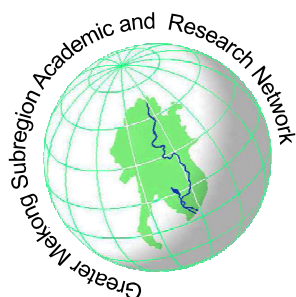


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GREATER MEKONG SUBREGION ACADEMIC AND RESEARCH NETWORK (<http://www.gmsarn.com>)

The Greater Mekong Subregion (GMS) consists of Cambodia, China (Yunnan & Guangxi Provinces), Laos, Myanmar, Thailand and Vietnam.

The Greater Mekong Subregion Academic and Research Network (GMSARN) was founded followed an agreement among the founding GMS country institutions signed on 26 January 2001, based on resolutions reached at the Greater Mekong Subregional Development Workshop held in Bangkok, Thailand, on 10 - 11 November 1999. GMSARN was composed of eleven of the region's top-ranking academic and research institutions. GMSARN carries out activities in the following areas: human resources development, joint research, and dissemination of information and intellectual assets generated in the GMS. GMSARN seeks to ensure that the holistic intellectual knowledge and assets generated, developed and maintained are shared by organizations within the region. Primary emphasis is placed on complementary linkages between technological and socio-economic development issues. Currently, GMSARN is sponsored by Royal Thai Government.

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The Effect of $\text{SiO}_2/\text{Al}_2\text{O}_3$ Ratios on the Properties of Geopolymers Prepared from Water Treatment Residue (WTR) in the Presence of Heavy Metals

N. Waijarean, S. Asavapisit, K. Sombatsompop, and K.J.D. MacKenzie

Abstract— The aim of this research was to develop a solidification binder using water treatment residue (WTR) as the aluminosilicate source and black rice husk ash (BHA) as a source of silica. The binder was prepared to obtain $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio of 1.78 and 2.00 and was activated with NaOH using $\text{Na}_2\text{O}/\text{SiO}_2$ equals to 0.25. Electroplating sludge (EPS) were added to the binders at 30, 50 and 70% by weight. The geopolymer synthesized with $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio of 2.00 gave higher strength than that at 1.78 at all curing duration. The addition of EPS at increasing amounts resulted in a reduction of strength. XRD revealed the presence of sodium aluminium silicate hydrate, and sodium zinc silicate, sodium iron silicate oxide and sodium aluminum hydroxide chromium oxide in geopolymer matrices, while an FTIR vibration band related to the geopolymer product shifted to 1002 cm^{-1} .

Keywords— Black rice husk ash, Geopolymer, Water treatment residue, Strength, XRD, FTIR

1. INTRODUCTION

Geopolymers (GPs) are inorganic materials that can be synthesized from a variety of industrial by-products and wastes, including sludge from water treatment plants, blast furnace slag, coal fly ash, mining waste and steel slag. They are formed by alkaline activation with controlled water content and suitable molar compositions [1]. The Si/Al ratios of the starting material play a key role in geopolymerization process and the geopolymer properties. MacKenzie et al. (2007) have reported that optimal properties of the products are achieved with the molar ratios in the range $\text{SiO}_2/\text{Al}_2\text{O}_3 < 3.3$, $\text{H}_2\text{O}/\text{Na}_2\text{O} < 10$ and $\text{Na}_2\text{O}/\text{SiO}_2 < 0.3$ [2-4]. Geopolymer technology is useful for utilization of wastes streams to produce materials that are more environmentally-friendly than ordinary Portland cement (OPC), and have a number of other applications such as the immobilization of toxic and radioactive wastes, or thermal insulation of buildings [5].

Water treatment residue (WTR) is a waste product from water treatment plants. It contains high proportion of clay minerals, principally kaolinite, in addition to aluminium and iron salts. Two hundred tons of WTR are

generated per day and disposed of directly into landfills. Due to the high cost of disposal process, reuse of WTR for the manufacturing of ceramics and bricks has been considered as an alternative to dumping in landfills. Its major chemical components especially silicon and aluminum could make WTR a suitable raw material for geopolymer production [6].

Rice husk is a by-product available in rice-producing countries. It is widely used as a biomass fuel in rice mills and electricity power plants by burning the husks under controlled conditions [1-2]. Such combustion processes produce on average about 18% rice husk ash (RHA), either as black husk ash (BHA) with a high carbon or white husk ash with a low carbon. BHA consists of highly crystalline silica with a very large specific surface area (about $50\text{-}100\text{ m}^2/\text{g}$) [7]. RHA is a well-known pozzolan that can be used in building materials and other applications such as insulation material, a fuel supplement in the manufacture of OPC and fertilizer.

Previous research has focused principally on the production of geopolymers from raw materials such as coal fly ash, clay minerals, and blast furnace slag [1-2, 6-8]. Very little work has been done on the use of WTR as the aluminosilicate source, with the Si/Al ratios adjusted with BHA. The goal of this research is to utilise two waste materials, WTR and BHA to develop a new cementing material with a potential application to immobilize heavy metals from an electroplating industry. The geopolymers under development would provide an environmentally-friendly approach to waste management by reducing the amount of waste disposed of in landfills.

2. EXPERIMENTAL PROCEDURE

Materials

The water treatment residue (WTR) is waste product obtained from a water treatment plant at Bangkaen, Bangkok Province, Thailand. WTR was thermally activated by calcining in an electric furnace at $800\text{ }^\circ\text{C}$ for 1 hour, and then ground to be retained on sieve no. 325.

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(45µm). The chemical composition of the WTR calcined at 800 °C determined by XRF is presented in Table 1. SiO₂ and Al₂O₃, were present in WTR at 54.00 and 30.40 % wt., respectively, with an initial ratio between SiO₂ and Al₂O₃ of 1.78. The crystalline phases of WTR calcined at 800 °C were determined by XRD to be quartz (JCPDF no. 03-065-0466) and mica (JCPDF no. 03-065-0466) (Fig. 1).

The black rice husk ash (BHA) used was a by-product from controlled burning of rice husks from a dried paddy factory in Nakompratom Province, Thailand. The rice husk was fired in a cyclonic furnace under controlled temperature above 850 °C for 1 hour to remove carbon and volatile organic compounds. The as-received BHA was ground in a Los Angeles abrasion machine for 6 hours to gain a particle size retained on a 45 µm mesh by wet-sieved less than 34%. The chemical composition of BHA determined by XRF is shown in Table 1. The high silica content (over 90% wt.dry) suggests that BHA

could be a good silicate source. XRD showed an amorphous phase of SiO₂ in cristobalite (JCPDF file no. 04-007-4907), in addition to some phosphide oxide (P₂O₅: JCPDF file no. 04-007-2296) (Fig. 1).

Electroplating Sludge (EPS) was brought from the electroplating facility located at Nongkham, Bangkok Province, Thailand. The EPS was generated from the waste water treatment plant by adjusting the pH of the wastewater to transform the soluble metals into metal hydroxide, followed by dewatering of the sludge. EPS was dried before reducing to a particle size less than 50 mm. The concentration of heavy metals in EPS was measured by atomic absorption spectrophotometry (AA-6300 series no. A305246). Zinc, iron and chromium were found to be the major metals present at 216.45, 81.8, and 22.40 mg/kg dry sludge, respectively.

Table 1: The chemical compositions of WTR and BHA

Content (wt% dry)	Elements as an oxide										%MC	%LOI	SiO ₂ /Al ₂ O ₃ ratio
	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	K ₂ O	CaO	MgO	TiO ₂	SO ₃	Na ₂ O	MnO			
WTR*	53.90	30.40	9.18	2.42	0.93	1.01	0.85	0.39	0.24	0.18	0.41	1.86	1.78
BHA	94.00	0.16	0.13	3.38	0.77	0.32	0.01	0.14	0.04	0.13	2.50	7.00	-

WTR* = WTR calcined at 800°C

%MC = % moisture content

% LOI= %Loss on ignition at 950°C

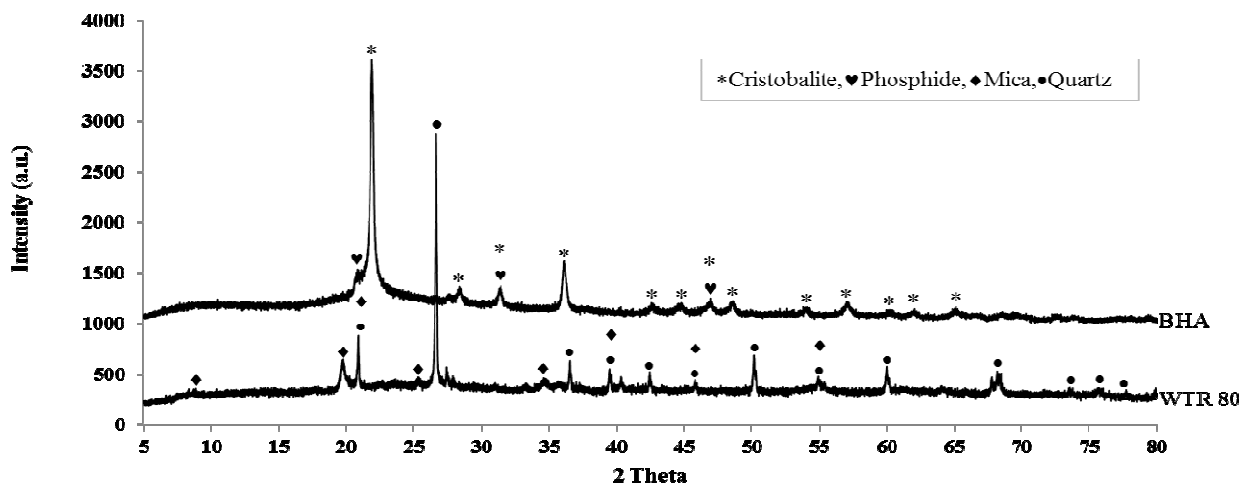


Fig. 1 XRD patterns of BHA and WTR

Geopolymer synthesis

The geopolymer were synthesized from calcined WTR. The molar ratio between SiO₂ and Al₂O₃ of WTR was adjusted from an initial ratio of 1.78 to 2.00 using BHA. EPS was added to the binders at the levels of 0, 30, 50 and 70% by weight. The proportions of each mixture are shown in Table 2. The water content of each mixture was determined by ASTM C187-68 [9]. NaOH was dissolved in the water before adding to the solid mixtures and mixed for 15 min. The homogenised mixtures were

transferred into cylindrical PVC molds, and shaken for 5 min to remove air bubbles. The samples were demolded after 24h, wrapped with cling film to prevent the loss of water from the mixture and allowed to cure at an ambient temperature of 29±2°C.

Compressive strength test

The cylindrical samples with an average diameter of 35 mm and height of 70 mm were determined by ASTM C39. The compressive strength was measured after curing for 7, 28, 42, and 60 days. Six replicates of each

sample were measured, to give a standard deviation in the range of ± 0.5 . The surfaces of all samples were flat and parallel. A fragment of the GPs after testing was retained for microstructural analysis.

Microstructural characterizations

The GPs samples were analysed using XRD, FTIR and SEM to study the mechanism of geopolymerization after curing for 28 days. Dried-powder of each sample was analysed under following conditions

1. The crystalline phases were examined by XRD (PAN alytical series X'Pert PRO) with a graphite monochromator and CuK α radiation source. The sample was scanned from 4 to 80° 2 theta at a rate of 0.04°2 theta step, at a counting time of 0.4s per step.
2. The functional groups of the GP were studied using FTIR spectroscopy (Perkin-Elmer, version 2000). The spectral data were collected in the range between 400 and 4,000 cm⁻¹.
3. The morphology characterization of the products were studied by SEM (JEOL JSM-6610LA) at 15 kV. All samples were coated with carbon.

3. RESULTS AND DISCUSSION

3.1 Effect of EPS on strength of WTR-based geopolymer

The strength development of WTR-based geopolymers with and without EPS is shown in Fig 2. The synthetic geopolymer prepared with SiO₂/Al₂O₃ ratio of 2.00 gave strength higher compared to those with SiO₂/Al₂O₃ ratio

of 1.78 at all curing time. It is generally known that at higher or lower SiO₂/Al₂O₃ ratio exhibits reduced strength due to the amount of unreacted SiO₂ or Al₂O₃ remaining in the sample [10]. Addition of EPS at increasing amount from 30 up to 70% wt causes a reduction of strength of geopolymer. The incorporation of a higher amount of EPS was associated with a decrement of the raw materials (WTR and BHA) for geopolymerization. Strength gain was caused by the dissolution of Si and Al from the aluminosilicate structure present in the WTR under highly alkaline conditions, resulting in a negative charge imbalance of the 4-coordinated Al; this imbalance was compensated by Na⁺ from NaOH, which led to the formation of aluminosilicate network [11].

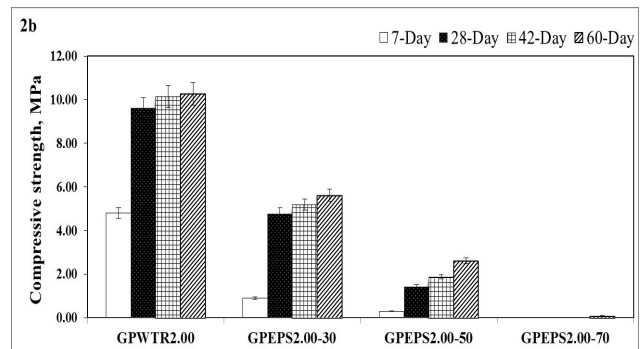


Fig. 2. Compressive strength of synthetic geopolymer incorporating various amounts of EPS; (a) without BHA and, (b) with BHA

Table 2: Proportions of geopolymer mixtures

Sample ID	Binders (%wt. dry)			Activator NaOH (gram)	Molar Ratios		H ₂ O
	WTR	BHA	EPS		Na ₂ O:SiO ₂	SiO ₂ /Al ₂ O ₃	
GPWTR1.78	700	0	0	121.25	0.25	1.78	364
GPEPS1.78-30	490	0	210	84.87	0.25	1.78	273
GPEPS1.78-50	350	0	350	60.62	0.25	1.78	217
GPEPS1.78-70	210	0	490	36.38	0.25	1.78	213
GPWTR2.00	655	45	0	127.15	0.25	2.00	357
GPEPS2.00-30	458	32	210	89.00	0.25	2.00	266
GPEPS2.00-50	327	23	350	63.57	0.25	2.00	224
GPEPS2.00-70	196	14	490	38.14	0.25	2.00	215

3.2 Effect of EPS on microstructure of WTR-based geopolymer

XRD

Fig 3 shows the XRD patterns of geopolymers synthesized from WTR and BHA with different amounts of EPS at the age of 28 days. The peak of quartz (PDF no. 03-065-0466) is clearly presented as an unreacted component in all samples, while silicon oxide as cristobalite phase (PDF no. 04-008-7827) is only present in the geopolymer with a Si₂O/Al₂O₃ of 2.00, both with

and without EPS. The crystalline phase of muscovite (PDF no. 04-011-5121), vermiculite (PDF no. 00-060-0340), and aluminum silicate oxide (PDF no. 01-074-1976) are observed in the geopolymer product. It is possible that these aluminosilicate clay minerals are inactive for geopolymerization reaction. The apparent phase of sodium aluminum silicate hydrate (NASH: PDF no. 04-014-2162) through faujasite (PDF no. 00-012-0246) in geopolymer product, indicating that the reaction between NaOH activator and aluminosilicate material under this condition occurred.

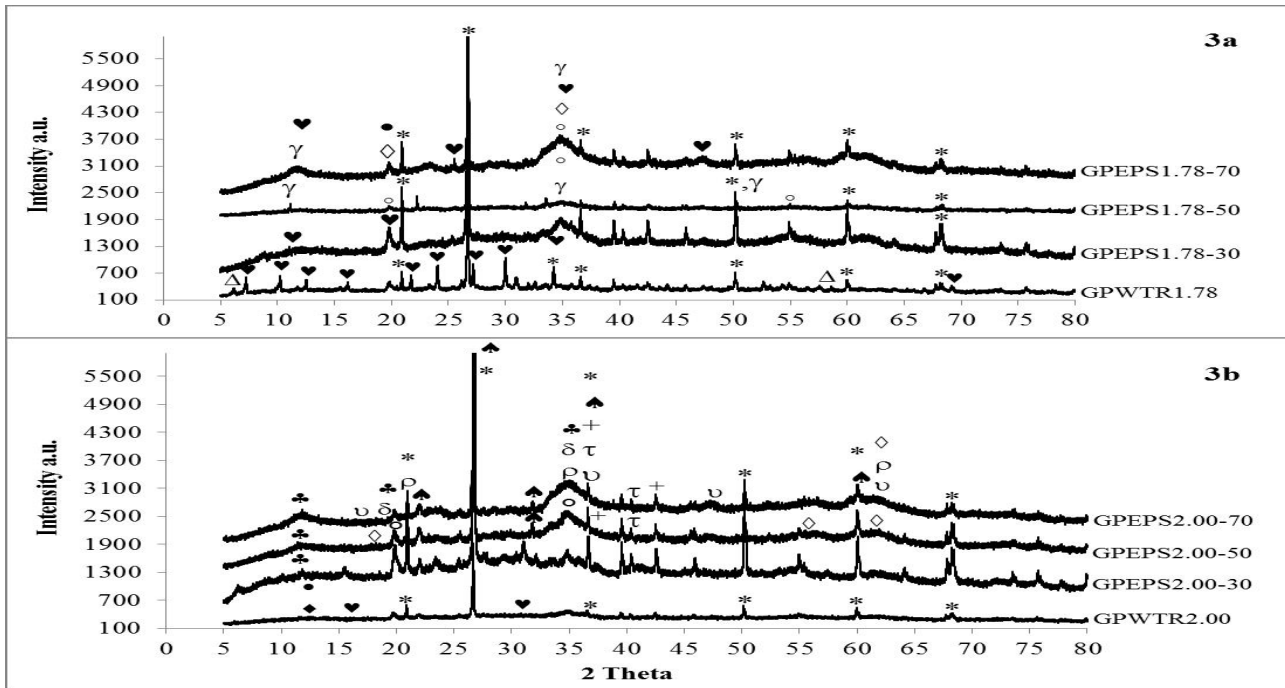


Fig. 3. XRD patterns of 28-day geopolymers incorporating various amounts of EPS; (3a) without BHA and (3b) with BHA. Key: *= quartz, •= aluminium silicate oxide, ♥= NASH, ♦= faujasite, Δ= vermiculite, ♠= cristobalite, °= sodium zinc silicate, ♣= Muscovite, += iron oxide, ◇= sodium iron silicate oxide, τ= zinc oxide, δ= sodium silicate oxide, ρ= sodium zinc silicate oxide, υ=sodium aluminum hydroxide chromium oxide, γ= sodium aluminium iron hydrate silicate.

