PMI INDONESIA CHAPTER

11th Edition January 2012

Excellentia

Project Management Newsletter

Meeting

Meeting with Ngee-Ann-Adelaide Education Center

@ Jakarta - November 17, 2011

PMII held meeting with faculty staff of Ngee-Ann-Adelaide Education Center, to explore the possibility of event collaboration and to gain support to chapter's next international symposium (SymEx 2012).

OMM

OMM #30 "SymEx Post Event"

@ Jakarta - December 21, 2011

In this end-of-year event, participants who did not attend the SymEx 2011, got the second chance to learn from the speakers, and gained the post-event review. We brought back Mr. Amin Leiman, PMP, CISA to talk about "Using Appreciative Inquiry to Empower Your Project", and Dr. Ir. Hari Gumuruh Soeparto, MT, PMP with "Strategy Driven Project Management: a solution to today business environment".

Seminar

Seminar Manajemen Proyek - Kolaborasi 5 Asosiasi

@ Jakarta – December 20, 2011

Seminar bertajuk "Managing Oil and Gas to Fulfill Energy Demand" dilangsungkan di Gedung Dewan Energi Nasional (DEN) Jakarta. Acara ini terselenggara berkat kerjasama dari lima asosiasi yaitu Komunitas Migas Indonesia (KMI), PMI Indonesia Chapter, IAMPI, ITAPPI dan Energy Nusantara. Acara berlangsung meriah dan peserta yang hadir adalah praktisi di bidang Energi & Migas, juga kalangan akademisi.

Meeting

Meeting with Curtin Perth University

@ Jakarta – December 1, 2011

After various occasions with Curtin University, we welcomed the faculty staff of Curtin Perth, Associate Professor Simon Leunig, Associate Professor Lina Pelliccione and Education specialist Patricia Kelly, who came for short visit to Jakarta. During the very short yet fruitful meeting, we discussed the plan of Project Management Goes to Campus program on their next visit.

Exam Prep

PMP/CAPM Exam Prep Session

@ Jakarta - December 21, 2011

PMI Indonesia melaksanakan sesi exam prep pada tanggal 21 Desember 2011, yang bertempat di Auditorium Microsoft Indonesia. Sesi ini merupakan kegiatan regular yang dilakukan sekitar 2 bulan sekali dengan tujuan untuk membantu kandidat yang akan mengambil ujian sertifikasi PMP atau CAPM.

Exhibition

Education Fair

@ Jakarta - January 15, 2012

PMI Indonesia Chapter collaborated with Curtin Sydney & Curtin Singapore participated as exhibitor in Connex - EDLink Education Fair. The participants who had interest in pursuing continuing education in project management area had many questions related to the importance of degree and certification for their future career.

Pembaca yang terhormat,

Edisi ke sebelas dari newsletter Excellentia bulan Januari 2012 adalah edisi pertama yang terbit di tahun 2012. Materi terdiri dari tulisan mengenai Carbon Management in Building Life Cycle dan juga laporan dari beberapa kegiatan PMI Indonesia Chapter selama bulan December. Saya ucapkan terima kasih kepada para pihak yang menyumbang tulisan dan juga kepada pihak yang telah membantu mewujudkan terbitnya newsletter ini. Kepada para pembaca saya ucapkan selamat membaca dan semoga bermanfaat bagi anda.

Atas nama team redaksi Newsletter Excellentia
Erlangga Arfan, PMP

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Newsletter Excellentia direncanakan diterbitkan sebulan sekali. Redaksi newsletter menerima kiriman tulisan dari pembaca. Silakan mengirimkan pertanyaan lebih lanjut atau tulisan anda ke email redaksi@pmi-indonesia.org. Isi dari tulisan-tulisan yang dimuat merupakan tanggung jawab dari penulis masing-masing.

PMI Indonesia Chapter

The Project Management Institute of Indonesia was founded in 1996 and is an organization dedicated to enhancing, consolidating and channeling Indonesian project management knowledge and expertise for benefit of all stakeholders. This organization is one of the chapters of Project Management Institute (PMI), a nonprofit, worldwide leading professional organization. Our members and credential holders span numerous industries, businesses and many of the Indonesian leading corporations as well as nonprofit institutions.

