ENHANCING SUSTAINABILITY PRACTICES IN CANADIAN CONSTRUCTION INDUSTRY:
A CASE FOR AN ACADEMIC PROGRAM IN SUSTAINABILITY

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Abstract: Sustainability in all aspects of our life is certainly an emerging trend. All industries including Construction Industry are taking active initiatives to support sustainability practices. Construction always has been a major player in Canada's economy. In the global economy, construction occupies a still larger position. Around the world this industry accounts for $8 trillion a year of economic activity or about 15% of the world's GDP. Moreover, this amount is projected to grow to $12 trillion by 2020. During this time period, Canada is expected to move from seventh to fifth place in terms of the world's largest construction market. This emphasizes the need for aptly trained professional in all domains of sustainability.

Sustainable development issues and environmental concerns are becoming popular with Canada's construction industry's ever increasing activities. Contemporary construction practices adhere to traditional methods of construction; negative environmental impact during and after construction phase is certainly an area of interest for construction professionals. Technological advancements in the engineering and construction industry is contributing to achieving sustainable construction practices, however industry has been complaining regarding lack of training/education to produce construction professionals with sustainability competencies. There is a growing need for construction professionals with sustainability skillsets, which are crucial for enhancing sustainability practices, especially given the growing complexity of construction projects and construction-related environmental law. Academic institutions have a responsibility to address this emerging need of the industry to support national economy. The competence of an academic program in the core area of sustainable built environment is in imparting to its students the necessary expertise to practice professionally for promoting and enhancing sustainability practices at every level of the industry. The study identifies the need for an academic program in sustainability in Alberta, Canada. To achieve the study objectives, an extensive review of existing training programs in the domain of sustainability is carried out. The study also identifies emerging trends in sustainability practices in the industry. This forms the basis for a proposed academic program for training professionals to address emerging needs of the industry in the sustainability domain.

The study suggests that a baccalaureate level program in sustainability will help training our students better to address the needs of sustainability professionals in the local and global built environment industries that await them. There is a dire need for the proposed educational program that should address the required skillset to produce career ready professionals for sustainable practices in construction industry. The study findings would be of interest to sustainability experts, construction professionals, and faculty involved with sustainable built environment education.

Keywords: Built Environment, Construction Practices, Education, Pedagogy, Sustainability.

INTRODUCTION

Construction is and always has been a major player in Canada's economy. It employs close to 1 million Canadian men and women and chalks up volumes of $123 billion annually (Arain, 2013) and has been accounting for about 12% of Canada's GDP. All industries including Construction Industry are taking active initiatives to support sustainability practices. There is a growing need for construction professionals with sustainability skillsets, which are crucial for enhancing sustainability practices, especially given the growing complexity of construction projects and construction-related environmental law. Academic institutions

have a responsibility to address this emerging need of the industry to support national economy.

Sustainable development is about ensuring a better quality of life for everyone, now and for generations to come. This requires meeting four key objectives i.e., social progress which recognizes the needs of everyone; effective protection of the environment; prudent use of natural resources; maintenance of high and stable levels of economic growth and employment (Masood, 2007).

In recent years, there has been an increasing amount of literature on sustainable building and architecture. The main idea of sustainability is to concentrate on environmental conditions to achieve a designed product with maximum internal attributes of environment so that it can minimize the undesirable aspects of these constructions (Pitt *et al.*, 2009). Buildings must reply to environment from design stage and settling when they are to decrease confronting with nature. The aims of sustainability in environmental design are to maximizing the human comfort, efficient planning, design for change, minimizing waste of spaces, minimizing construction expenses, minimizing buildings maintenance expenses, and protecting and improving natural values (Masood, 2007).

Sustainability not only aimed at physical sustainability, but also sustaining and protection of earth and its energy resources. Sustainable architecture is integrating two aims include technology and human's aims. International Council of Building (CIB) defined the purpose of sustainable architecture creating and innovate an artificial healthy environment based on ecologic design and resources efficiency. A sustainable building is a building with the lowest inadaptability with artificial and natural environment and it is including the building itself, surrounding environment, and regional and global environment (Williams, 2007, Masood, 2007).