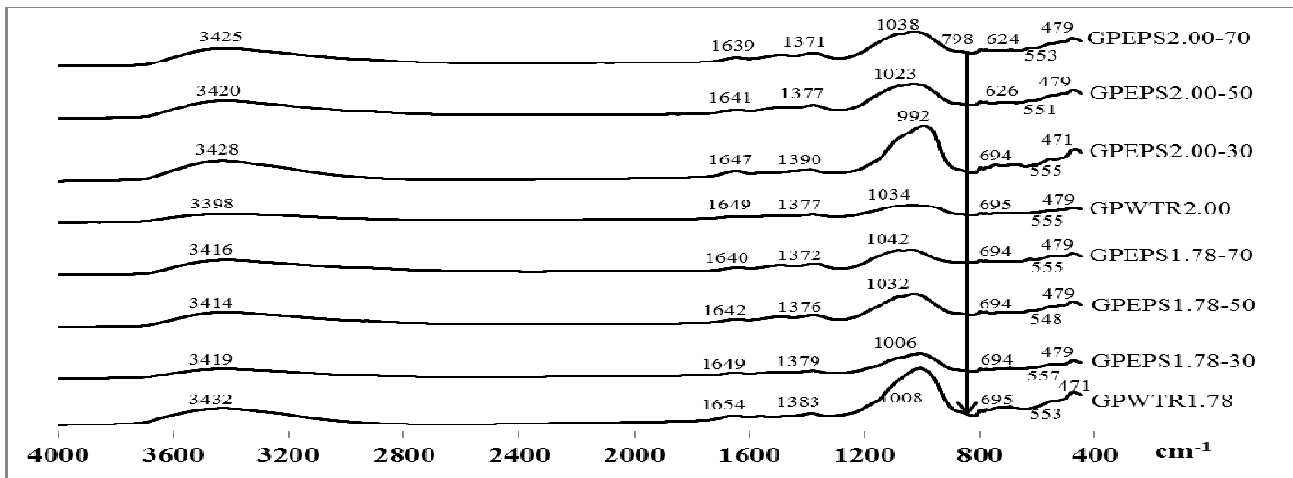


Fig 4 FTIR spectra of geopolymer synthesized with and without EPS

Table 3: EDS results of 28-day WTR-based geopolymer synthesized with 50% heavy metal waste.

Sample	% Mass of elements															
	Si	Al	Na	Zn	Fe	Cr	K	Mg	Ca	Ti	P	S	Cl	O	C	Total
GPEPS 1.78-50%	17.16	12.29	7.50	7.59	6.54	1.79	1.91	0.47	1.16	0.37	0.63	1.28	1.30	21.56	18.46	100

Other crystalline phases in the geopolymer products synthesized with EPS include sodium zinc silicate (PDF no. 00-030-1267), iron oxide (PDF no. 00-001-1223), sodium iron silicate oxide (PDF no. 04-002-8286), zinc oxide (PDF no. 04-014-0085), sodium zinc silicate oxide (PDF no. 00-019-1262), sodium aluminum hydroxide chromium oxide (PDF no. 01-077-0064), and sodium aluminium iron hydrate silicate (PDF no. 01-083-2369). These are indicative of insoluble forms of a heavy metal

waste incorporating into the aluminosilicate structure, implying that it is possible for these heavy metals to be immobilized in WTR- based geopolymer matrices [8, 12, 13].

FTIR

Fig 4 shows the FTIR spectra of geopolymer with and without EPS, which was reported in the wavenumber regions between 4000 and 400 cm⁻¹. The center of a

vibration band of all samples was shown dominantly in regions around 1000 cm^{-1} assigned to Si-O-T (T= tetrahedral Al or Si) due to associated solidification of geopolymer product [1]. The vibration bands at 3398 cm^{-1} and $1639\text{ to }1654\text{ cm}^{-1}$ were observed to correspond to the water molecule and the OH group, respectively [1, 8, 14-15]. Other bands at about 798 cm^{-1} indicate the presence of Si-O-Si and symmetric and asymmetric stretching of tetrahedral AlO_2 and SiO_4 units in the geopolymers [8].

SEM-EDS

The morphology characterization of the geopolymer product synthesized without BHA and with 50% EPS is shown in Fig 5. The inhomogeneity on the surface area after reaction with NaOH solution and curing for 28 days was observed. This is revealed in some areas of insoluble iron, zinc and chromium ion as determined by EDS analysis, which through XRD analysis was shown to be composed of a heavy metal hydroxide form. The heavy metal ions were retained in the geopolymer product with the percent mass of zinc, iron and chromium, which are reported in Table 3. It can be seen that the heavy metals were incorporated in the aluminosilicate structure, but the bonds on Al and Si tetrahedral building blocks in geopolymer were also unaffected. It may be cause due to the strength development in geopolymer matrix during geopolymerization [8, 11, 16-17].

4. CONCLUSIONS

This study indicates that the waste residues, WTR and BHA, are suitable raw materials for geopolymer synthesis, and is applicable to immobilize heavy metals from electroplating industry. The sample with Si/Al ratio of 2.00 without EPS and with 30% EPS were found to produce the greatest strength at all curing times. The reaction products identified by XRD including sodium aluminum silicate hydrate, sodium zinc silicate, sodium iron silicate oxide, sodium zinc silicate oxide, sodium aluminum hydroxide chromium oxide, and sodium aluminium iron hydrate silicate. GPs formation was confirmed by FTIR at the vibration band about 1000 cm^{-1} . SEM image shows the inhomogeneity on the surface of geopolymer synthesized from WTR with 50% EPS at the age of 28 days, which revealed retention of insoluble heavy meatlals in accordance with EDS analysis.

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Institutional Creativity of the Human Resource Management System (HRMS) in Ministry of Public Works and Transports

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Abstract— Institutional creativity in human resource plays critical role in the Ministry of Public Works and Transports' (MPWT) performances as it is the programme, policy or practice designed to influence changes in employees' attitudes and behaviours to fulfil its development goal of the ministry. This paper aimed at examining the existing performance management system and performance appraisal and its strengths and weaknesses. The creativity performance in MPWT context was mainly on the top-down practices in which significantly contributed to strategy improvement on human resource management, specifically on professional development. Performance management relies on trusts and reliability of peers and higher ranking personnel, however, problems existed on clearly measurement due to unacquaintance of appraisers. Thus, the 360 degree feedback is recommended for both performance appraisal and performance management.

Keywords— Human resources management system; Institutional creativity; Lao PDR.

1. INTRODUCTION

1.1. Rationale

Ministry of Public Works and Transports (MPWT) is a government organisation supporting the Lao Government to public services across the country. The effectiveness of human resource performance system influences the change of employee's attitudes and behaviours. Performance management at MPWT seemed to add values to its objectives enabling performance culture developed and maintained leading to the employees' rewards and contribution to the development. MPWT has not clearly shared visions of its strategic objectives; established the performance of each function, group and individual to ensure that the performance is aligned with their actual needs; and clearly linking the employees' performance evaluation to employees' development and rewards. The performance appraisal practice within MPWT has not really addressed the issues related to employees' professional abilities leading to personal development and rewards. For such reasons, it is important to examine the performance management and performance appraisal so that it can improve personnel development by providing continual training opportunities, creating fairer systems in recruiting people for appointment and promotion into public services and new wage system and other incentives: health care cover and bonus, organising and scheduling workload and output, setting priorities, creating a monitoring system for staff performance, better handling conflict and grievance with departments or inter-departments, which results in efficient public services delivery through improved organisational structures and procedures, and

creating a productive and motivated professional civil service adhering to high ethical standard.

1.2. Objectives

This study aims at firstly examining the perception of existing HRM system: performance management and performance appraisal practiced in the Ministry of Public Works and Transports and secondly identifying the strengths and weaknesses of both performance management and performance appraisal.

1.3. Scope of Research

The content of this research covers the evaluation of perception of existing leaders, managers and employees regarding to the performance management and performance appraisal, which includes compensation and benefits as these aspects are believed to be parts of institutional creativity leading to enhance human capital in MPWT. The study covered 3 major locations: Vientiane Capital, Bolikhamxay and Champasak. The target population was on directors and deputy directors of departments, head and deputy head of divisions.

2. LITERATURE REVIEWS

Human resource management (HRM) in an organization involves the policies and practices needed to carry out the staffing (or people) function of management. HRM helps the management process avoid mistakes and to get results. Therefore, the HRM manager's job in management process involves planning, organizing, staffing (human resource management), leading, and controlling [1]. HRM includes conducting job analyses, planning labor needs and recruiting job candidates, selecting job candidates, orienting and training new employees, managing wages and salaries, providing incentives and benefits, appraising performance, communicating, training and developing managers, building employee commitment, being knowledgeable about equal opportunity, affirmative action, and

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employee health and safety.

Theoretically, there are various ways to assess how well Human Resource Management System (HRMS) perform their roles. The organizational effectiveness and organizational capacity model as tool for measuring state management performance. Management is generalized as a process of managing the organization's internal elements for implementing a set of activities towards desired results under the changing and uncontrollable external environments for fulfilling the organizational objectives in line with its vision. The organization's ability to align its vision, goals, planning, activities and results is known as organizational effectiveness. [4]

2.1 Performance Management

Organisations require ever-improving performance to survive and prosper in today's competitive world. Individual and organisational performance improvements are the key to competitive advantage. Performance management is seen as "an interlocking set of policies and practices which have their focus the enhanced achievement of organisational objectives through a concentration on individual performance" [2]. "Performance management is to ensure that employee actions are linked to and add value to organisational objectives, that a performance culture is developed and maintained, and that employees are rewarded for their contribution and developed so that they can perform [3].

Performance management, as asserted by Stone 2002, p. 265], has the following key elements:

- The creation of a shared vision of the organisation's strategic objectives
- The establishment of performance objectives for each function, group and individual to ensure their performance is aligned with the needs of the business.
- The use of a formal review process to evaluate functional group and individual progress towards goal achievement
- The linking of performance evaluation and employee development and rewards to motivate and reinforce desired behaviour. Thus, performance management involves goal establishment, performance evaluation, employee development and reward. It provides the link between the organisation's strategic business objectives, employee performance, development and rewards and organisational results.

It is, therefore, important to note that performance management can have a significant impact on the success of an organisation through promoting cooperative effort towards common goals, encouraging teamwork and more open communications; increasing individual and group performance; and facilitating change [2]

2.2 Performance Appraisal

Performance appraisal can be viewed as an overall measure of organisational effectiveness since organisational objectives are achieved through the effort of individual employees. Performance appraisal of employees is a critical, dynamic and ongoing

management activity because managers are continually observing and judging their employees. It is noted that performance appraisal involves evaluating performance, communicating that evaluation the employee and establishing a plan for improvement. This evaluation process, as asserted by Stone [2002], may be formal or informal which has a direct impact on the employees' salary increase, promotions, terminations, training and career development or professional development. Dynamic performance appraisal program has its characteristics of goal establishment, performance feedback, and performance improvement. It is stated that good performance measurement is a necessity for effective feedback, while feedback in turn is also essential for a quality goal-setting program because it allows staff to see how well they are performing and helps them to set new goals. Setting goals without creating a way of measuring achievement is useless. Goal setting, if they are designed well, can be the powerful tools for increasing staff motivation and performance [2].

3. RESEARCH METHODOLOGY

The mixed research methods quantitative and qualitative were employed. For quantitative study, the author used cluster sampling approach selecting those directors of departments, heads of divisions, senior staff and technical staff with total of 100 persons. Where 8 directors of departments, 6 heads of division and 10 academic staff will be selected for qualitative study mainly based in the Ministry of Public Works and Transports' Headquarter.

For quantitative data analysis, the author used Statistical Package for Social Science Version 19 (SPSS 19) to seek for frequency, percentage, means and standard deviation. While qualitative data analysis, the author used content analysis after codification from MP3 and note-taking. The process of this interpretation all data collected will be transcribed managed in table of qualitative analysis.

4. RESEARCH FINDINGS

4.1 Respondents and Key informants

The result of this study has shown that there were male respondents more than female respondents which covered 62 persons and 28 persons respectively. It was indicated that most of the respondents were holding technical staff (62 persons), Deputy Head of Division (25 persons) and Head of Division (13 persons) respectively. Thirty respondents were holding Bachelor degree; whereas, twenty-one respondents had higher diploma, eighteen and eleven respondents were holding Master degree and diploma respectively. The result further revealed that most of the respondents had experiences and worked in MPWT over fifteen years. With respect to job responsibilities, most of the respondents in the survey had responsibilities for technical work (38 persons), then supervising or coaching (21 persons) while administrative (13 persons) and clerical work (8 persons)

4.2 Performance Management

The result from the analysis of performance management rating from 1 strongly disagree to 5, strongly agree and measured by means of 39 indicators or variables starting from: Mission is clear and energise employees; Strategic goals and objectives have focus and stretching; Owners defined for goals and objectives; Strategies are developed and resources allocated; Customers' needs are addressed; Output and outcomes are defined; Decision issues and decision process are used; Management culture is supportive; Measures flow from goals and objectives are developed by managers; Inventory of common measures is formalized resources provided; Responsibilities for data collection, reporting, analysis and posting are identified; Managers used measure to evaluate performance; Reward system are clear and consistent and reflective levels of success; Data resources are identified; Information systems are designed to support data collection and reporting; Pilot tests are conducted; Automatic or manual requests are used for periodic update; Data entry tabulation, summarization methods are documented for each measure; Data definition for common measure are followed; Reliability, timeless, accuracy, rapid access and confidentiality are addressed; Data are integrated; Analytical capabilities are developed; Results are analysed and validated; Management review results vs. expectations and make mid-course connections; Feedback is provided for continuous improvement; Activities of process owners used performance information for continuous improvement; Rewards and recognitions are based on results; Benchmarking and comparative analysis with best in class are done; Management feedback is provided; Performance is used to identify opportunities for reengineering and allocation of resources; Professional development of the staff is seen as an important aspect of management by the ministry; The personnel in this institution are very informal and do not hesitate to discuss their problems with superiors; The personnel are encouraged to take initiative and do things on their own without having to wait for instruction; The management of this institution make efforts to identify and utilise the special talents of the personnel; and Promotion decision of personnel are based on their suitability.

Quantitatively, it was found that PM was generally from good to excellent since the majority of respondents agreed and strongly agreed with the statements mentioned in performance management at 3.49 and 4.70, specifically, management culture is supportive and mission was clear and energise employees respectively. Whereas, it was found that female respondents partly agreed with the statements that Inventory of common measures is explored and balance scorecard or similar tools are used at 2.94 and 2.83 respectively.

Performance Management (PM) by job title: head of division, deputy head of division and technical staff found that the deputy head of division partly agreed with the statement that management culture was supportive at 2.76. The statements that the management of this institution made efforts to identify and utilise the special

talents of the personnel; and promotion decisions of personnel are based on their suitability were rated at 5.00 by heads of division while the deputy head of division only ranked 3.52 and 3.32 respectively.

It was found that PM by number of working years experienced strong disagreement by those under 1-5 years of working experience under the statements that strategic goals and objectives had focus and stretching; output and outcome were defined; inventory of common measures was explored; balance scorecard or similar tools were used; performance levels were reflective of resources; automatic or manual requests were used for periodic update; reliabilities, timeless, accuracy, rapid access and confidentiality were addressed; data are integrated; analytical capabilities were developed; promotion decision of personnel were based on their suitability, which were all rated at 1.00, which was contrary to those with more years of working experience as it could be seen that PM in the above statements were rated more and more according to the number of experience.

Qualitatively, the analysis of the performance management in the Ministry of Public Works and Transports (MPWT) was largely on system evaluation, and from top-down process rather than from multi-angled feedbacks which significantly contributed to the improvement of strategies for managing or leading human resources and supported professional development of personnel in MPWT.