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Carbon Management in Building Sector

Alin Veronika, ST, MT, PMP

Introduction

Global warming as a result of increasing atmospheric concentration of greenhouse gases emissions (GHG) which are associated with the consumption of energy of human activities, has become a dramatically urgent and serious problem. Recognizing as the most pressing environmental, social, and economic problem facing the Earth, global warming has global and long-term consequences. Moreover, the enormous impacts of the global warming take important position in the public awareness. Many nations both in developed countries and developing countries started to take action to address the challenge of this problem. For instance, in 1988, two United Organizations (the World Meteorological Organization and the United Nations Environment Programme) established The International Panel on Climate Change (IPCC) to assess the scientific, technical and socioeconomic information relevant for the understanding of the risk of human-induced climate change. In 1992, continued by opening the Framework Convention on Climate Change (FCCC) at the Rio Summit, and the Kyoto Protocol in December 1997 which is an international treaty aimed at preventing potential dangerous anthropogenic interference with the climate system.

As one of the major industry, construction industry produces gas emission directly and indirectly from various activities (Goldenberg 1998). Over the last decades, many studies proved that construction industry uses high-energy in its activities and produces global greenhouse gas emissions, ecological destruction, and resource depletion (CICA 2002, Melchert 2007, Zimmerman et al. 2005). The construction sector in the U.S. has the third highest GHG emissions among the industrial sector (U.S. EPA 2008), and according to the statistics provided by the U.S. Census Bureau (2003), the building construction industry consumes about 40% of energy which is almost similar in the U.K where energy use associated with building nearly 50% of all primary energy used.

Buildings emit enormous GHG throughout their whole lifecycles, and many aspects and stages of building development and utilization impact their energy and environmental performance, from planning, design, construction, commissioning, operation and maintenance. This paper aims to present the state of the art of the carbon management research related to the building sector over the past decades. Firstly, this paper provides an overview carbon emissions in building construction, which is followed by reviewing studies of life cycle assessment. Then the review systematically explores the carbon reduction in construction. Finally, some conclusions and recommended further research are drawn in the last section.

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Carbon emissions in building construction

Aiming at providing useful information about carbon emissions in building construction industry, many researchers have studied energy consumption through buildings life cycle and they concluded that each buildings life cycle had different effects (e.g. Bevington 1990, US. EPA 1994). Carbon emissions are commonly expressed depending on the life cycles stages included, i.e.: planning, design, construction and installation to test, commissioning, operation and maintenance (Marta Gangolells et al 2009). EMSD (2007) categorized this major life cycle of construction into the following phases: 'cradle to entry gate', 'entry gate to exit gate' and 'exit gate to grave'. Otherwise, Sodagar and Fieldson (2008), for the purpose of carbon emission, have been represented those whole lifecycles in three distinct stages, i.e. the initial impact covers from the content of materials to construction process; operational Impact starts from operational phase to maintenance; and the end of life impact occurs to deconstruction process until waste materials.

According to this above categorization, the carbon emissions in construction studies which are portrayed in figure 1, are reviewed in the following by five groups: the studies on emissions in planning and design phase, materials (embrace all manufacturing and transportation) and construction process phase, operational phase, maintenance and renovation phase emissions, deconstruction and disposal waste materials phase.

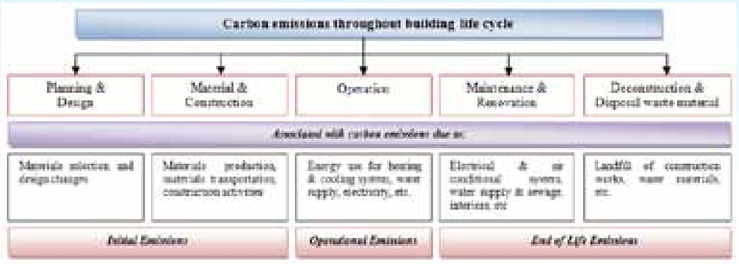

Figure 1. Carbon emissions in building life cycle

Based on figure 1, the planning and design process is the first phase of the carbon life cycle for buildings. Data used at the planning and design phase will prove valuable at the later phase, such as materials transportation phase. At this early stage, the activities involved are choice of material used in construction (González and Navarro 2006), choice of technology and construction method, define work tasks, estimate of the required resources and durations for individual tasks, and identify of any interactions among the different work tasks (Hendrickson and Tung 1998). Hendrickson and Tung (1998) and G.P. Gerillaa 2007) believed that at planning and design phase could be fine way to reduce carbon emissions in buildings industry by using a correct selection of materials and technology.