Sustainability in all aspects of our life is certainly an emerging trend. All industries including Construction Industry are actively involved in supporting sustainability practices. Industry therefore direly needs trained professionals to support the suitability practices. This emphasizes the need for aptly trained professional in all domains of sustainability.

SUSTAINABILITY PRACTICES IN CONSTRUCTION INDUSTRY

The improving social, economic and environmental indicators of sustainable development are drawing attention to the construction industry, which is a globally emerging sector, and a highly active industry in both developed and developing countries (Ortiz *et al.*, 2009). The construction industry as a whole has to rapidly come to terms with the broader environmental and social agenda that is presented by the concept of sustainable development because the built environment affects all human activity (Curwell and Cooper, 1998).

Various initiatives are being taken by industry to support sustainability practices. Vancouver Regional Construction Association's (VRCA) Excellence in Sustainable Construction Certification Program helps construction companies identify synergies between profit, protect our environment, and enhance our communities. VRCA supports companies in implementing innovative solutions for reducing their carbon footprint during construction (VRCA, 2014)

As the first country to adopt LEED outside of the United States, the Canadian building industry embraced the LEED rating system early on, to create what is now a strong base of over 1600 LEED-certified projects across the country (Mueller, 2014).

Canada is the home to 1,633 LEED-certified projects, totaling 22.3 million gross square meters of space. From hospitality to retail, whether single projects or those using LEED volume certification; the projects in Canada represent the diversity and breadth inherent in LEED. LEED professionals are key leaders of the green building industry. Earning a LEED professional credential— including the LEED Green Associate; LEED AP (Accredited Professional); LEED Fellow and various certificate designations—denotes qualified expertise in green building (Choy, 2014). LEED professional credentials mean much more than just a professional accolade; those who earn them form a network of committed green building practitioners across an array of industries. As Canada's commitment to sustainability continues to evolve and grow, more and more of its building professionals are earning their LEED professional credentials. At present, there are 3,651 credential holders in Canada. 2,529 of those individuals hold LEED AP with specialty or LEED Green Associate designations (Choy, 2014).

The industry has a dire need of sustainability professionals to encourage and support the industry practices in sustainability. Academic institutions have a vital role to play in training the professionals to meet the need of industry in the sustainability domain.

INSTITUTION	COURSES OFFERED	PROVINCE	CITY
NAIT	LEED Green Building Strategies and Green Associate study course	Alberta	Edmonton
SAIT Polytechnic	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Alberta	Calgary
University of Alberta	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Alberta	Edmonton
Douglas College	LEED Green Building Strategies and Green Associate study course	British Columbia	New Westminster
University of British Columbia	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	British Columbia	Vancouver
University of Manitoba	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Manitoba	Winnipeg
Red River College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Manitoba	Winnipeg
Nova Scotia Community College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Nova Scotia	Lawrencetown
Conestoga College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Kitchener
Fanshawe College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	London
EPIC	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Mississauga
Durham College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Oshawa
Algonquin College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Ottawa
Centennial College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Scarborough
George Brown College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Toronto
Humber College	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Toronto
University of Toronto	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Ontario	Toronto
Cégep du Vieux Montréal	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Québec	Montréal
SIAST	LEED Green Building Strategies and Green Associate study course LEED Canada for New Construction 2009	Saskatchewan	Moose Jaw

Table1: Post Secondary institutions offering Green Building related courses (CaGBC, 2014)