4.3 Performance Appraisal

Based upon the performance appraisal on variable statements: The performance appraisal of personnel by the directors provides opportunities for staff to have clear understanding; the appraisal system provide the personnel effective feedback about their performance; the appraisal system helps directors to identify the needs of the personnel; the appraisal system provides opportunity for staff to communicate the support the needs from his/her senior to perform his/her job well; the appraisal system provides opportunity for self-review and reflection; the appraisal system encourages the directors and staff to have common understanding of the staff; the appraisal system has scope for reflection and assessment; the appraisal system encourages open communication between directors, staff and peers through performance review; the appraisal system aims at strengthening directors-personnel relationship through developing mutual trust; the appraisal system helps interested staffs to gain more insights into their strengths and weaknesses; the appraisal system has scope for communicating the institute plans and development goals to staff; the objectives of the appraisal system are clear to all staff; periodic orientation programmes are conducted to explain the objectives and other details of the appraisal system; the director generally spend time with their staff to discuss their performance; the director helps their staffs to plan their performance in the beginning of the year; discussion on key performance areas /key results/tasks between director and staffs is very educative; the director does a thorough join on self-appraisal in terms of reviewing reflecting and analysing

the factors affecting their performance; the performance review discussions are taken seriously by directors and sufficient time is spent on these discussions; the performance review discussion are conducted with high quality and care; efforts are made by directors to see that staff are objective in their appraisal system; the appraisal data are used as inputs for recognition and encouragement of high performers; and the appraisal facilities growth and learning in the institute both for the staff and the directors.

Quantitatively, it was found that the majority of respondents considered performance appraisal from neutral to high since they seemed to strongly agreed with the statements mentioned in performance appraisal activities while it was seen that the female respondents strongly agreed with the statements that the appraisal system helped directors to identify the needs of the personnel; and the appraisal data were used as inputs for recognition and encouragement of high performers at the rate of 5.00 as well as male respondents rating from 4.23 to 4.65.

Based upon the number of year of working experience, it was found that the respondents with 1-5 years of experiences rated the lowest in the performance appraisal system had scope for reflection and assessment at 1.00; and PA of personnel by the directors provides opportunities for staff to have clear understanding at 3.00 whereas they strongly agreed with the rest of the statements. Similar to PM, PA rating increase depends on the respondents' number of years of experience.

Qualitatively, the content analysis revealed that PA depends on trusts and reliability of peers and colleagues voting for the popularity and professional knowledge and competence for rewards and punishment, which was difficult to measure in case of unfamiliarity of the appraisers.

4.4 Strengths

Performance Management has been implemented high in clarifying and energizing its missions to employees, goal and objective definition, data management and identification, and information management.

Whereas, performance appraisal with clear objective and system emphasises on its implementation in terms of identifying needs of employees, providing opportunities for junior staff to communicate with senior ones and opportunity for self-review and reflection, encouraging the development of common understanding and communication between the top management and employees, correcting biases of directors to a review process, strengthening directors-personnel relationships through developing mutual trusts, assisting interested staff to gain more insights into his/her strengths and weaknesses, and having scope for communicating the MPWT plans and development goals to staff.

Moreover, there were periodic orientation programmes to explain the objectives and other details of PA, which includes the time the directors spent for discussion with staff, the plan they share at the beginning of the year, the indicative key performance areas, the high quality and care performance review discussion, the use of appraisal data as inputs for recognition and encouragement of high

performance, and the training of subordinates to cope with their personal bias and favouriticism

Inductive training implementation was totally accepted by staff, specifically on providing excellent opportunities for new staff to learn about MPWT, and the opportunity to transfer knowledge from seniors to juniors.

4.5 Weaknesses

Although majority of PM activities have generally been well-implemented, they were not well applied to the junior staff with one to five year of work experience in terms of providing the insight on strategic goals and objectives, output and outcome definitions, exploration of common measures, the use of balance scorecard reflective of resource performance levels, the addressed reliability, timeless, accuracy, rapid access and confidentiality, integration of data and developed analytical capabilities. In addition to PM, the PA system did not have scope for reflection and assessment for the above mentioned juniors.

5. DISCUSSION

The weaknesses of this study indicated that MPWT has not created the shared vision on the strategic objectives specifically the junior technical staff. They did not understand the process of the evaluation against their performance as described by Stone, 2002 that performance management is effective if there is a shared vision of organisation's strategic objectives at all levels. The linkage of employees' performance appraisal and employee development and rewards leading to motivate and reinforce desired behaviour and organisational cultures.

6. CONCLUSION

Quantitatively, it can be concluded that performance management were significant from neutral to high performance since the majority of respondents rated from 3.69 to 4.70 except for junior staff with 1-5 year of work experience.

Whereas, it can qualitatively concluded that the performance management was considered as top-down system rather than individual feedbacks. Although in some practices of PA and PM were based upon trusts and reliability of peers and colleagues, there was a risk in the practice as the people providing feedbacks may not be acquaintance to the individual appraisee.

7. RECOMMENDATION

PM in MPWT in some cases need improvement, especially among the junior staff in PM and PA practices. The implementation of both PM and PA should be conducted by sector and individual responsibility rather than inspector teams since 360 degree evaluation is needed and to avoid the consequences from unfamiliar biases.

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Socio-Economic Impact and the Adaptation of Boten People under Chinese Transnationality

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Abstract— This research paper is about Socio-Economic Impact and the Adaptation of Boten people under Chinese Transnational influences. Its aims are 1. To find out the transnational issues and the influences of Chinese capital in Laos: Boten 2. To study the socio-economic impact on Boten people. This paper uses qualitative research methodology by gathering information from documents and field research. Analyzed the information with Transnational Enclosure theory, Territorialization and Periphery framework.

The research finds out that the transnational enclosure and territorialization were acting and processing parallel at the same time. Chinese capital power spread its influences on economics and politics in Laos which is the strategic country that China can connect itself to South East Asia. China focuses on its national interest in Laos, especially in logistic strategy as the main route for Chinese products. Its influences slowly enclosed Laos local people's authority on their own spaces. Meanwhile, to reach its development goal, Laos' government did not act against these Chinese investments, instead, the government set up regulations to support and facilitate Chinese capital. Reteritorialization is an example. Laos government defined Boten district as a worthy connecting location between Laos and China. Thus, it specified Boten district to be a Special Economic Zone which would be managed by Chinese developers.

With this development plan, Lao government expanded its power over Boten community. Luangnamta province sent a number of officials to deal with Boten people. They had no choice, but to move their community to a new village where it is 10 kilometers apart from the former village. The former land then was an economic zone, not an agricultural land anymore. The territorialization for Boten district was to redefine the value of the location that it could be developed to be a significant economic zone which was better than leaving it unworthy as a paddy field.

Keywords— Chinese capital's influence, Lao, impact of development.

1. INTRODUCTION

Lao's development strategy since the 2nd National Economic and Social development plan (1986-1990) to the 7th National Economic and Social development plan (2011-2015) emphasized on Economic Development by promoting Foreign Direct Investment: FDI. Land-linked strategy and Battery of Asia strategy are important development strategies that attract huge amount of FDI such as Hydro power dam projects and Developing Logistic and Economic Corridors.

Until now, Chinese people are the majority of foreign investors in Lao. It has dramatically increased the investment projects since 1990s as Chinese investors have been investing around 800 projects, valued 3,900 million USD in Lao. The increasing number of Chinese investors in Southeast Asia was the effect from "Go West Strategy", "Go Out Policy" and "Go South policy". These policies aim to develop the periphery and indigent regions of China, especially, the West and the Southern part of China. Therefore, Yunnan and Guangxi are the strategic areas for those policies in order to connect China to Southeast Asia.

Chinese Investments in Lao are mainly in service

sector, logistic, mines industry, hydro power and agro-industry. For example, R3A road, which connected Yunnan and Lao, has a benefit on China in logistic strategy. China investors also invested in hydro power dam to produce electric and export to China to solve the electric deficiency of South China. In service sector, Chinese private investors invested in hotels, entertainment complex including Casinos such as Royal Jinlun in Boten, King Roman in Bokeo and Savan Vegas in Savanakheth. Moreover, they invested in agro-industrial in the model of contract farming. To conclude, China's "Go Out Policy" has been conformed with Lao development strategy in achieving the Lao's vision 2020, a promising year that Lao will be unnamed from Least Develop Countries. According to both countries' development strategies, Lao state and China state gained advantages from the investments of Chinese investors in Lao. Lao GDP indicators are rising, while China's investment abroad policy is reaching its target.

Nevertheless, those areas and lands that were invested by foreigners are not useless or wasted. It was once a living area for Lao people. Until Lao government allowed transnational capital to increase Lao economic development indicators, Lao government has allocated land, both useful and useless, to facilitate these foreign investors. For Boten case, the area was a living area and paddy rice field of Tai Lue people. However, Lao government allowed Boten Dankham Co.,Ltd. by Chinese investors to invest an entertainment complex in Boten in Special Economic Zone model. Boten SEZ will be rented by China developers for 30 years and can be

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extended to 90 years. Therefore, Tai Lue people in Boten were forced by their government to move the village to resettle in a new area, located 10 kilometers from their own land.

Former Boten village was just a periphery area which was far from state power and modernization. It was recognized when Lao government has identified a SEZ and a strategic area for trans-border trade and logistic. It is now a stop point of R3A road and the high speed train which will value up the SEZ. Boten then may gain its potential in being the center for trade and product distribution center. The changes are what Boten people have to face with either nowadays or in the future. How Boten people adapt themselves and what their disadvantage in development projects are the main questions for the aim of development in Lao.

2. PURPOSES

To explain the trans-boundary procedure and the expanding of Chinese influences in Lao: Boten village as the case study.

To explain the impacts and adaption of Boten people.

3. RESEARCH METHODOLOGY

This research applied qualitative research method by gathering information from literature review. Sources of information are from primary and secondary data in Thai and English. Collect field information by interviewing Lao officials and local people in Boten. Data has been analyzed to prove the theory and research to find a new conclusion from the area study.

4. THEORY

This article applied 3 theories: transnational enclosure, Reterritorialization and Marginalization. Transnational enclosure is the concept adopted to explain the context of International relations between China and Lao government. It also related to the influence of transnational capital that can expand its power over local community. Meanwhile, reterritorialization is the concept applied for Lao's new development strategy. In other words, reterritorialization is the process of re-identifying the meaning of a space from forestry area or unused area to develop to an economic area. Lastly, marginalization is used to explain the situation and the adaptation of the community which is directly affected by the development project.

5. TRANSNATIONAL ENCLOSURE AND RETERRITORIALIZATION IN THE DEVELOPMENT DISCOURSE

5.1 Lao government and development

Lao main stream development vision is to upgrade Lao from LDCs list. Its aim is modernization. Lao economy was once depressed in 1960s from the socialist strategy which has a pressure on Lao government in order to open the country and revise its economic policy. New Economic Mechanism (NEMs) was launched in 1986; it turned Lao economy to follow capitalism. Private and

Foreign capitals became the main income for Lao economy. Of course, the development after 1986 focused less on economic and social equality which are the cores of socialism, but it gave more attention on the growth and progressivity in Economic Indicators.

"Development" is the main principle for Lao government before NEMs, though the meaning is difference from "development" after NEMs. The former development focused on creating modern and equal society; shorten the differences between social classes by central-planned economy. Private ownership was posed by state as it was criticized in being the source of social classes and privileges. Lastly, socialist way could not reach its aim in economic and social sector because it was in an immediate process and lack of socialist fundamental. For "development" after NEMs, it was defined as modernization under capitalism. This time, private ownership and market-oriented system are the principle of development. This is the effect of development discourse which identified Lao as an underdeveloped country. It was reproduced the definition by the categorization of International organization. For example, UN declared Lao as a Least Developed Country (LDCs), ADB cited in 1986 that Lao was one of the poorest countries in the world. By that definition, Lao was donated over 1.11 billion USD in between 1986-2004 by ADB. Lao's income depended on Foreign Aid over 85%¹. As the definition of an underdeveloped country in development discourse, Lao government changed its strategy to increase modernization indicators and economic development indicators. The discourse also acted in enclosing the opponent knowledge such as local wisdom. Local wisdom is community's holistic perspective which does not categorize daily life from ecology as a part of community's relations. It is the opponent of modernism because wisdom defines ecology as a part of community that people can get advantages from ecology only under the belief (animism) conditions and community's regulations. While modern economy defines ecology as natural resource that should be exploit its usefulness, the development discourse encloses the value of wisdom and redefines the traditional behavior as a useless and demolished activity, such as the slash and burn agriculture. With these internal and external procedures, capitalism development in Lao has been expanded to stand and hegemonize the meaning of "development" in Lao.

New Economic Mechanism was the turning point of economic strategy. Market-oriented system was implied to provoke the slow-down economy. Lao government promoted Foreign Direct Investment and Foreign trade by modern investment laws and regulations. In 1989, Lao state accelerated the country reform which resulted in the increasing amount of FDI and trade. However, the majority of trade and investment in Lao are in natural resources sector which are forestry, mines, and hydro

¹ ADB's Country Strategies and Programs for Lao PDR, 28 June 2006. Source: <http://www.adb.org/news/adbs-country-strategies-and-programs-lao-pdr-rated-successful>. 8 August 2013.

power². Another strategy for Lao economic development is “Land Linked Strategy”. R3A road, R9 route, and high speed train are logistics channels of distribution between Lao-China and Lao-ASEAN. Moreover, mega projects for development, such as contract farming and Land concession in the model of Special Economic Zone and Specific Economic Zone are the latest development projects.

“Development” in capitalism does not only increase the economic indicators, it also supports and legitimizes the state authority expansion. As Lao was suffered from war period for a long time and, historically, the country was never been united. In the past, Lancang was separately governed in three kingdoms; Luangprabang, Vientian, and Champasak. They were assembled when France occupied all Lao into French Indochina. After the independence, Lao was in the proxy war period and had to face with the conflict between Liberalists and Communists until 1975 when communist could control the country. However, Lao government still could not use its absolute power in some areas and some groups of people such as border area and high land area. The socialism ideology in nation state building period emphasized on the conflict among minorities. Though, when the government initiated capitalism development in 1986, “Development” became the tool of the government in strengthening state authority among minorities and periphery areas. Constructing a road was modernization and it was also a tool to spread state power to access the remote area. Dam building did legitimize the state to take possession on natural resources management in the name of state resources. Boten village is a case study for the state authority legitimization. Declaring Boten Special Economic Zone is an excuse for Lao government to legitimize the government authority in order to manage Boten area.

The development of capitalism in Lao is the specific model as in other socialist countries, such as China and Vietnam. These countries use market-oriented system in economy while they are also insisting rules in socialism regime. Therefore, Lao economic development model is liberal capitalism under state control or half centralized – liberalized economy. Nevertheless, state interference does not cause any anxious to foreign investors because they are protected by investment laws. In controversy, one party government gains more benefit in facilitating private investors. As the government is in an absolute power to allocate natural resources, those democratic countries have a pro-long public hearing process. To sum up, “Development” in Lao is benefit those foreign investors and to Lao state in legitimizing its power.

5.2 The influence of Chinese capital in Lao

China is one of the most rapid economic growth countries in these 2 decades. 4 modernization policies and liberal capitalism were launched in late 1970s.

² Bank of Thailand. 2554. Annual Report PDR 2553 and Outlook for 2554 (online). Source: http://www.bot.or.th/Thai/EconomicConditions/AsianEconomies/Laos/EconData_Laos/Pages/Economic%20condition.aspx, 28 September 2555.

Chinese economy drastically increased from two hundred billion USD in 1978 to 5.7 trillion USD in 2010. China became the second largest amount of import-export value country⁴. Moreover, Chinese government changed the economic strategy to export investments instead of import foreign investors. As a result, China claimed as ranking up to the 9th investment country of exporting in 2011 with 6.5 ten billion USD.

Yunnan and Guangxi are assigned to act like a linkage between western and southern part of China with Greater Mekong Sub-region and Southeast Asia. Conforming to “Go South policy” that Chinese government promotes Chinese investors to invest abroad with low-rate interest loan, China is splendidly positioned in the high rank of foreign investors in Southeast Asia, including Lao. Until now Chinese Investors have invested in Lao around 3,900 million USD or 800 projects in mines industry, agro-industry, forestry, electric industry, garment industry and other service sectors. King romans of Laos Asian Economic and Tourism Development Zone is a good example of Chinese investment in Lao. It located in Tonphung district, Lao PDR, and it is planned to develop to be a distributing center. It is invested by Jinmumen group with 86 million dollars⁵. Moreover, recently China’s cumulative investment in Laos stands at \$5.1 billion, edging out Thailand and Vietnam from railroad linking which cost of \$7.2 billion.⁶

5.3 Chinese capital’s influences in Boten: Transnational enclosure and reterritorialization

There are two national interests for Chinese capital in Boten; the interest in Boten Special Economic Zone and the interest in logistic sector. The second interest is in developing process. These logistic projects will upgrade Boten to be a strategic connecting point between China and Lao. Moreover, China local government had defined Xisuangbanna to be Xishuangbanna Border Free Economic Cooperation Area, thus, Boten is now a valuable area for Chinese developers. Golden City Group Co.,Ltd is the developer and investor who receives the concession in developing Boten Special Economic Zone. It is approved by the National Planning and Cooperation Committee on 9th December, 2003. It has been specified

³ UN National Accounts Main Aggregates DATABASE. 2012. Comparison of China’s historical GDP Perra rankings in the world.(Homepage on internet). Available from: http://en.wikipedia.org/wiki/Historical_GDP_of_the_People's_Republic_of_China. 4th October 2012.

⁴ United Nations International Merchandise Trade Statistics, 2012. 2011 International Trade Statistics Yearbook volumeI. (Homepage on Internet). Available from: <http://comtrade.un.org/pb/>. 30th September 2012.