The carbon emission in materials and construction phase as a result of the extraction and processing of raw materials, construction materials production, and materials transportation in between processes and on-site installation, and transportation of construction waste to landfill, has a substantial impact to environment (G.P. Gerillaa (2007, Adalberth and Almgren 2001). Junnila (2004) found that carbon emissions in construction process are generated by transportation of materials to site, use of construction equipment on site, use of energy in materials installation processes and the transportation of construction waste to a landfill. Furthermore, Adalberth (1997) stated on his research in Sweden that 70-90% of the environmental impact arises from occupation phase during the life cycle of building from manufacture of construction materials through demolition.

Regarding operation phase, Dobbelsteen et al. (2009) found that, for the case of office buildings, energy consumption during building operation accounts more than three-quarter of the environmental load, whereas the use of building materials is responsible for nearly one-fifth. Suzuki and Oka (1998) defined that the operational phase emissions are generated by utilities such as electricity, gas, water supply and sewage, heating and cooling system, and others. By using a case study of office building in Japan, they determined that energy used in the operational stages is approximately 90% and 80% of the total carbon emissions in maintenance phase.

Studies related to carbon emissions in maintenance and renovation phase (Adalberth and Almgren 2001, Scheuer et al 2003) found that the carbon emissions of this phase are mainly due to energy consumption for purposes of heating, cooling, lighting and operating domestic or commercial appliances; and materials use for purposes of facilities maintenance/upkeep, which may account for 70-90%.

Construction industry consumes worldwide about 40% of all raw materials which nearly the same amount of materials end up in landfill as construction waste (Koroneos and Dompros 2007). According to environmental Hong Kong (2002), in 2001 construction industry contributes nearly 40% of the wastes reaching landfill. Furthermore, Fieldson et al (2009) who applied the Guaranteed Maximum Carbon (GMC) approach to estimate the whole life emissions, categorized deconstruction process and waste materials process into the end life impact of building life cycle, where the use of demolition equipment and the transportation of demolition waste to landfills be a factor marginally to the total life cycle environmental impacts of buildings (Adalberth and Almgren 2001, Junnila et al 2006). Additionally, disposal waste in buildings construction is generated by refurbishment, dismantling or demolition (EEA 2002). Due to a large amount of waste materials which is produced by disposal of buildings, it is fully necessary to use reuse or recycling materials method and eventually can reduce carbon emissions in buildings industry.

The above studies related to energy consumption and carbon emissions during life cycle show that operational phases produces the highest emissions among other phases, following by materials and construction process phase. Although there are limited studies that discussed about the emissions in early stage (planning and design stage), this phase plays a significant role to reduce the emissions since the materials that will be used in construction process, are determined in this phase. In order to evaluate the impact to environment of construction works, buildings life cycle assessment is the appropriate method as can evaluate the energy consumption and carbon emissions whole buildings life cycle. To know more about the great efforts of building's researchers and professionals in reducing carbon, the next section will discuss previous studies related to its performance.

Life cycle assessment in building construction

Regarding carbon emissions due to each phase of construction activities, life cycle assessment (LCA) should be adopted, where have been used broadly since 1990 to calculate energy consumption and carbon emissions. Over the past ten years, both researchers and professionals have been performed studies using either case study in their country or survey method to analyze carbon emissions caused by construction industry. Many studies defined that LCA itself is a method to evaluate the environmental load of processes and products both goods and services through their life cycle from cradle to grave (EEA 2002, Taborianski 2004, Fava 2006, USEPA 1993, Sonnemann et al 2003, Fava 2004).

As a tool to evaluate of the environmental impact such buildings industry, LCA provides assessment energy consumption all along the life cycle from cradle to grave, namely, from raw materials purchasing, materials manufacturing and distribution, use and maintenance to disposal of waste materials (Raymond). Moreover, McDonough and Braungart (2002) on their research defined that the major phases of cradle to grave life cycle are raw material extraction, manufacturing, build, use and disposal of waste, which mostly the materials will be thrown away after disposal and their value is considered as zero. Since cradle to grave life cycle starts from material extraction 'cradle' and ends at materials disposal 'grave', Steffen (2006) described this concept as a linear or one way process, and the useful materials at the end of product's life are just directly discarded at landfill as waste materials (Bisset 2007, U.S. Green Building Council 2005). Furthermore, the process to deliver the materials waste to landfill will consume high energy; eventually will increase the carbon emissions.