INSTITUTION	PROGRAM
Brandon University	Master in Rural Development
British Columbia Institute of Technology	Master of Engineering in Building Science
	Master of Applied Science (specializing in Building Science)
Carleton University	Master of Arts / Master of Applied Science / Master of Engineering in Sustainable Energy
Concordia University	Master of Science in Geography, Urban, and Environmental Studies
	Master of Environment in Environmental Assessment
Dalhousie University	Master of Laws (environment)
	Master of Arts in International Development Studies
	Master of Environmental Studies
	Master of Resource and Environmental Management
Lakehead University	Master of Environmental Studies in Northern Environments & Cultures
	Master of Environmental Studies in Nature-based Recreation and Tourism
McMaster University	Master of Arts or Master of Science - Geography & Earth Sciences
McGill University	Master of Laws (environment)
	Master of Science (environment)
Memorial University	Master of Arts - Environmental Policy
	Master of Environmental Science / Master of Science - Environmental Science
	Master of Applied Science in Environmental Systems Engineering and Management
Nipissing University	Master of Environmental Studies
	Master of Environmental Science
Queen's University	Masters in Applied Sustainability
	Collaborative Masters in Applied Sustainability
	Master of Environmental Studies
Royal Roads University	Master of Environment and Management
	Master of Arts / Master of Science in Environmental Practice
	Graduate Certificate in Sustainable Community Development
	Master of Arts in Environmental Education and Communication
Ryerson University	Graduate Certificate in Sustainability Management
	Master of Environmental Applied Science and Management
Simon Fraser University	Master of Urban Studies
	Master of Arts / Master of Science in Geography
	Master of Resource and Environmental Management
	Master of Resource Management (Planning)
	Graduate Certificate in Development and Sustainability
Thompson Rivers University	Master of Science in Environmental Science
Trent University	Master of Arts in Sustainability Studies
University of Alberta	Master of Business Administration in Natural Resources, Energy, and Environment
University of British Columbia	Master of Arts / Master of Science in Interdisciplinary Studies
	Master of Arts in Resource Management and Environmental Studies
	Master of Arts / Master of Science in Community and Regional Planning
	Master of Laws (environment)
University of Calgary	Master in Environmental Design
	Master of Science in Sustainable Energy Development
University of Guelph	Master of Science in Capacity Development and Extension
	Master of Science in Food, Agricultural, and Resource Economics
	Master of Landscape Architecture (sustainability)
University of New Brunswick	Master of Environmental Management
University of Northern British Columbia	Master of Natural Resources and Environmental Studies
	Master of Science in Natural Resources and Environmental Studies

	Master of Arts in Natural Resources and Environmental Studies
	Master of Arts / Master of Science in Interdisciplinary Studies
University of Prince Edward Island	Master of Science in Environmental Sciences
University of Saskatchewan	Master of Environment and Sustainability
	Master of Sustainable Environmental Management
University of Toronto	Master of Environmental Science
University of Victoria	Master of Arts / Master of Science in Environmental Studies
University of Waterloo	Master of Environmental Studies
	Master of Environmental Studies (Planning)
	Master of Applied Environmental Studies (Planning)
	Master of Environmental Studies
	Master of Environmental Studies in Sustainability Management
	Master of Environment and Business
	Master of Environmental Studies
University of Western Ontario	Collaborative Environment and Sustainability Program
	Masters in Environment and Sustainability
University of Windsor	Master of Science in Environmental Science
University of Winnipeg	Master of Arts in Environmental, Resource and Development Economics
Vancouver Island University	Master of Arts in Sustainable Leisure Management
York University	Master in Environmental Studies

Table2: Post Secondary institutions offering grad programs in sustainability (Source: College of Sustainability, Dalhousie University: http://www.dal.ca/faculty/sustainability/programs/futurestudies/cdnprogams.html)

TRAINING SUSTAINABILITY PROFESSIONALS

There are many Canadian Post Secondary (PS) institutions offering courses related to green building, and sustainability (CaGBC, 2014). Table 1 shows the courses and the PS institutions offering sustainability related (LEED) courses in Canada.

There are many Post Secondary Institutions offering graduate programs with sustainability major/focus in Canada as shown in Table 2. Whereas, there are very few PS institutions offering diploma and degree programs in sustainability domain.