⁵ Laos data center Khon Kaen University, Fall 2551, Thailand 3 years 50 Chinese investment in Laos - Vietnam overtake sign (online). Source:

http://laos.kku.ac.th/index.php?option=com_content&task=view&id=160&Itemid=88. 2 October 2555. See more lean and strategic excellence. 2012. Keep an eye on China’s capital plan remediation project in Burma, China - ASEAN (online). Source: <http://prachatai.com/journal/2012/06/40827>. 2 October 2555

⁶ Adam Pasick. 2014. China just became the biggest investor in Laos, and Laos’s neighbors are worried (online). Available from: <http://qz.com/172350/china-just-became-the-biggest-investor-in-laos-and-laos-neighbors-are-worried/#/h/44076,3/>. 20th May 2014.

that the company is allowed to manage and develop on a 1,640 hectares under the contract of 30 years which can be renewed to 90 years⁷. The developer company has the authorities in managing and developing the area. Boten SEZ is planned to be the center of entertainment complex, casinos and hotels which are the main income for the first phase. Boten SEZ is rapidly well known by Chinese, Thai, and Lao gamblers.

However, the Special Economic model raised some issues about national sovereignty and the legitimacy of Lao government in approving foreign investors to develop the concession zone and drive out local Lao people. The distinctly sovereignty of Lao government was reduced by SEZ and replaced by Transnational Chinese capital. The state sovereignty, once the sacred principle of nation, has been ambiguous in some parts under this development discourse⁸.

The Chinese private investors promoted by Central China Government were the result of the transnational enclosure procedure, compromising between private sector, state, and local people. On the other hand, Chinese private investors invest correctly under the Lao investment law and regulation. With the positive bilateral relations between China-Lao, the investors smoothly start to develop real estates and business in Boten SEZ. Meanwhile, the western and the southern region of China gain the advantage from this relationship and the border development.

As quoted before that both states gain advantage from the Chinese investments, for Lao, it is invaded under some particular conditions. Lao referred the ADB's development discourse to reterritorialize the space. It is the process on defining a space, whether it is utilitarian or not. If not, reterritorialization will follow its process, starting with re-drawing a new territory line, called Special Economic Zone, then defining the aim to conform development strategy. Therefore, the reterritorialization process of Lao government is properly fixed with the Chinese capital's requirement. The benefit for China is the chance to spread its economic and politic influence to Lao and Greater Mekong Sub-region. Besides, the SEZ in Lao can be the channel for Casino business which is not allowed in the main land of China. Lao government also gains some benefit from the concession's income, tax revenue and cash flow from business in SEZ. To conclude, the reterritorialization is the process that eases Chinese investors by referring national and local economic development, meanwhile, it drove out those local people to a new village. The

transnational enclosure process therefore can be introduced as a cooperation activity between Lao government and Chinese government, enclosed the local people authority on their former land and push them to be the absolute marginal people.

Even the hotels and casinos had been closed down in 2011 by Lao government. Lao government announced that casino in Boten broke the regulation by allowing Lao people to gamble. Moreover, there are a lot of violence and drugs reports in the area. Central Chinese government also agreed with Lao government to close down casinos. The other reasons are the reports on deceiving Chinese tourists to become indebted and because the casino location is close to Chinese border. As a result, those casinos had closed down immediately and it affected the effort to develop Boten for a while. Later on, Golden City Group had sold its shareholder to Yunnan Haicheng Industrial Group Stock Co.,Ltd which is proficient in developing tourist attraction and trading area. However, from the former problems, Lao government gave more attention to security issue. The Special Economic Zone model was changed to Specific Economic Zone and Namtha local government had to take part in Boten Specific Economic Zone administration in term of security issue. For economic issue, the developer still has fully right to administrate.

In conclusion, Boten case reflected the expansion of Chinese capital influence that rapidly has accessed to Lao. The growth of economic indicators is increasing, but the economic and social equality issue are decreasing. Local people as stake holders of the development were forced and were pressed from state authority to become a periphery group. Therefore, it can be concluded that Boten development is run by state and capitalist in the model of reterritorialization and transnational enclosure process.

6. MARGINALIZATION IN LAO'S DEVELOPMENT PROCESS

6.1 Problems from development

The mega-investment projects and the concessions are a model for Lao's economic development. Social and economic problem defined in the 5th national social and economic development plan (2001-2005) are tended to terminate shifting cultivation, decreasing opium agriculture and decreasing poverty to 50% in 2005. Continuingly to 7th national plan (2011-2015), the plan aims to distribute fundamental infrastructure such as electricity, roads, and telecommunication. These national development plans take part in increasing Lao people's quantity of life, including their opportunities in general⁹.

Though Lao economy development is precisely growing, long term problems are also discussed repeatedly. For example, environmental issues, inequitable problems among minorities and the foreigner's migration. Environmental issue in Lao is an international problem, such as Sayaburi dam project or the contract farming in agro-industry which are

⁷ Special Economic Zone is an important developing strategy of Lao government. The SEZs recently permitted for 5 zones; Savan Seno (2002) Boten Beautiful Land Specific Economic Zone (2003) Golden Triangle (2007) Phoukhiao (2010) and Vientiane-Nonhthong Industry-Trade SEZ (2011). There are another 5 zones which are on the negotiation processes, another 12 zones which are now on the process of feasibility studies and 24 zones are announcing for the interested developers. Available on: <http://www.sncsez.gov.la/index.php/en/>. 26th August 2013.

⁸ Research Fund, 2012. Scholars warn China Relations - ASEAN / Mekong be "Extraterritoriality new era". (Online). Source: http://pr.trf.or.th/index.php?option=com_content&view=article&id=1014:-qq-&catid=37:2010-06-10-02-36-14&Itemid=55. 5 October 2555.

⁹ UNESCO country report, Laos 2008.

questioned about the losses in ecology in long term. Another important issue is the inequitable problems among minorities which last for a while and reflected in the unequal indicators. For example, the number of educational opportunity of Lao Lum is higher than those from highland and the great proportion of poverty people are Lao Teung and Lao Sung¹⁰. Moreover, a new problem which is the result of promoting FDI is the migrating of foreigners in Lao.

These immigrants who came to work in Lao under Lao investment law have also settled down their business. In many cases, they pushed local people to a second class labor, though these local people are Lao citizen. For example, Tonphung Special Economic Zone where local people had been moved out to another location while most of the employees in the SEZ are Chinese people. Chinese investors earn a lot of money and the employees are hired in a high rate salary, while Lao local people are still suffered from the lack of occupation and from the community's migrating.

For Boten case, the transnational enclosure is a continuous procedure which relate to legitimacy in development. The government relies on state authority to negotiate and compromise with local people who have to move out. The migrant was preceded under a condition that Lao government will pay for rice field, house and moving cost compensations. The fact is local people receive an opportunity to negotiate, however, it is a discussion on a restricted condition that Boten community must move out. Furthermore, the following problem is that some villagers do not receive the compensation as agreed upon, and they cannot request a call for further discussion with state regarding any responsibility. It is because they already moved out and because the protest and requirement are not being responded. Boten SEZ still kept its progressive and earned a lot of money. Lao government reached its aim in increasing economic indicator. It is just former Boten villagers who are duplicated suffering from the negative impacts. They moved out from their familiar and fertility land and ended up with a limited land in the new location. They lost their agricultural life because they are not capable to buy any paddy field in the new village. Moreover, they are not properly reckoned by the government. This power structure reflects the government's aspect in separations of people from consideration process, development process, and land management process. It is a sample of a phenomenon that Lao government and Chinese capital occupied the authority while pushing local people to be marginal people in their homeland.

¹⁰ The number of Lao children between 11-16 in each ethnic minority who never attend school; 5.8 % of Lao-Tai ethnic group, 21.9% of Mon-Khmer, 41.3% of Tibeto-Berman and 20% of Hmong-Yao. (Richard Noonan. Ethnicity and Participation in Primary Education: Some statistical results from the 2005 census (Homepage on internet). Available from: <http://www.scribd.com/doc/60131647/Ethnicity-and-Education-in-Lao-PDR>. 2nd October 2012).

6.2 New Boten community: Marginalization

Special Economic Zone development strategy has its influence on local people. Kamyod Chaiyawong, vice Boten village headman, referred that Lao government has already notified villagers that the land would be developed and managed in SEZ model. The government would deal with the developer to compensate Boten villagers for house, paddy field, and moving cost. In 2005 and 2008, Boten people which comprised of 3 communities; merchandise community, farmer community, and salt pit community, moved out from their former homeland. Lao government and Golden City Group, the developer and investor, agreed to compensate for families who owned paddy field for 50 million Kip per hectare. However, the price was bargained. It was lower than the expected value at around 100 million Kip¹¹. Families who have no paddy field did not receive any compensation, just a proportion of land for habitation. Nevertheless, some villagers practically did not receive any compensation or not in full amount. At this point, the government failed to compensate and to act in regard of its promise.

The second issue is that Boten villagers lost their occupations because of the lack of paddy field. The new village is not a vacant land but it is occupied by Panna, Lao Sung, who have been settled down there for a while. The land left in the new village is considered inefficient for a new agriculturist community. Families who want to own paddy field have to buy land at Namtha city. Some houses spent the compensation on a rubber plantation at Natoey village. Some adapted themselves and became a merchandise or worker at tariff barrier port. Some bought a truck or a cab for transportation employment¹². Even though Chinese developer has promised the community that they will employ Boten people in casinos, in practice, Boten people cannot speak Chinese and have no skill in service sector. As a result, they frequently failed the probation. Thus, most of the workers in casinos are Chinese or Lao workers who graduated from Vientien.

The effect from development projects in Boten SEZ thus has its influence on Boten people to face the changes and instability in lives. Even though Lao government had paid the compensation, it was not enough for a new settlement. To shortly interpret this phenomenon, "Development" in Boten turns to have a negative effect on local people.

6.3 The adaptation and change of Boten people

Boten development process is stimulated by the reterritorialization and transnational enclosure by Chinese capital. It is proceeding without a proper attention to local people who are negatively affected. Not only losing their paddy fields, Boten people also lost their socio-cultural practices which related to the losses of their agricultural lives. Some Boten people can adapt themselves by changing their occupations from agriculturist to other occupations because most of Boten

¹¹ Kamyod Chaiyawong, vice Boten village headman, 12th February 2012.

¹² Yai Oun, villager, 12th February 2012.

people do not own paddy field anymore. However, some local people, especially elderly, cannot face the rapid change. They are familiar with their circular lives. They spent most of their money in building a new house in a new place. Now, they live on collecting wild products which is not enough to support themselves. Meanwhile, groups of younger generation learn to take advantage from Boten location. They set up a logistic service company. Some own a restaurant, a garage, and a shipping company.

Basically, socio-culture and community relations are declining because Boten people pay more attention to economic issue. Cultural system and its meaning are slowly being diminished. For example, animism is tended to be a marginal belief, only Buddhism remains. Interdependence relationship in community has also been changed. Those middle-age people often show their concern on individualism among community members. The spirit of unity and helpful are faded away. Likewise, social behavior is rapidly changed along with the new way of life. Youth have to work in a big city. Their work progressive depends on their personal abilities and their personal costs such as labor, education, potential, and skill. Stability and certainty have been lost in the way of life.

The adaptation of community reflects the effort in managing lives instead of waiting for government aid. It is because Boten people surrendered to government power that they could not fight or negotiate with. The strength of single party government thus does not come from only government, but also from the weakness of Lao civil society which rarely stand to fight in political activities. Boten is just a case study for the civil society that Lao people have denied their willing to surrender, however, their strength is less to fight against their government.

The future of Boten people are still faced with uncertainty from any upcoming projects. In the near future, Lao government will construct the High Speed Train which will pass through the new Boten. It is certain that Boten people have to move their community again. Villagers have the same opinion that they will confront with the situation if they have to relocate again. Their saving in building new houses is limited and they will not surrender to government power without a proper discussion. However, the strength of Boten people is less to fight against the government. It is possible that the High Speed Train will affect those people again. This time, the compensation will be decided and paid by the government, unlike the last migration which was paid by Chinese developer. So, it may be equal or less compared to the last migration. The future of Boten people seems to be in a difficult condition, both economics and politics. Though development brings a lot of advantages and progressive, for Boten people, it is not worth the stable life they have lost. Most of Boten people prefer their farmer lives than modern life style and civilization.

7. CONCLUSION

Boten district is a Tai Lue community located on border zone between Northern Lao and Southern part of China.

Before 1980, Boten was just a local border where both states allowed local ethnic traders to trade and exchange under limited regulations. It was until the end of 1980s when Lao activated its open policy and promote the diplomatic relations between Lao and China. Under this circumstance, Lao authoritarian used capitalization as the main strategic to develop the country such as land concession, mining and hydro-power production. According to the intimate relationship between China and Lao, Chinese capital gained the high rank in investment statistic in Laos. Boten district was considered to become more important in the country's development strategic. Being a border economic zone and a connecting location are strategies for this space.

Lao government allowed Chinese developer's company to manage Boten Special Economic Zone since 2003. The contract lasts for 30 years and can be extended twice. This 1,640 hectare space was introduced to be a new tourist attraction with luxury hotels, golf club and casinos. Moreover, under Chinese developer and investors, the usual language used in Boten SEZ is Chinese, Renminbi is the major money and the time there is known as Beijing time. It seems to be a part of China, but it is not. This phenomena can be defined as transnational enclosure which China expanded its power over its territory.

With this development plan, Lao government expanded its power over Boten community by trying to manage the space in the name of Lao government. Boten people had no choice, but to move their community to a new village where it is 10 kilometers apart from the former one. Thus the reterritorialization in Boten case was to redefine the value of the space from an unworthy land to be a potential economic zone.

Both transnational enclosure and reterritorialization procedures directly impact Boten people and push them to the periphery of power. Boten people had to move out of their hometown where they located for more than 200 years. They were forced to move to a new place and they had to adapt themselves with the new environment. They were suffered by the unfair compensation that they did not have power to bargain with the government. They had to adapt their customs and lives because there were limited spaces in the new village for them to cultivate. Some grew up and earned themselves on paddy field, thus, they have no other expertise to afford themselves. Without paddy field, Tai Lue people had to work out of agricultural sector which caused changes in community relations. Although some families could adapt to the new circumstances, they moved from agricultural sector to service sector, but most of the community members felt of the uncertain lives. They wanted a secure and stable life as they used to when they were farmers.

For farmers, migrating is not something simple and acceptable, they rely on land. The first move for Tai Lue Boten was started in 2005-2008 for "National development". They lived with changes along eight years in the new place, and in the near future, they have to move for the second time. This time it is the high speed train project which will first stop in Boten station. Lao government banned every unfinished construction in new Boten because the train railway will pass through the

center of the new village. This time Boten villagers will actively fight for themselves, at least fight for the proper compensation. However, lastly they are still victims of the development and will be forced to surrender to the government and capital power.

What happened in Boten district is just a case study in Lao that reflects the question from periphery people about the disadvantages of development that those with less-power have to face with. With this question, it leads to another suspicion that does development deserve its value as it is praise or not.

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Lao PDR Primary Health Care Expansion Project: A Case Study of Development Project Implementation Efficiency and Effectiveness

Anousone Rassavong, Mana Southichack, and Saykhong Saynasine

Abstract— This paper examines the effectiveness and efficiency of the Primary Health Care Expansion Project in eight provinces in northern part of Lao PDR to draw lessons for improving levels of efficiency and effectiveness of future project coordination and management. This case study provides lessons, from a management perspective, to larger questions concerning effective and efficient use of scarce financial resources, especially those of foreign loans, on development projects beyond the health sector. Our analysis finds that the implementation of the PHCEP was effective but inefficient, due to cost overrun and abnormally large miscellaneous spending. To improve implementation efficiency, we recommend that project fund from each partner, especially from government's share of financial commitment, should be in place prior to issuing contracts to avoid rising costs due to delays, and keep miscellaneous spending at a minimum. In addition, to improve allocation efficiency, more funding should be allocated for expansion of village-based health service centers, where responses to health care service expansion were highest and the poor benefited most.

Keywords— Effectiveness, efficiency, project management, project evaluation.

1. INTRODUCTION

Effective and efficient use of Official Development Assistance (ODA) has constantly been an issue of concern for both the donor and recipient countries, and it is the core issue in this paper. How efficient and effective have government development projects been managed and how can improvement be made? This is a larger, dual-question this case study of the Primary Health Care Expansion Project (PHCEP—the Project) seeks to answer. The Project covers eight provinces in northern Lao PDR (hereafter, Laos, for convenience), focusing on the *effectiveness* and *efficiency* issues of project implementation and outcomes of the civil work component of the Project. Improving health care is an integral part of government's strategy towards sustainable socioeconomic development, as better health care helps reduce poverty and promotes equity, which tends to further promote a more sustainable development path. Knowledge gained from this case study is hoped to be applicable to improving future management of development project implementation with cooperative agreement between Laos and foreign/international aid agencies in order to raise effectiveness and efficiency, leading towards a more sustainable socioeconomic development.

Laos' economic reforms, which formally began in 1986, from a centrally-planned economy to a market-oriented one, have resulted in relatively high economic growth with increasing personal incomes and improving wellbeing. Laos' per capita gross national income quadrupled between 2000 and 2011, from \$280 to \$1,130, elevated the country from a low-income to lower-middle income group, and poverty declined from 38.6% in 1997 to 23.2% in 2013 [1]. Life expectancy at birth, between 1995 and 2010, rose from 59.5 years to 68.5 years for female and from 57 years to 65.7 years for male. Infant mortality rate, per 1,000 live births, also nearly halved over the same period, dropping from 80.1 to 42.1 [2].

