilling and high quality training is key. Reported that there are many of shoddy courses giving people a poor knowledge and skills base.

Theme 4: Inadequate Industry Engagement with Limited Mutual Recognition of Program Providers

- Perception that CPD engagement is not beneficial to job or business and is understood to only fulfil membership, accreditation or regulatory requirements
- CPD learning rarely sticks. People do it just to maintain accreditation
- Practitioners need transferable points across CPD multiple schemes – an integrated, vetted, national approach

Theme 5: Human Capital: Challenge to traditional industry practice and adaptation to technology

- Innovative products and processes challenge the traditional practices and often can't be overcome due to both a skills gap and a lack of the financial resources to overcome them. Most practitioners are not willing to invest time nor money on improving practices to achieve energy efficiency because it is believed that they would then be unable able to compete with the majority of practitioners because most consumers pick builders on price alone.
- The industry and government may lack the understanding of the economic costs related to untrained, unskilled or a poorly trained built environment workforce
- Very few workplace cultures value innovation
- Traditional practitioners are resisting the move toward systems teams blurring the lines between manufacturing and construction and a perceived need to redesign the project development and implementation groups to be cross-disciplinary to add value to projects
- Adversarial and risk adverse building practices are not conducive to collaborative design and construction
- Minimal understanding about the importance of new business opportunities in construction
- Dr. Chan Chak Wing Building, designed by Frank Gehry, is a good example of upskilling of a small company to do innovative work.

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