There are very few PS intuitions offering undergraduate programs in sustainability domain in Canada, a few institutions are University of British Columbia, University of Waterloo, Ryerson University, University of Saskatchewan, Lakehead University and Royal Roads University.
Sustainability training requires hands-on and applied education to train professionals for industry who could add value to sustainability practices. The training should include core competencies identified by the industry and provide opportunities for inter-disciplinary learning within an institution to train career ready graduates.

Case For A Degree Program In Sustainability

Governments and environmental agencies should apply construction codes and other environmental policies to improve sustainability in the building sector (Pitt *et al.*, 2009). The other stakeholders also need to have a serious level of effort and commitment. For this reason, entities involved in the construction industry must be proactive in creating environmental, social and economic indicators, which bring about building sector sustainability and promote the use of sustainable construction practices in both developed and developing countries (Ortiz *et al.*, 2009). For supporting and encouraging the sustainability practices in industry, it is vital for academic institutions to train professionals with required competencies. Academic institutions are the backbone for supporting sustainability practices in industry. As indicated earlier, there are numerous programs at grad level with focus on sustainability, however the programs are deemed as theoretical (pure academic) programs only. The industry's need for sustainability professionals demands that the academic institutions train students in an interdisciplinary and applied educational environment.

A polytechnic institution offers a range of technology programs. The variety of technology programs presents the wealth of expertise and knowledge base that belong to the polytechnic institution (Arain and Hoffmann, 2009). Sustainability is a mutli-disciplinary domain, requiring expert knowledge in related aspects of sustainability. The mutli-disciplinary nature of sustainability training makes it a natural fit for a polytechnic institution where all

expertise could be brought together to train professionals with sustainability expertise for industry.

A polytechnic institution attracts a diverse group of life-long learners through a practical, hands-on and outcomes based approach to education. For training professionals in sustainability domain with appropriate skillset that industry needs, institution has to be a hub of technical and soft-skills required for training sustainability professionals.

An emerging academic discipline, Sustainability is an area where industry needs skilled graduates in both North America and internationally, and the needs are expected to grow in the future. The context for development of a comprehensive baccalaureate program in sustainability is the strong ties that usually exist between a polytechnic institution and the construction industry. Polytechnic institution relies on their industry advisory committees to help determine competencies required by the industry.

The proposed degree program in sustainability will be a unique degree program in Canada. Its development will involve extensive research, analysis of comparable local and global programs, identification of program outcomes, a comparison of program outcomes with employability skills, curriculum development, and internal and external review processes. Eventually the degree program will be applied, hands-on and address the core competencies identified by the industry.

The proposed sustainability degree program will be a technologically enriched; laptop delivery program constructed around the unifying framework of program outcomes/ competencies. Program competencies will be the defining feature of the proposed degree program. Program competencies will be defined by an Industry Focus Group consisting of industry and academia experts from various related disciplines. The industry focus group's involvement will be vital in defining the program competencies and also validating the course level outcomes that would support the program outcomes.

In a polytechnic environment where the focus remains on hand-on and applied education, students from various related disciplines would be able to collaborate on the proposed interdisciplinary degree program to participate and learn on joint projects. Students will learn the core competencies in sustainability through numerous projects and case studies from local and global industries.

Conclusion

Sustainability is an interdisciplinary domain that involves all programs related to built environment. There is a growing need for construction professionals with sustainability skillsets, which are crucial for enhancing sustainability practices, especially given the growing complexity of construction projects and construction-related environmental law. Academic institutions have a responsibility to address this emerging need of the industry to support national economy.

The competence of an academic program in the core area of sustainable built environment is in imparting to its students the necessary expertise to practice professionally for promoting and enhancing sustainability practices at every level of the industry. The paper identifies the need for an academic program in sustainability in Alberta, Canada. The paper also identifies emerging trends in sustainability practices in the industry. This forms the basis for a proposed academic program for training professionals to address emerging needs of the industry in the sustainability domain.

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