Despite initial economic success and improvement in social conditions, Laos remains one of the poorest and least developed countries in the world and in Southeast Asian region, thus remained dependent on ODA. Between 1995 and 2011, Laos received a total of \$5,841 million in ODA in grants and loans, accounting for 53% of total government expenditure over this period [3]. ODA accounted for as much as 84.8% of government's total expenditure in 2002, but it has substantially reduced to 25.3% by 2010 [3]. Despite a drastic drop in its share, the actual amount of ODA has actually increased 1.5 times over this period, from \$278.5 million in 2002 to \$413.8 million in 2010. Thus, ODA remains a crucial source for financing the country's development and maintaining economic growth momentum as total government spending has rapidly expanded to meet the growing demand of an expanding economy. Therefore international cooperation remains a critical component of the country's development work.

Effective and efficient management of ODA is critical. Effective use of ODA means intended results/goals are achieved while efficient use of ODA, especially for loans, means better results at a lower cost. An efficient development project is a project that attains a certain set

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of outputs with less resources used, or a project that produces more outputs of a given quality standard with a given amount of resources. That is, given a total of \$2,938.8 million of PPG foreign debts, as of December 2010 [4], with an efficiency gain of just 1% for all development projects, the country would have saved \$29.4 million, excluding interest cost. This can be translated into improvement of many schools, health care centers, clean water facilities, roads or agricultural extension services in many villages around the country.

Beyond that, efficiency in development projects gets transmit to project outcomes and impacts beyond the investment implementation. On outcomes, has quality standard improved and is utilization rate sufficiently high? On impacts, how much cost savings associated with getting local healthcare services and economic gains associated with increased access to and improved health care services have been created? Although these questions are essential and relevant for our study, this short paper focuses on implementation effectiveness and efficiency. The Project is an ideal case study because it involved multiple locations, multiple contract packages, and multiple levels of management and oversights. Other than on the ADB side, on the Lao side involved the central and local government bodies across eight provinces. Also, the project has been concluded, thus allowing for a conclusive assessment of project performance. The Project civil work primarily involved new construction, upgrade and renovation of provincial and district hospitals and village health care centers. Although the project also has institutional capacity building component, our focus is on civil work, a required step prior to institutional capacity building. Under the Project, six provincial hospitals, 14 district hospitals, 136 health centers, five training facilities (nurse schools and health training centers), and 12 health offices were either constructed new, upgraded or renovated, altogether at a cost of \$6.48 million [5]. It is a cooperative agreement between Lao government and ADB, with the latter as major financial sponsor. The project implementation covered a span of six years (July 2001 – June 2007), financed by a loan from ADB (ADB Loan Number: 1749(SF)). This was part of a much larger assistance programs the ADB has provided to Laos over 2000-2009 as pointed out earlier.

2. LITERATURE REVIEW

Chianca (2008) provides a global perspective of aid evaluation, pointing out to common problems involving inadequate care and quality of the evaluation, too much emphasis on project outputs and less on outcomes and impacts, among others [6]. We examine effectiveness and efficiency issues for both of project outputs and outcomes, as well as impacts.

A project performance evaluation report for the Primary Health Care Project (PHCP) in Oudomxay and Xiengkhouang provinces (ADB loan 1348-LAO(SF)) indicates that the project would result in economic benefits through reduced health care costs and increased income for the population in the project area [7]. The PHCP, which was a pilot project preceding the PHCEP

being examined herein, built 73 primary health care centers and three district hospitals, renovated five hospitals in the two provinces and supported an educational program in Oudomxay that trained nearly 6,000 health workers and staff. With increased service coverage, making medicine and treatment more accessible, not only costs associated with travel had decreased, diagnosis and treatment cost also reduced. Increased service coverage also led to better health awareness, which in turns reduced illness and income loss as a result of illness and of time adults used to care for ill children. This effectively resulted in an increase in income. In addition, a healthier population, as a result of improved access to health care and of better health care services quality, is more productive than the less healthy one, leading to income gain through productivity improvement. It was estimated that a 10% reduction in the under-5 mortality rate (U5MR) as a result of the project would result in 12% economic rate of return [7]. Between 1990 and 2000, Laos experienced approximately 40% reduction in U5MR. A cost-benefit analysis with a projection over 1995-2014 indicates that the project could save more than 0.5 million workdays that would have been lost to illness. The economic benefits of the project comprise of 60% cost savings and 40% of labor productivity gain [7].

The PHCP has been judged as effective and efficient. Efficiency evaluation in the performance evaluation report was based only on the difference between the planned budget and actual cost of project implementation. That is, the PHCP was judged to be efficient because there was no cost overrun. This view of efficiency is relevant for cost control of project implementation, but not necessarily from the country level development management perspective. That is, it does not convey whether the project has allocated budget optimally. For example, while the project may have been implemented efficiently, right on the budget, it may have allocated too much resource towards provincial hospitals and too little towards village health service centers where a marginal impact may be much larger. The cost-benefit analysis of the whole project produced a positive result with 12.2% economic internal rate of return, justifying the economic feasibility of the project as a whole. However, while the cost-benefit analysis provides a basis for judgment concerning the entire project, it does not provide micro level information needed to channel the scarce resource towards areas that would generate greater benefits. Micro information would be useful for determining whether more resources should be allocated to provincial level, district level or village level health care facility, or to certain geographical areas. Our analysis addresses these short-comings by going in depth analyzing micro data.

3. METHOD AND DATA

The method of analysis employs in this study is qualitative. Strauss and Corbin, (1990) explain that qualitative analysis can be used to better understand many issues or problems where little is known [8]. In fact, it would be the only appropriate approach if

relevant quantitative data is lacking. Palenberg (2011) describes how efficiency can be analyzed as a qualitative concept using comparative rating [9]. However, this study does not get into qualitative rating of efficiency in the sense of efficiency as a qualitative concept. Rather, we employ qualitative analysis mainly to gain a deeper understanding of the quantitative efficiency measure of project outcomes.

Both quantitative and qualitative data are used as complements to inquire a more in-depth understanding. Weaknesses in project implementation and management will be identified in order to provide appropriate recommendations for improvement of future development projects where applicable. To assess efficiency and effectiveness, in addition to financial data, survey data on health care facility, professional medical staff, outpatient visit, inpatient admission, and other relevant indicators after the project completion are evaluated against baseline data. Data used in our analysis are mainly from two sources, including Project's Building and Civil Works Component Final Report [5] and Health Facility Survey 2006 [10].

4. MAIN FINDING

Our assessment focuses on effectiveness and efficiency in selected provinces with significant investments in Provincial Hospitals (PH), District Hospitals (DH) and village Health Service Centers (HC). Here, as project investments in certain facilities in some provinces involved minor renovation, only investments that involved new construction or major renovation (deemed as an upgrade) of facilities are considered significant.

Civil works on health facilities in the provinces started in 2003 and nearly all completed in mid-2006. Thus, a few sites weren't captured in the survey which took place in 2006. Table 1 provides a summary of Project's provincial investment distribution, showing types of facility invested and total investment cost in US dollar as reported in Project's Building and Civil Works Component Final Report [5]. The per capita investment cost of the Project was added into the table to provide a cross-province comparison of project investment in per capita term.

Table 1. PHCEP's Major Areas of Investment

	Types of Facility Invested	Total Cost (USD)	USD / Capita (2004)
Phongsaly	PH, DH, HC, TF/NS	758,911	4.67
Luang Namtha	PH, DH, HC, TF/NS	1,449,525	10.19
Oudomxay	PH, TF/NS	841,713	3.24
Bokeo	PH, DH, HC	936,865	6.59
Luang Prabang	HO	13,845	0.03
Houaphanh	DH, HC, TF/NS	1,418,326	5.16
Sayaboury	DH	243,144	0.73
Xiengkhouang	TF/NS	194,812	0.87
Sub-Total		5,857,141	3.02
Offices & Misc.		626,075	
TOTAL		6,483,216	

Notes: PH - Provincial Hospital; DH - District Hospital; HC - (village) Health Centers; TF/NS - Training Facility/Nursing School; HO - Health Office; Offices & Misc. - project management office, health offices in southern provinces and miscellaneous.

Table 2 shows levels of project penetration on the three types of public health service facilities in project area. Project's civil works had the greatest penetration on PH, accounting for 50% of the total number of PH. Civil works on DH and HC had relatively small penetration rates of 15.8% and 16.7%, respectively, as DH and HC had relatively large initial units. Thus, it can be said that intervention at the PH level had created the greatest impact to health service capacity in the region in term of physical change to the facilities.

Table 2. PHCEP's Civil Works Penetration

	Units of Facility (2004)	Significant Investment		Level of Penetration	Spending Share of Total
		Units Build New	Units Upgrade		
PH	8	2	2	50.0%	32.1%
DH	57	3	6	15.8%	25.7%
HC	275	46		16.7%	32.2%

Effectiveness

We examined the effectiveness of the Project by analyzing its impact on various areas, including the direct impact of civil works on service space availability; on equipment, supplies and drugs; on staffing; and on service delivery. If, after completion of project implementation, these indicators increased as expected, the Project implementation is considered effective. Our assessment finds that, overall, the Project implementation is considered effective.

On service space availability, it is clearly noticeable that all provinces with significant investments in civil works experienced significant increases in service space availability, except for DH in Luang Namtha which remained constant. Four provinces (Phongsaly, Luang Namtha, Oudomxay and Bokeo) with significant investment in PH experienced an increase in service space availability between 6 and 30 percentage points (Table 3). All five provinces with significant investments in DH (Phongsaly, Luang Namtha, Bokeo, Huaphan, Sayaboury) experienced an increase in service space availability between 7 and 16 percentage points, except for Luang Namtha, which remained constant. Similarly, all four provinces with significant investments in HC (Phongsaly, Luang Namtha, Bokeo, Huaphanh) experienced an increase in service space availability between 4 and 20 percentage points. Other provinces without significant investment in HC experienced decrease in service space availability, except for Oudomxay.

Though civil works would only directly impact the health care facility space availability, they are prerequisite for hospitals and health service centers to install new equipment and supplies and hire more staff in order to care for more patients. How much has investment in the physical structure affected other measureable indicators of the Project's effectiveness is thus examined.

We start with changes in equipment and supplies and staffing. The survey shows that equipment installment in provincial hospital and district hospital type A (DH-A) increased considerably, especially for high and middle

range equipment, with between 24% and 38% percentage point increases as illustrated in Table 4. However, civil works do not seem to have any impact on supplies and drugs neither at provincial hospital nor district hospitals of both type A and type B.

Table 3. PHCEP Impact on Service Space Availability

Province (significant investments)	Change in % Space Availability for All Services Over 2004 - 2006		
	PH	DH	HC
Phongsaly (PH, DH, HC)	30	16	4
Luang Namtha (PH, DH, HC)	15	0	20
Oudomxay (PH)	6	-3	12
Bokeo (PH, DH, HC)	17	16	11
Luang Prabang	-7	-6	-3
Houaphanh (DH, HC)	4	7	4
Sayaboury (DH)	-6	9	-2
Xiengkhouang	-5	-3	-7
Overall	8	4	12

The situation at the village health service center, summarized in Table 5, is less clear. It should be noticed that all eight provinces in the Project area are shown in Table 5 and others through Table 8 with indicators specifying which province had significant investment in PH, DH, or HC in parentheses for convenient of making comparison. That is, for example, even if the focus is on PH, provinces without significant investment in PH are included. Four provinces with significant investments in HC (Phongsaly, Luang Namtha, Bokeo and Houaphanh) all experienced declines in equipment availability between 5 and 12 percentage points, except for Luang Namtha with no change over 2004 – 2006. Supplies also show a similar pattern as that of equipment. Nonetheless, drugs availability increased in all other provinces with significant investments in HC, except for Luang Namtha. In fact, other provinces either with insignificant or no investment in HC, except for Oudomxay, experienced improvements in availability of equipment, supplies and drugs. This could be a result of survey timing and site selection. The survey could have taken place before installments of equipment, supplies and drugs, causing the survey results for provinces with significant investments in HC to show availability deterioration. At the mean time, the Project most likely had selected appropriate provinces to intervene—those that needed additional investment. Thus, provinces without significant investments did not suffer equipment, supplies and drugs availability deterioration.

On staffing, the survey in general shows improvements for at all three types of health care facility. At provincial hospitals, Table 6, the share of high level staff increased (4 - 12 percentage points) while the share of low level staff declined (2 - 16 percentage points) in all four provinces with significant investments in PH (Phongsaly, Luang Namtha, Oudomxay, Bokeo). It is noteworthy to point out that, while Luang Namtha PH's total number of staff decreased over 2004 - 2006, the province's PH had the highest gain in the share of high level staff (12 percentage points), relative to other provinces with

significant investments in PH, and the biggest lost in the share of low level staff (16 percentage points) compared to all eight provinces in the Project area. This can be interpreted as a significant quality improvement. At district hospitals, Table 7, all five provinces with significant investments in DH (Phongsaly, Luang Namtha, Bokeo, Houaphanh and Sayaboury) experienced an increase in total number of staff and the share of high level staff, Except in Luang Namtha which lost 1% of high level staff. In general, district hospitals in all eight provinces lost the share of low level staff, including those without significant investment in DH. At the village health service centers, the survey clearly reveals that staffing was growing rapidly in all provinces with and without significant investment in HC over 2004 – 2006. The increased was contributed mainly by growth in the number of public health care workers (PHC Worker) as illustrated in Table 8. In 2004 one HC had a doctor. By 2006, none of the HC had any doctor, as staffing at HCs was dominated by nurses/midwives and PHC workers.

Table 4. PHCEP Impact on Equipment & Supplies at PH and DH

	Change in % of Availability Over 2004 - 2006		
	PH	DH-A	DH-B
Basic Range Equipment	8	8	1
Medium Range Equipment	30	24	-3
High Range Equipment	38	33	0
All Equipment Av.	25.3	21.7	-0.7
Supplies	0	-4	6
Drugs	-7	2	1

Table 5. PHCEP Impact on Equipment & Supplies at HC

Province (significant investments)	Change in % of Availability Over 2004 - 2006		
	Equip't	Supplies	Drugs
Phongsaly (PH, DH, HC)	-7	-8	11
Luang Namtha (PH, DH, HC)	0	1	-3
Oudomxay (PH)	-12	19	19
Bokeo (PH, DH, HC)	-5	-2	4
Luang Prabang	3	11	9
Houaphanh (DH, HC)	-11	3	12
Sayaboury (DH)	2	0	2
Xiengkhouang	2	11	4
Overall	-3.5	4.4	7.3

Table 6. Impact on PH Staffing, Change in Number and Composition Over 2004 - 2006

Province (significant investments)	Total No.	% High Level	% Mid. Level	% Low Level
Phongsaly (PH, DH, HC)	7	5	-2	-2
Luang Namtha (PH, DH, HC)	-10	12	4	-16
Oudomxay (PH)	17	8	1	-9
Bokeo (PH, DH, HC)	9	4	11	-15
Luang Prabang	-62	5	4	-9
Houaphanh (DH, HC)	-7	13	-10	-3
Sayaboury (DH)	19	-1	-8	8
Xiengkhouang	16	1	4	-4
Overall	-11	6	1	-6

Table 7. Impact on DH Staffing, Change in Number and Composition Over 2004 - 2006

Province (significant investments)	Total No.	% High Level	% Mid. Level	% Low Level
Phongsaly (PH, DH, HC)	55	1	7	-10
Luang Namtha (PH, DH, HC)	40	-1	9	-10
Oudomxay (PH)	-7	1	-1	-3
Bokeo (PH, DH, HC)	6	2	6	-11
Luang Prabang	-10	-1	1	-3
Houaphanh (DH, HC)	20	12	8	-6
Sayaboury (DH)	12	1	2	-4
<u>Xiengkhouang</u>	61	1	-2	-1
Overall	177	2	3	-5

Table 8. Impact on HC Staffing, Change in Number and Composition Over 2004 - 2006

Province (significant investments)	Total No.	Doctor	Nurse / Midwife	PHC Worker	Auxil. Nurse
Phongsaly (PH, DH, HC)	10	0	6	7	-2
Luang Namtha (PH, DH, HC)	38	0	9	22	4
Oudomxay (PH)	27	0	0	34	-11
Bokeo (PH, DH, HC)	25	0	6	19	0
Luang Prabang	24	0	7	24	-7
Houaphanh (DH, HC)	32	-1	3	23	1
Sayaboury (DH)	31	0	1	24	-6
<u>Xiengkhouang</u>	17	-1	7	11	-1
Overall	204	-2	39	164	-22

As has been discussed, the Project civil works had considerably contributed to improvement in service capacity for all three types of health care facility over 2004 - 2006. Health facilities gained more service space, installed new and better equipment, hired more staff, and the share of more skilled staff had increased. Next, we examined impacts on health service facility utilization. We selected three types of services outcomes as indicators for Project's impact on service capacity. Other important services delivery indicators reported in the health facility survey 2006 that were not discussed includes cases for X-Ray examination, surgical intervention, ultrasound examination, pre- and postnatal care, blood transfusion, immunization of women and children, etc.

Table 9 – Table 11 summarize project impact on services delivery of the three health facility types across provinces. To isolate project impact from other factors, only those with significant investment are included. As a whole, the numbers of outpatient visit, inpatient admission and birth delivery had all significantly increased across three types of health facility, except for inpatient admission at district hospitals, which increased just 0.1%. The numbers of inpatient admission and birth delivery in HC increased the most, compared with DH and PH, indicating that village-based health service facility was in high demand.