Based on the above situation, Braungart et al (2007) developed a new variant concept namely 'cradle to cradle' which changes the linear flows of material to a cyclic process (Miyatake 1996), and eventually nothing will go to waste, by regenerating previously depleted materials into useful and valuable materials (Tischner et al 2001). Therefore, by increasing the reuse and recycling processes, buildings construction industry becomes less dependent on raw materials, and the value of materials is designed to be upgraded or maintained. Braungart et al (2002, 2007) who called cradle to cradle concept as eco-effectiveness on their studies, stated that this concept integrates products with environmental health, economic growth and social development. Moreover, this concept also designs materials flowing within different products' life cycles, because using materials in another product's cycle may be more efficient than sending it back to its own cycle (Kibert 2008). In the end the buildings industry can reduce carbon emissions by recovering valuable materials from buildings at the end of their life (Shakantu et al 2002, Klőpferr 2006). The above review of cradle to grave and cradle to cradle concept is summarized and portrayed in figure 2.

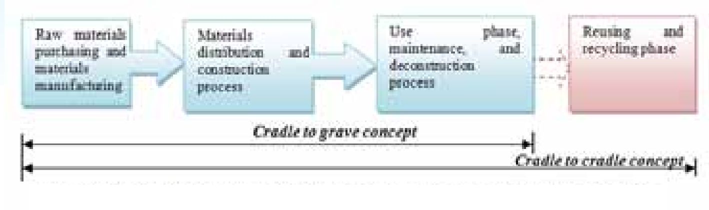

Figure 2. Comparison two life cycle assessment methods in construction sector

Since construction industry produces aforementioned significant amount of waste, it is genuinely important to reduce this waste by using reuse and recycle approach. Because the growing number of new materials that use in construction will become a problem because it threatens to result in increased resource use and waste emissions (Braungart et al 2007), besides manufacturing new products, resources which embrace all raw materials and energy, are constantly consumed since those zero value products cannot be reused or recycled. Furthermore, in long-term perspective, cradle to cradle (C2C) concept has a capability to maintain and upgrade the value of materials by reusing and recycling waste materials or designing waste materials into different products' life cycles, thus, can generate a positive relationship with ecological health and abundance, and long-term economic growth (Braungart et al 2007).

Carbon reduction in construction stage

The aforementioned environmental impact of the construction industry is extensive and readily identifiable. Therefore, the construction industry must be responsible to the environment as well as our future generations. In order to reduce this impact, life cycle analysis (LCA) has proposed as a proper method to evaluate the energy use and CO2 emissions due to construction activities which embraces all buildings life cycle.

The cradle to gate concept is a term used in LCA, where starting from raw materials (cradle) to manufacture and construction phase, use phase and finally to the disposal phase (grave). On the other hand, concerning to rapidly deplete of natural resources, Cradle to cradle have developed as a variant of LCA, where the end-of life disposal step for the product is actually a return to the original raw material or another product. Since each phase of building life cycle has different impacts to environmental, the assessment should begin at planning and design phase and continue until either disposal phase or reusing/recycling phase. Furthermore, it is worthwhile to notice that none of the five phases is separated from the others; there is considerable overlap among them indeed. For instance, the output data from the design process becomes the input for the materials and construction stage, and so forth.

According to the categorization as mentioned in figure 1 and figure 2, the carbon reduction management in construction studies are reviewed in the following by five groups: 1) Design; 2) Materials production; 3) Materials distribution and construction process; 4) Facility usage, maintenance and demolition; 5) Reusing and recycling.

About Author

Alin Veronika, ST, MT, PMP is an independent consultant and a researcher who did many researches about construction and project management topics. When she worked as a research assistant in The University of Hong Kong and she did a research about carbon management in building industry which part of her research can be read in this article. She enjoys being active to contribute her research and knowledge to Construction and Project Management community by publishing 2 books about project management and corporate performance, more than 30 articles in international and national conference and journal.

Up Coming Events

- **Call for Volunteer session, Jan/25**
- **PMI Philippines Technical Session, Feb/4 @ Manila, Phillippines**
- **PMI Roadshow to Newmont Nusa Tenggara, Feb/9 @ Mataram, NTB**
- **PMI Visit to Curtin University, Feb/13 @ Perth, Australia**
- **Member Gathering, Feb/25 @ Jakarta**
- **PMP/CAPM Exam Prep, Feb/29 @ Microsoft, Jakarta**
- **OMM #31 "Agile Project Management", Feb/29 @ Microsoft, Jakarta**

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