Services outcomes, however, varied across provinces. Among the four provinces with significant investments in PH, Phongsaly's provincial hospital was the only one experiencing substantial declines in all three selected services delivery indicators—outpatient visit, inpatient admission and birth delivery—while Luang Namtha's was the only one that had substantial increases in all three indicators. While Bokeo's provincial hospital experienced a considerable decline in the number of

inpatient admission (22.7%), it had considerable increases in the numbers of outpatient visit (13.4%) and birth delivery (87.4%). Oudomxay's provincial hospital had a slight decline in the number of birth delivery (-0.2%), but the province had significant rises in the number of outpatient visit (74.5%) and inpatient admission (51.8%).

Table 9. Impact on Outpatient Visit: Percent Change over 2004 - 2006

Province (significant investments)	PH	DH	HC
Phongsaly (PH, DH, HC)	-35.5	6.2	28.1
Luang Namtha (PH, DH, HC)	64.2	-24.8	49.1
Oudomxay (PH)	74.5		
Bokeo (PH, DH, HC)	13.4	-12.1	49.0
Luang Prabang			
Houaphanh (DH, HC)		98.5	1.5
Sayaboury (DH)		59.2	
<u>Xiengkhouang</u>			
Overall	39.3	34.5	19.9

Table 10. Impact Inpatient Admission: Percent Change over 2004 - 2006

Province (significant investments)	PH	DH	HC
Phongsaly (PH, DH, HC)	-66.5	-49.8	121.6
Luang Namtha (PH, DH, HC)	113.5	-0.7	96.4
Oudomxay (PH)	51.8		
Bokeo (PH, DH, HC)	-22.7	49.3	-23.0
Luang Prabang			
Houaphanh (DH, HC)		-16.9	81.9
Sayaboury (DH)		33.4	
<u>Xiengkhouang</u>			
Overall	13.4	0.1	22.9

Table 11. Impact on Birth Delivery: Percent Change over 2004 - 2006

Province (significant investments)	PH	DH	HC
Phongsaly (PH, DH, HC)	-28.2	30.0	130.5
Luang Namtha (PH, DH, HC)	63.7	-10.4	132.1
Oudomxay (PH)	-0.2		
Bokeo (PH, DH, HC)	87.4	43.9	20.8
Luang Prabang			
Houaphanh (DH, HC)		7.9	26.1
Sayaboury (DH)		82.6	
<u>Xiengkhouang</u>			
Overall	34.6	30.0	48.6

The service delivery outcomes in Phongsaly may suggest that there was a shift in utilization from provincial and district hospitals to village health centers, as the number of patients at PH declined for all of the three selected types of services and the number of inpatient admission at DH also declined while those at HC increased phenomenally, 28.1% for outpatient visit, 121.6% for inpatient admission and 130.5% for birth delivery. As a whole, Project impact on services delivery outcomes was most dramatic at the village health centers. All provinces with significant investments in HC had substantial increases in the number of outpatient visit,

except for Huaphanh, with only 1.5% increase, in the number of inpatient admission, except for Bokeo which experienced a decrease of 23%, and in the number of birth delivery, ranging from 20.8% to 132.1%.

Efficiency

We examined two types of efficiency. The first type of efficiency is project implementation efficiency, which focuses on cost control. The second type of efficiency involves resource allocation. Beyond examining the total financial cost of project implementation, efficiency can be examined in more depth by focusing on cost per unit of benefit created by the Project. How much did it cost to add a percentage of service space availability in provincial and district hospitals and village health service centers? How much per outpatient visit did it cost the project in each of the three types of the health care facilities and at different provinces? How much did it cost to allow one more patient to obtain health care in each of the three types of health care facilities and at different provinces? The answers to these questions provide essential knowledge for efficient resource allocation. That is, they can guide future development project preparation to decide whether more resource should be allocated to provincial hospitals, district hospitals or village health centers, and in which province.

Implementation Efficiency: The Project's civil works component was completed at a cost of \$6.483 million, 14.3% above the total contract signed (Table 12). The civil works final report [4] explains that this cost overrun was contributed by rising domestic costs as the civil works covered a span of several years. Civil works started with Project Management Office in April 2002, followed by the provinces in early 2003, and nearly all were completed by mid-2006, with Huaphanh completed last in October of the same year. Over 2002 and 2006, inflation, measured by the Consumer Price Index (CPI), rose 10.1% annually on average. Another factor contributing to cost overrun involved delays in some construction projects caused by late payments to contractors whose work plans and schedules included expected payments from the Project. This led to upward cost adjustments as contractors must continue to pay certain cost commitments such as salaries to essential workers and interest cost of loans. The delay also further exacerbated the inflation effect. The loan agreement includes a condition that payments to contractors would be 12% from Lao government's contribution and 88% from ADB loan funds. The problem was originated from government's contribution commitment, according to the civil works final report [4].

Another area requiring attention, which the report did not point out, is miscellaneous spending of \$359,320, which accounts for 5.5% of the total project expenditure. This miscellaneous spending is an exclusive category from other miscellaneous that would be included in all construction contracts. Thus, Project's cost that was bunched into the "miscellaneous" cost category was certainly higher than 5.5%. Since this miscellaneous spending does not have a clear record of what the

spending was for, much of that was most likely a lost for the Project an equivalent of 7-8 village health centers.

Table 12. Cost Overrun

	Original Plan	Contract as Signed	Final Cost	% Cost Overrun from Contract
Phongsaly	569,000	679,285	758,911	11.7
Luang Namtha	1,077,500	1,158,097	1,449,525	25.2
Oudomxay	589,000	650,737	841,713	29.3
Bokeo	865,500	845,599	936,865	10.8
Luang Prabang	823,500	13,845	13,845	0.0
Houaphanh	730,000	1,287,241	1,418,326	10.2
Sayaboury	352,500	213,356	243,144	14.0
Xiengkhouang	158,000	176,812	194,812	10.2
PMO	100,000	174,939	177,298	1.3
Other-South	80,000	89,457	89,457	
Supplementary	360,000			
Miscellaneous		384,320	359,320	
TOTAL	5,705,000	5,673,688	6,483,216	14.3

Allocation efficiency: Four indicators were selected for benefit-based efficiency analysis. They include change in space availability for all services, outpatient visit, inpatient admission and birth delivery. The service space indicator measures the direct impact of the Project's civil works, while the other three indicators assess indirect impacts made possible by the completion of the civil works. While outpatient visit gauges change in the service space capacity for all patients that visited the health care facility and received services, the inpatient admission measures the facility's capacity to provide services to patients that needed to stay overnight for more attentive care by medical professionals. Birth delivery in a modern health care facility is an important indicator as it has a significant impact on the health and chance of survival of both the mother and child. Birth delivery at a modern health care facility equipped with qualified staff, medical equipment and drugs would not only significantly reduce infant and maternal mortality rate, compared to traditional rural birth delivery without proper medical care. The mother would receive basic but critical knowledge from professional medical staff, important for the health of both the mother and child throughout their lives beyond the postnatal recovery period. This would have a long term positive impact on the general health of the population, increasing labor productivity in a broad sense. That is, more healthy population tends to be more productive than less healthy population.

First, we compare across the three health facility types—PH, DH, and HC—cost per percentage change and per unit increase of the four selected indicators, and the results are summarized in Table 13. For each type of facility, only provinces with significant investments in that type of facilities, not from all 8 provinces, are included in the analysis. For instant, for PH, only four provinces (Phongsaly, Luang Namtha, Oudomxay and Bokeo) with significant investments in PH are included. Analysis for DH and HC was done in a similar fashion. The health facility survey [10] reported change in service

space of the health facility only in percentage term. Thus, we compare across facility types—PH, DH and HC—the cost of a percentage increase in service space, and it reveals that increasing service space at the provincial hospital was most efficient, as it cost the least per percentage point increase, followed by district hospital and village health service center. In term of cost per percent and per person increase in the number of outpatient visit, the district hospital was the most efficient, followed by provincial hospital and village health center. This suggests that investing in DH is most efficient, relative to PH and HC, as both per percent increase and per each additional outpatient cost of investment was the lowest.

The investment cost per percent increase in inpatient admission and in birth delivery was the lowest at HC, as provinces with significant investments in HC experienced the highest percent increase in the number of inpatient admission and birth delivery in HC over 2004 – 2006 (Table 13). The percent increase in the number of inpatient admission at HC, at 22.9%, was far exceeding the 13.4% increase at PH and 0.1% at DH. As well, the 48.6% increase in birth delivery at HC was far exceeding the 34.6% increase at PH and 30% at DH. In contrast, investment cost per each additional inpatient admission and birth delivery at HC was not the lowest. This suggests that although it cost more per each additional inpatient admission at the HC than at the PH and it cost the most at the HC per each additional birth delivery, investing more in HC would be relevant because demand for village-based basic health services was the highest, as response to improved basic health care in the villages was highest.

Table 13. PHCEP Efficiency Across Health Care Institutional Types

Category	PH	DH	HC
\$ per % Change in Space	122,434	173,454	268,041
\$ per % Change in OP Visit	52,928	48,214	105,268
\$ per % Change in IP Admission	155,465	14,856,334	91,233
\$ per % Change in Birth Delivery	60,185	55,543	49
\$ per Additional OP Visit	106	67	204
\$ per Additional IP Admission	1,374	104,072	1,815
\$ per Additional Birth Delivery	4,179	3,750	11,301

While the overall investment cost per percent increase in service space availability was lowest for PH and highest for HC, the results vary across provinces (see Table 14). For Phongsaly and Bokeo, increasing space of PH was the most efficient and increasing service space in HC was the least efficient. In Luang Namtha, however, increasing HC service space was most efficient, and despite that 16% of the \$1.4 million allocated to the province was spent on DH civil works, there was no change in service space availability. Across provinces, investment in PH had the highest impact on increasing service space availability per cost unit in Phongsaly, with Oudomxay having the lowest impact, while investment in DH had the highest impact on service space availability per unit cost in Sayaboury. Investment in HC had the highest impact on service space availability per unit cost in Kuang Namtha. While measuring per unit cost of increasing service space is important for

comparing efficiency, the unit cost per percent change in the service space may not convey efficiency comparison properly if the service space in each of the province's PH varied. The same amount of space increase at the same cost would cause the percent increase in space higher for the PH with less space than the PH with more space before the civil works began. However, the comparison offers a broader picture of the Project's impact.

Table 14. Investment Cost in USD per Percent Increase in Space Availability for All Services

Province (significant investments)	PH	DH	HC
Phongsaly (PH, DH, HC)	7,023	20,430	
Luang Namtha (PH, DH, HC)	44,775		25,012
Oudomxay (PH)	129,511		
Bokeo (PH, DH, HC)	14,922	18,657	34,971
Luang Prabang			
Houaphanh (DH, HC)		96,874	170,844
Sayaboury (DH)		14,728	
Xiengkhouang			

5. CONCLUSION AND RECOMMENDATIONS

We found that the Project was implemented effectively overall, based on our analysis of the civil works direct impact on service space availability and indirect impacts on equipment, supplies and drugs; on staffing; and on service delivery. However, the civil works implementation is not considered to be efficient due to cost overrun of 14.3%, compared to the total amount of contracts signed, contributed by delays of funding on the part of Lao government's share of financial commitment for all contracted works and miscellaneous expenses. Although the cost overrun was largely contributed by domestic price increases, it was exacerbated by delays of some construction sites caused by delays of payments to contractors which originated from government's 12% share of financial commitment for all contracted works. This can be avoided by ensuring that committed funding from all project partners be in place prior to any contract is signed. Also, a strong committee to oversee the bidding process and approval for all contracts is critical to ensure quality job outputs at a competitive cost.

The miscellaneous spending of 5.5% is not considered an abnormality. However, this was added to the miscellaneous items normally would have already been included in every contract, which normally can be anywhere between 2% and 5%. This additional miscellaneous expenses, which lack a clear record of what they were for and how they contributed to project outputs, can be translated into 7-8 additional HCs. Therefore, miscellaneous expenses must be controlled and kept at a minimum. In association with miscellaneous spending, funding for minor, unessential renovation that does not contribute to improving service capacity or quality should not be allowed. Funding for this category should be coming from regular maintenance budget.

Additional analysis finds that efficiency of resource utilization can be improved by allocating more to the development of HCs, where responses to expanded service space in terms of inpatient admission and birth

delivery were most robust. Due to high responses, investment cost per percent increase in inpatient admission and birth delivery was the lowest at HCs. Thus, it is recommendable that increasing investment in HCs would better serve the needs of the population and would be economically more cost effective, as financial cost of investing in health care facility is only part of the entire economic cost to the country.

Total economic cost of health care to the country is one that involves both health care service providers and users. Going to a hospital located in the capital city of the province or to a district hospital from many villages could be a matter of an entire day, and returning home would be another day. Thus, time alone can be a factor discouraging villagers from getting proper health services both for basic and more serious care. The transport cost between home and the hospital and overnight cost are out-of-reach for many poor villagers. Thus, the village-based HC would substantially reduce transport cost and the opportunity cost of time for villagers who need health services. A more convenient and affordable basic health services by HCs would encourage villagers to obtain basic health care services, leading to better health and higher productivity. A statistical analysis finds evidence that, over 2002/03 – 2007/08, expanding HC services greatly benefit the poor while expanding PH services favors the better off [11].

It should be pointed out that the analysis relied heavily on two sources of data, both of which are project reports. Although data in these two sources are considered reliable, without a third party, independent source of data, some biases may exist in the report. For instance, miscellaneous expenses were not pointed out as an issue of efficiency lost in these reports. Several limitations of our study exist. Our analysis does not include the post-project impact on measureable health conditions of the population in the Project area, such as changes in infant and maternal mortality rate, under-5 mortality rate and a loss of time due to sickness. An analysis of the Project's impact on cost associated with travel and other costs involved in obtaining health care services is another limitation of this paper. These important data would allow an economic impact analysis of the Project.

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Low Carbon Hotels Towards Sustainable Tourism in Koh Chang and Neighbouring Islands, Thailand

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Abstract— Tourism is considered as one of the most growing economic sectors, and also one of the emerging concerns faced by policy makers and stakeholders due to its potential implications to environment and climate change. Efforts should therefore be made to balance the economic benefits of the tourism industry and protection of the environmental values. This paper presents the results of a research, which developed guidelines for low carbon hotels in Koh Chang and its neighboring islands, under the full support by Designated Areas for Sustainable Tourism Administration (DASTA), Thailand. The guidelines include criteria and indicators for measuring resource use and carbon emissions of hotels and related enterprises, with participation of local stakeholders. Primary data were collected through field survey and unstructured interviews with key stakeholders. In addition, secondary data were gathered from review of related literature and existing supporting documents used in developing the guidelines. The analysis revealed nine categories ranging from policy and administration to carbon emissions, with each having several supporting indicators and criteria in the proposed guidelines. The results suggest that the success of implementing the low carbon guidelines depends primarily on management support and development of supporting systems such as monitoring and auditing, documentation and database, and capacity strengthening for staff and related personnel. Real experiences from on-going pilot applications of the guidelines are expected to improve effectiveness and efficiency of actual implementation of the guidelines, before it can be adapted as a formal low carbon standards for Koh Chang, and other tourism areas.

Keywords— Carbon Emission, Criteria, Guidelines, Indicators, Low Carbon Tourism.

1. INTRODUCTION

Nowadays, tourism sector is growing at a rate that potentially makes it a significant source of carbon emissions and environmental degradation due to its high demand on energy and other natural resources. Hotels as a part of tourism sector are major energy end-users [1]. With the concerns of hotels and carbon emissions, the concept of Low Carbon Hotels (LCHs) is guided and applied in this study for solving aforementioned problems which is broadly accepted as a significant implementation to reduce carbon emission in hotels.

An LCH is a hotel based on low energy consumption, low pollution, and low CO₂ emission. Its core principle is to use energy efficiently, use clean energy technology and pollute less [2]. This LCH research can be implemented through the collaboration of different stakeholders and decision-makers including relevant government ministries and their line agencies, monitoring and evaluation experts, hotel owners and customers, and communities dependent on the hotel and tourism industry. The cooperation formed by these stakeholders would aim to achieve the activities of

energy saving, conservation of natural resources and environments, community income, community development and sustainable tourism through the LCH guidelines developed in this study based on the natural and community features of Koh Chang and Neighbouring Islands. Koh Chang and Neighbouring Islands are designated as sustainable tourism destination in Thailand by the Designated Areas for Sustainable Tourism Administration (DASTA). In addition, there are some good hotel examples in Thailand applying the concept of Sufficiency Economy which also leads the hotel towards sustainable tourism.

DASTA [3] was established as a public organization mandated to serve as a coordinator of sustainable tourism operation and integrated administration of valued tourism areas. DASTA provides mechanism that enables flexibility and promptness in joint-operations of government agencies or state enterprises. Consequently, DASTA is a major supporter for this study.

Koh Chang and its surrounding areas (Koh Mak, Koh Kood and other smaller islands) are regarded as the jewel of the Gulf of Thailand. This group of islands is located in Trat Province, Eastern Thailand, which is expected to become a world-class ecotourism destination. As of 2011, there were 147, 18, and 23 hotels in Koh Chang, Koh Mak, and Koh Kood, respectively.

To qualify as an LCH, the hotel needs to be assessed using an evaluation guideline that makes use of selected indicators and criteria such as, carbon footprint, energy consumption, total green area, building design, policy, administration management, pollution control, transportation, carbon emission, water consumption, and purchasing.

The aim of this paper is to present the results of

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developing the guidelines for implementing LCH management system for a growing tourism destination of Koh Chang and its neighboring islands in Trat Province, Thailand. The scope of the paper also covers the process of setting up the cooperation for developing the guidelines among key stakeholders involved in energy and environmental management, local culture, and international sustainable tourism; indicators and criteria for assessment of the LCH; results of a pilot assessment with adjustments; and recommended procedure for implementing the LCH management system. The LCH management system was developed to be implemented as a pilot initiative for the study area under the support of DASTA.

2. LITERATURE REVIEW

Hotel operations are one of the major carbon dioxide emitting industry through its large consumption of energy, water and non-renewable resources. Many studies posit that sustainable development and management can help reduce CO₂ emissions through effective energy and environmental management policies [4], and related standards/indicators/guidelines can also help reduce carbon emissions.

Likewise, a green hotel indicates an eco-friendly hotel operation through good practices in water and energy use conservation, environmentally purchasing policies, and waste minimization. While low-carbon activity is defined as a smallest output of greenhouse gas (GHG) emissions into the ecosystem, especially CO₂ [1].

Low-carbon tourism, an offspring of low-carbon economy, is a form of eco-tourism based on low pollution, low power consumption, and low emission. Its aims are to improve the quality of tourism services, to protect local nature and cultures, and to make positive contributions to local population [2].

In comparison between the green hotel indicators and low carbon activity and tourism's definition, the principle of low-carbon is more concentrated on low energy consumption which means through many methods to consume less energy, for example, using the local raw materials to reduce the transportation from outside, etc. Therefore, in this study, it is focused on the principle of LCH which leads the hotels and areas towards sustainability.

Related Guidelines and Standards

There are several international and national studies related to the development of sustainable hotel guidelines. Some guidelines are set up as a program for any interested stakeholders, some are set as an initiative to proceed to any advanced level of awards, and some are conducted as like a benchmarking for comparison purpose. However, the related guidelines and standards are summarized in following paragraphs.

The Energy Conservation and Carbon Reduction (ECCR) was developed and adapted for the hotel industry in Taiwan by Teng, et al. [4]. The development of ECCR involved interviews with the senior hotel managers, environmental specialists and governmental officials to identify the framework, structures and

determine weights of criteria through a questionnaire survey. Such collaboration among specialists from different fields is a good combination to scrutinize the indicator's framework and weights based on their expertise. The ECCR consists of 7 categories: (i) communication and participation; (ii) top management commitment; (iii) energy; (iv) water; (v) waste; (vi) building; and (vii) purchasing which cover most of the major concerns in this study. There are thirty-two (32) indicators were used to identify and prioritize ECCR contributions. The results revealed that top management commitment is the most significant factor in determining the success of ECCR implementation. It means that the success of passing ECCR standard mainly depends on the executives' responsibilities, actions and policies which will be perceived to all subordinates through their, especially, actions.

EarthCheck [5] is conducted mainly for benchmarking environmental and social performance. This is applied as like a benchmark to identify the level of each case in terms of environment and social aspects. Using its own set of indicators, it compares whether these indicators are lower, equal or better than baseline level. Indicators can be divided into eight categories: (i) policy; (ii) energy; (iii) water; (iv) waste; (v) community; (vi) paper; (vii) cleaning; and (viii) pesticides. However, it can be seen that the EarthCheck does not cover the building, communication, and purchasing aspects.

The Green Key Eco-Rating Program [6] was designed to recognize hotels, motels, and resorts that have outstanding sustainable initiative improvement. The full online assessment contains 160 questions divided into five main areas: (i) corporate environmental management; (ii) housekeeping; (iii) conference and meeting services; (iv) food and beverage services; and (v) engineering and maintenance. This guideline is quite interesting about online assessment which makes more channels for approaching by any stakeholders or participants to do the assessment. Moreover, it is convenient for the program to update news or communicate to the program attendants.

The Green Seal Environmental Standard [7] is a guidance process for lodging properties seeking Green Seal certification. Some requirements are needed to meet its initial certification level, such as organization and regular compliance. Other requirements are listed to pass bronze level, silver level and gold level, respectively, using the following major indicators: waste minimization, reuse and recycling; energy efficiency, conservation and management; management of freshwater resources; wastewater management; hazardous substances; environmentally and socially sensitive purchasing policy; continuous improvement plan; and any three (3) of the following: energy reduction; sustainable building; renewable energy; greenhouse gas reduction; zero waste; green cleaning; water conservation. For the overall of this Green Seal Environmental Standard, it covers most of all related factors according to the environment and energy aspects which is a good reference for LCH case to review.

The Green Building Initiative [7] consists of many categories, which covers for major scopes such as

energy; water; resources; emissions, effluents and pollution controls; indoor environment, and environmental management system. This initiative is concentrated on environmental aspect more than energy point of view.

The Green Tourism Business Scheme (GTBS) [8] includes the criteria of management; communication; hydro energy; waste; purchasing; transportation; wild life; and landscape.

On the other hand, the Certification for Sustainable Tourism (CST) [8] covers for only 4 categories: physical-biological environment; hotel facility; customers; and socio-economic environment. It shows that the CST emphasizes on tourism especially for the hotels.

The Leadership in Energy & Environmental Design (LEED) for Existing Buildings [8] includes 5 categories: sustainability; water; energy; materials and resources; and indoor environment.

The Nordic Swan Label [8] is a unique of eco-labeling used by Nordic Countries, which covers the areas of energy, water; chemicals; consumables and raw materials; finishing and fixtures; waste management; and transportation.

Green Globe 21 [8] is a global certification, which is based on the following international standards and agreements: Global sustainable tourism criteria; Global partnership for sustainable tourism criteria; Baseline criteria of the sustainable tourism certification network of the Americas, Agenda 21 and principles for sustainable development endorsed by 182 governments at the United Nations Rio de Janeiro Earth Summit in 1992, ISO 9001/14001/19011 (International Standard Organization).

The Green Leaf Standard [8], [9] was established as a guidance to protect and conserve the environment for hotel tourism in Thailand. The criteria are classified into 18 categories: policy and communications; human resource development; committee; target and plan; waste management; efficiency and energy consumption; water consumption; kitchen and restaurant; laundry; purchasing; indoor air quality, air and noise pollution; water and its quality; spa and healthy massage; fitness center, swimming pool and outdoor activities; security; environmental impact; corporate social responsibilities within the community; and cultural support. This guidance is a good study to review in terms of supporting to conserve the environment which can be applied for its principle to the LCH study.

The Oregon Economic and Community Development Department [8] developed benchmarks and criteria for green hotel certification in Thailand. The initial phase of its project identified and compared existing certification programs in Thailand and other international certification programs, including the Green Leaf Program (from Thailand); Green Tourism Business Scheme (from Scotland); Certification for Sustainable Tourism (from Costa Rica); Energy Star (from U.S.); LEED for Existing Buildings (from U.S.); Green Leaf Eco-Rating Program (from Canada); Nordic Swan Label (from Nordic Group of Country); ECOTEL; Green Globe 21; and International Hotels Environment Initiative. Each

program consists of different categories and indicators.

Green Building [8] under Thailand Energy Award 2011 is a campaign to promote energy conservation in buildings. The scoring criteria used are energy efficiency; renewable energy; water efficiency; environmental protection; indoor environmental quality; other green features and innovation. This award is specified for the standard of energy field, specially, in building.

Each guideline/standard covers to a various categories of indicators and criteria depend on their scope and purpose of interest, area to be apply for, etc. However, in this research, the categories, indicators and criteria will be applied from the mentioned related reviews, theories, and the definition of low carbon tourism, low carbon activity.

Certification and Auditing Process

Some standards and guidelines do not end up its qualification as only guidance, however, it can be developed further to certify or define it as a certification afterward. Hereinafter, there are some references that mentioned about certification and its auditing process. Each certification/program has different processes of auditing and weighting to judge a case. Some have various levels of certification depending upon the ability and capability of the attendant.

The Green Seal Environmental Standard [7] is divided into 3 levels: bronze; silver; and gold. It requires applicants to at least meet some basic requirements to qualify for the initial certification level. More challenging requirements are set to qualify for the higher certification level.

GTBS [8] has 3 levels of certification: bronze, silver, and gold, and each level requires for significantly higher reduction of environmental impacts.

Certification for Sustainable Tourism (CST) [8] is divided into 6 sustainability levels (from 0 to 5 by weight percentage), evaluated through a checklist questionnaire consisting of 153 questions. The range of weight percentage starts from less than 20 to more than 94.

LEED [8] certification levels are separated into 4 levels based on 100 possible base points: certified, silver, gold, and platinum. The scoring range varies from 40-49, 50-59, 60-79, and above 80, respectively.

ECOTEL Certification [10] consists of five areas or spheres: sustainability commitment; waste management; energy management; water management; employee education and community development. These areas encompass the processes, systems, and practices to ensure the sustainable operation in hotel through an audit under each of these globes based on checklist survey.

The ISO:19011 certification process [11] involves collecting data by appropriate sampling and verifying (audit evidence), evaluating against audit indicator (audit findings); reviewing; audit conclusion; preparing, approving and distributing the audit report; completing the audit; and conducting audit follow-up.

There are 3 processes of ECOTEL certification [10]: (1) property assessment, which is conducted through interviews, physical inspection, and data collection; (2) roadmap for certification, which is considered through

targets, technology, and workshop trainings; (3) and audit, which is the final process to conduct and award the certification.

The assessment process of ISO: 14015 [12] involves planning the assessment, collecting and validating information, evaluating the information, and reporting on the assessment.

The environmental auditing process of Green Leaf Hotels Standard [9] consists of 3 key steps: (1) the screening process in which 13 questions related to environmental restrictions are paneled; (2) the qualifying process through which environmental activities in hotels are identified; and (3) the grading process, which the environmental auditing in operational process of hotel are divided into 11 sections as mentioned earlier. There are 2 scoring standards. The first standard scores range from less than 45.34% to more than 77.99% and can receive from 1 leaf to 5 leaf certification. The second standard scores range from less than 52% to more than 66.5% and can receive from 1 leaf to 5 leaf certification.

The guidelines and standards can be developed or implement further to a process of certification which includes auditing process, scoring and certifying. This research project also ends up with recommended guidance for certification and auditing process.

3. METHODOLOGY

The overall methodology of the process in developing the guidelines is organized into 4 phases as follows:

Phase 1 consisted of the studies and literature reviews related to low carbon guidelines and standards, the survey, on-site observations, and interviews with the key stakeholder representatives such as the hotels or resorts, local governments. This phase is the initial step in studying all related international and national literatures related to tourism, environment, low carbon, and energy. On-site observations of the study areas and interviews with key stakeholders, which included owners of tourism businesses and its related enterprises, policy makers and relevant local government officers were carried out in April and July 2012. Eight small and medium hotels in Koh Chang and Koh Mak were visited during those periods. The main objective of this phase is to acquire the baseline information about the study area, and the business owners' opinions about the future LCH research, the nature of their business, their knowledge and understanding about low carbon economy, and business constraints. The expected output from this phase is to obtain a preliminary draft of the LCH guidelines. It took 2 months for this phase (April to July 2012).

Phase 2 involved the development of categories, indicators and criteria for the draft guidelines, with more detailed survey and interviews. This phase continues the process of data gathering started in phase 1, with more literature reviews, additional surveys adjusted to each study area, actual application, economic competitiveness, and other related concerns. The number of each category, indicators and criteria was taken into account for their scoring and weighing. The expected output from this phase is to obtain a detailed draft of the guidelines based

on scoring and weighing of indicators and criteria. This Phase 2 took 3 months for developing the categories, indicators, and criteria.

Phase 3 was a pilot test of the developed guidelines (from phase 2). Adjustments were also made based on the lessons learned and inputs from the implementers and stakeholders. The guidelines developed from phase 2 were tested as a pilot on medium and small hotels because it is easier to approach the top management. The hotels do not have a large or complex organization of their management, therefore, there are better opportunities to meet, talk, discuss, and exchange some information, knowledge, and opinions with the top management or their representatives. Moreover, their feedback on this LCH research can be obtained through the actual actions, their mind and their responsibilities through a discussion and site observation. Based on the total number of hotels and time limitation, 12 cases in Koh Chang and 6 cases in Koh Mak were selected and then the test was conducted. Although the selected hotels are either small-sized hotels (less than 30 rooms) or medium-sized hotels (more than 30 rooms), each must possess working knowledge of energy consumption and conservation, having readiness and efficacy for continuous improvement, having interest and good understanding on energy planning for the organization, experienced in energy management, willing to network and exchange knowledge and experiences related to energy and environmental management. The pilot tests were carried out in September 2012 and conducted through a causal method as shown in Figure 1.

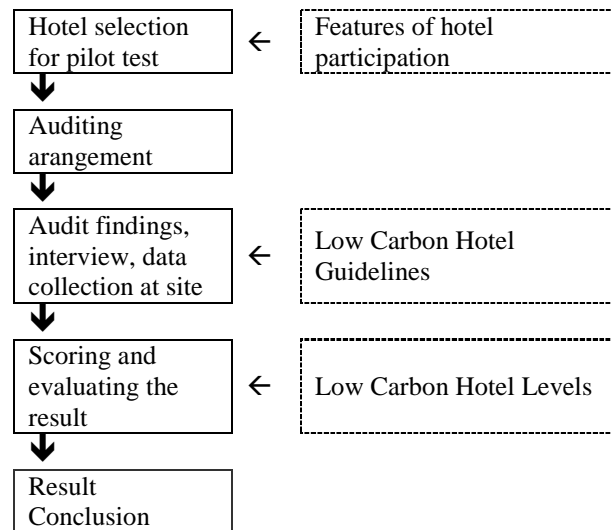


Fig.1. Causal Method for Testing the LCH Guidelines.

Phase 4 focuses on the dissemination of the LCH guidelines and implementation plan and procedure for LCH management system. The purpose of this phase is to present the final draft of the LCH guidelines from phase 3, and to get feedback/suggestions from the key stakeholders such as DASTA, the provincial government agencies, hotel owners/representatives, local governments to further improve the guidelines. A seminar was arranged in Koh Chang in November 2012, where to gather feedback and suggestions from key stakeholder-participants to improve the final draft of the

LCH guidelines. The agenda of the seminar focused on two main topics: (1) the appropriateness of the LCH guidelines in terms of indicators and criteria by case of Koh Chang and its neighboring islands; (2) the implementation plan and procedure for LCH management system. Moreover, the LCH research was also promoted and disseminated to all related key stakeholders during the seminar, and also through its website (www.lowcarbonhotel.webs.com) that provides some basic information about the research and updates for the research participants. It took 1 month for this phase.

4. RESULTS

Phase 1 - Literature reviews related to LCH guidelines and standards including preliminary survey and interview selected key stakeholders.

There are many different certifications, standards, and guidelines that were reviewed. A summary of categories containing each guideline is shown in Table 1. The result from phase 1 as mentioned in the section of methodology (phase 1) is the preliminary draft of LCH guidelines which contains the following categories: (1) policy and administration, (2) energy management; (3) transportation; (4) tourism activities and participation;

(5) building and nearby area; (6) procurement and inventory management; (7) waste management; (8) water management; and (9) CO₂ emission. These categories were adapted from the literature as referred in Table 1. The draft of LCH guidelines can be revised after testing on-site. From site visit and stakeholder interviews, it revealed that the guidelines should be universally acceptable and can also promote the image of participating hotels as supporters of sustainable tourism. It also revealed that the guidelines' process should not be complicated in terms of hotel operation. Furthermore, the costs of certification should be reasonable and can be afforded and achieved by different sizes of hotels. Lastly, the guidelines should benefit to all related stakeholders, including tourists, hotel owners, and communities dependent on the hotel and tourism industry, and the environment.

From the site visit, the characteristics of the hotels in Koh Chang and Koh Mak were revealed to be different. The hotel businesses in Koh Chang are mainly focused on tourism business operation, while the hotels in Koh Mak are focused on alternative energy technology and its application, and family business operation.

Table 1. Certifications/Standards/Guidelines Summary versus Categories from the Literature

Category	Certifications / Standards/ Guidelines										
	ECCR	Earth Check	Green Key	Green Seal	Green Bldg.	GTBS	Nordic	Green Globe	GTZ	Thai Energy	Green Leaf
Administration-Management	✓			✓		✓					
Policy-Developing Plan		✓		✓							
Communication-Participation-Society	✓	✓				✓		✓			✓
Purchasing	✓			✓		✓					✓
Environment-Nature-Animals			✓		✓	✓		✓		✓	✓
Energy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water	✓	✓		✓	✓	✓	✓			✓	✓
Waste-Waste Water	✓	✓		✓		✓	✓	✓	✓		✓
Building-Indoor Environment	✓			✓	✓					✓	✓
Chemicals-Hazardous Substances-Flammable		✓		✓			✓				✓
Pollution (Air, Sound)					✓			✓			✓
Transportation						✓	✓		✓		
Resources		✓			✓		✓				
Cleaning-Household		✓	✓	✓							
Services			✓								
Indicator Calculation		✓		✓					✓	✓	

Phase 2 - Development of categories, indicators and criteria for a draft of the guidelines, with more detailed survey and interviews

After having draft LCH guidelines with its draft of scoring and weighting, it is used for detailed survey in

Koh Chang and Koh Mak. The development of categories, indicators, and criteria for the LCH guidelines were carried out through the second phase by adjusting them with the results from site visit, interviews and through the scoring and weighing. Eight categories were developed for the guidelines: policy and administration;

energy management; transportation; tourism activities and participation; building and nearby area; procurement and inventory management; waste management; and water management. The last category is CO₂ emission, which necessitates further data collection and analysis. The results of scoring and weighing of categories, indicators, and criteria before and after the detailed survey are shown in Table 2.

Table 2. Developing categories, indicators and criteria for a draft of the guidelines (before and after the detailed survey)

Categories	Before detailed survey		After detailed survey	
	Indicator	Criteria	Indicator	Criteria
1. Policy and Administration	5	5/5/5/4/5	2	5/8
2. Energy Management	4	11/9/9/6	4	7/6/5/6
3. Transportation	1	5	2	6/5
4. Tourism Activities and Participation	3	3/4/5	2	1/5
5. Building and Nearby Area	1	9	3	5/7/7
6. Procurement and Inventory Management	3	4/3/3	2	5/5
7. Waste Management	1	10	4	10/5/6/5
8. Water Management	1	7	2	8/1
9. CO ₂ Emission	4	1/1/1/1	3	1/1/1
Total	23	116	24	128

From Table 2, the details of each category are explained as following.

Category 1 Policy and Administration

Policy and administration of the hotel are important factors that help communicate policies developed from top management or hotel owners to its supervisors and personnel on ground that implement or observe the hotels’ policy on low carbon hotel and environmental sustainability. Since some hotels do not have the official written policy (due to having staff from different countries, which may or may not be legally documented), policies are often communicated verbally. However, poor or miscommunication can easily lead their personnel’s poor or wrong understanding and interpretation of the rules. Officially written policies in Thai, English and the migrant workers’ own languages should be published by the hotel to ensure staff’s correct attitude and approach on running and maintaining a low carbon hotel. Meanwhile, many small and medium-sized hotels that are family businesses have simple

administration and management systems,. Thus, these type of businesses tend to avoid complicated actions, complex systems, and documentation.

Policy and administration is required in 2 indicators: (1) policies towards low carbon and environmental & social sustainability; and (2) personnel and organization development.

Category 2 Energy Management

Energy consumption is a major concern for establishing low carbon hotels. Electricity expenses remain as one of the largest costs in running a hotel business. Hence, energy management is a key knowledge and skill for hotel operators to effectively and efficiently manage their hotel, in terms of energy expenses, energy consumption control, energy efficiency improvement, energy technology, operation and maintenance, energy policy, and use of renewable energy. Some of the hotels the project visited were still using energy inefficient equipment. Installation of power meters in different areas of the hotels can save, monitor, control and manage energy consumption, and thereby also curb the hotels’ CO₂ emission. Energy efficient policies and renewable energy technology should be promoted and campaigned to entice more establishments to follow the principles of a low carbon hotel.

Energy management can be identified into 4 indicators: (1) energy efficiencies; (2) energy consumption for air conditioning system; (3) energy consumption for electrical lighting system; and (4) energy consumption for other systems and use of renewable energy.

Category 3 Transportation

Transportation is directly related on how much carbon is emitted into the environment through vehicular consumption of oil and gas. Alternative fuels such as biofuel or gasohol can help reduce CO₂ emission. However, access to alternative fuel is limited to hotels operating in Koh Chang area since the islands are 8 to 82 kilometers away from the nearest coast. Some hotel operators are also concerned by quality of engine run by biofuels. In the meantime, mass transportation, walking, bicycling, and carpooling can help the hotel being LCH.

According to the guidelines, transportation requires 2 indicators: (1) transportation management; and (2) supporting and persuading measure for an optional reasonable transportation.

Category 4 Tourism Activities and Participation

Supporting tourism activities and participation depends on site area, landscape, and group of tourists. Initiating environmental conservation activities can encourage the growth of eco-tourists, and also may help reduce carbon dioxide emission. Such activities can be in the form of low carbon menu, mountain biking tours, kayaking, among others.

Tourism activities and participation category includes 2 indicators: (1) number of sustainable tourism activities; and (2) participation and support for implementation.

Category 5 Building and Nearby Area

The hotel building and its surrounding landscape are factors related to energy consumption inside building when it is occupied after construction. If the site area and landscape, including green area, are taken into account for building design, then, CO₂ emission can be reduced. Moreover, building management, material construction and technology application also affect energy consumption significantly through more effective and efficient heat insulation, proper window orientation and ventilation, building orientation, and building color and reflectiveness.

Building and nearby area consists of 3 indicators: (1) building design and technology applied for reducing energy consumption; (2) area and landscape; and (3) building management.

Category 6 Procurement and Inventory Management

Procurement and inventory management need a good logistics operation practices to reduce the environmental impact. More so since all of the goods and, most of the personnel, needed to run the hotel in Koh Chang are taken from the mainland. Sustainable purchasing and inventory or green procurement practices are necessary to take into account in achieving low carbon hotel status. This leads stakeholders to also realize how a sustainable hotel can help in maintaining low carbon emission.

Procurement and inventory management includes 2 indicators: (1) purchasing, materials and inventory management; and (2) reducing procurement and local procurement.

Category 7 Waste Management

Waste management is very important to relieve and reduce the environmental impact caused by wastes. Presently, there are many methods and solutions adapting to reduce the amount of waste, as like as, biogas, bio fertilizer, animal food, reduce, reuse, and recycle method.

Waste management is composed of 4 indicators: (1) Waste management efficiencies, (2) Waste reduction inside the room and bathroom, (3) Waste reduction in service center: kitchen, meeting room, conference room, outdoor activities), (4) Waste reduction inside the office and lobby.

Category 8 Water Management

Proper water management is required to address concern on metered water consumption and data collection, and water use efficiency. This helps hotels to manage and control water consumption of ground water resources in the island.

Water management indicator comprises of (1) water use efficiency; and (2) water consumption per tourist per day.

Category 9 CO₂ Emission

The eight (8) categories as aforementioned are the checklist questionnaire, however, category 9 on CO₂ emission, needs calculation and analysis of historical data from hotel (answerable via detailed questionnaire).

CO₂ emission is calculated in accordance with: (1) Power and heat (electricity and fuel usages); (2) transportation (fuel consumption); and (3) waste management based on disposal methods.

Weighting Distribution of Guidelines' Indicators and Criteria

After scoring and weighing the criteria and indicators adjustment in according to the results of detailed survey and stakeholder interviews, the distribution of weight among categories are shown as a bar graph in Fig.2.

The highest weight was given to Category 2: energy management (20%), and Category 7: waste management (20%). Next is Category 9: CO₂ emission which has 15% distribution compared to other categories. Category 1: policy and administration, Category 4: tourism activities and participation, and Category 8: water management were weighted for 10% each. The remaining 3 categories have less significant weights to the total scores of all categories as 5% weight distribution that are transportation, building and nearby area, and procurement and inventory management.

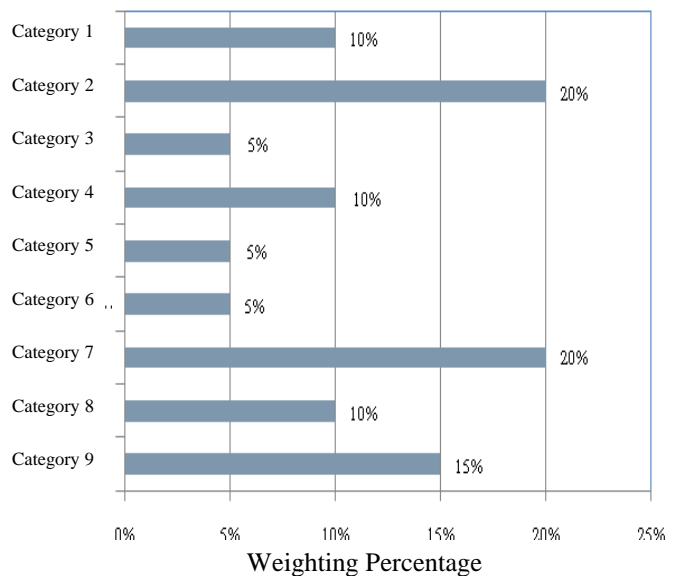


Fig.2. Weight Distribution among the Categories of Indicators

Phase 3 - Pilot test the developed Guidelines and adjustment per lessons learned

This is a pilot stage of the draft LCH guidelines. As mentioned, twelve (12) hotels in Koh Chang island and 6 hotels in Koh Mak island were selected and considered for the pilot tests in September 2012. In this study, the LCHs can be divided into possible 4 levels: Platinum, Gold, Silver and Bronze, and via 2 types of scoring.

Type 1 is based on the overall scores earned from categories 1-8 counting from each score of indicators as presented in Table 3. Indicator 9 was excluded from consideration because of the incomplete data during analysis so that a fare evaluation could be obtained for all participating hotels.

Table 3. Scoring Type 1

Level	Definition	Total Score (%) Of Category 1-8
4 – Platinum	Excellent Low Carbon Hotel	>90
3 – Gold	Good Low Carbon Hotel	80-90
2 – Silver	Medium Low Carbon Hotel	70-80
1 - Bronze	Beginning Low Carbon Hotel	60-70
0-Underweight	Need to improve	<60

Result of pilot test and scoring based on Type 1 is shown by bar chart in Fig.3.

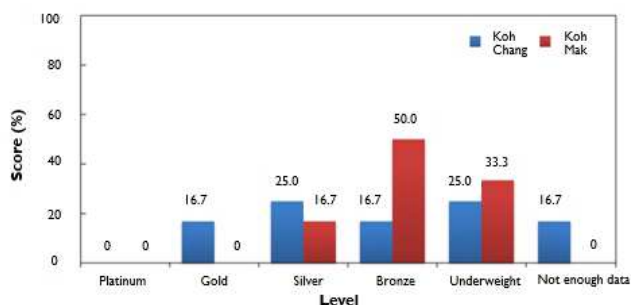


Fig.3. Result of Pilot Test based on Type 1

Based on scoring Type 1, the result showed that there is a normal distribution among the 18 pilot cases. None of the hotels can achieve the platinum level. The total score of hotels in Koh Chang that can achieve the gold level is 16.7%, but none of the hotels in Koh Mak can reach to this level. For silver level, there are 25% and 16.7% scores that the hotels in Koh Chang and Koh Mak can achieve, respectively. The highest score that the hotels in Koh Mak can achieve is 50% for bronze level, while hotels in Koh Chang achieved 16.7% score of hotels in the same level. However, there are some 25% and 33.3% scores of the underweight level of hotels in Koh Chang and Koh Mak, respectively.

Type 2 is based on selected categories for classification with a score of more than 75%, and a minimum score at 50% of each category (see Table 4). It should be noted that category 9 was again excluded based on the same reason. The result of the pilot test and scoring based on Type 2 is shown by bar chart in Fig.4.

No hotel in Koh Chang and Koh Mak was able to reach Platinum level and Bronze level. The highest scores are in underweight level - 41.7% for hotels in Koh Chang and 83.3% for Koh Mak. None of the hotels in Koh Mak was also able to achieve the Gold level while the hotels in Koh Chang were able to achieve Gold level up to 8.3%. For Silver level, the total hotels in Koh Chang and Koh Mak gained the scores of 33.3% and 16.7%, respectively.

Table 4. Scoring Type 2

Level	4 Plati- num	3 Gold	2 Silver	1 Bronze	0 Under- weight
Definition	Ex- cellent Low Carbon Hotel	Good Low Carbon Hotel	Me- dium Low Carbon Hotel	Be- ginnin g Low Carbon Hotel	Need to improve
Category 1	++	++	++	+	+/-
Category 2	++	+	+	+	+/-
Category 3	++	++	+	+	+/-
Category 4	++	++	+	+	+/-
Category 5	++	++	+	+	+/-
Category 6	++	++	+	+	+/-
Category 7	++	+	+	+	+/-
Category 8	++	+	+	+	+/-
Category 9	++	++	++	+	+/-
++ more than or equal to 75%					
+ more than or equal to 50%					
+/- less than 50%					

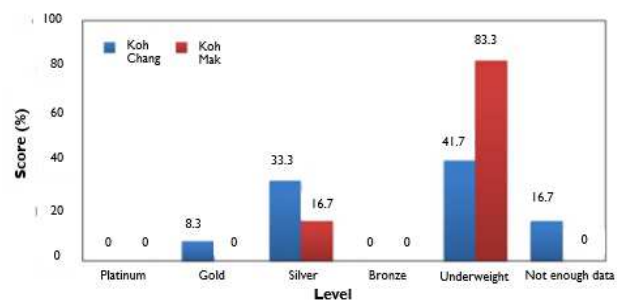


Fig.4. Result of Pilot Test based on Type 2

Phase 4 - Dissemination of the LCH guidelines and implementation plan & procedure for LCH management system

The purpose of this phase is to present the final draft of the guidelines and to get feedback and suggestions from key stakeholders. The potential is also to develop the implementation plan and also LCH certification process in the future. The seminar had participants comprising of 28 key stakeholders represented by hotel owners or representatives, DASTA, local government, and other agencies. The comments and suggestions can be generally aggregated into two main points:

(1) Appropriateness of indicators and criteria towards low carbon hotels. The feedbacks and suggestions are mainly about energy management concern on how to differentiate the break even point of efficient/saving appliances to electricity saving costs. Suggestions were also raised to consider not using any appliances which emit low carbon according to

categories of accommodation. Secondly, the guidelines should also be developed to be able to cover other business sectors such as restaurants. Lastly, in calculating the category of CO₂ emission, the benchmark used as reference for calculation shall be referred universally in the country which the results are able to be compared among each other without any bias.

(2) The implementation plan and procedure for LCH certification. Some organization should be established to handle, promote, and sustain this project in order to persuade parties who are interested in achieving LCH status. As of now, the LCH research is promoted through www.lowcarbonhotel.webs.com. The benefits of participating in the certification process should also be promoted and identified, especially, in terms of global marketing. The project should have a trial that runs for at least 1 year before starting to formally apply and implement it on more hotels, on larger scale (i.e., national and international). DASTA can monitor the feedback and results continuously. When the project starts running, DASTA's responsibilities would cover assigning committee for different sectors and roles that the hotel owners can also attend. The government sector should issue supporting policies and lend assistance in some activities related to the LCH concept, together with a training course or seminar.

5. RECOMMENDED IMPLEMENTATION PLAN FOR LCH MANAGEMENT

After getting feedback and suggestions on guidelines, the implementation plan and procedures is recommended by dividing into 2 main terms:

(1) Overall implementation plan and procedure for LCH as shown in Fig.5. It is divided into 3 steps as follows:

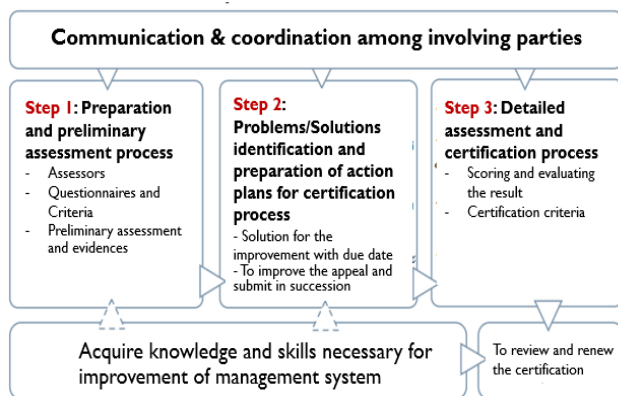


Fig. 5. Proposed Overall Implementation Procedure for LCH Management System.

Step 1: Preparation and preliminary assessment process is a preliminary stage for the hotel owner to handle the assessment process by themselves. This can be done by appointing staff to take responsibility towards LCH to prepare documents needed by the questionnaires, and to have an internal assessment of the hotel based on the questionnaires.

Step 2: Problem/solution identification and preparation of action plans for certification process is according to step 1. Regarding to the internal preparation and assessment, the hotel owner or hotel representatives can find the problems, faults, and solutions through the guidance of the questionnaires and also put up recommendations at the same time when all evidences and documents are submitted to the LCH committee before having a detailed auditing.

Step 3: Detailed assessment and process is implemented by an external committee who handle the LCH auditing and assessing the hotel participant, and then, scoring and evaluating the results for certification. Monitoring system will be taken regularly after certifying the hotel with LCH.

(2) The supporting process requires 4 main elements: format and supporting system; auditor; evidences, data and documents; and auditing and monitoring.

In addition, Fig.6 provides key steps to be taken for auditing, according to the suggestions from the dissemination seminar. Therefore, the implementation of monitoring, scoring, and auditing process in this study should be applied and developed further.

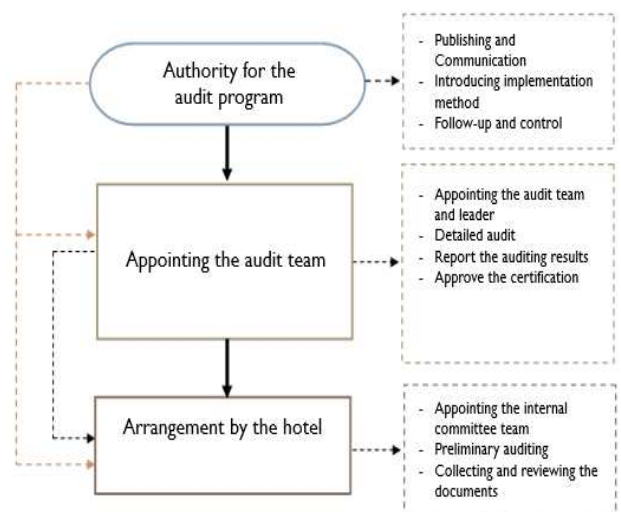


Fig.6. Recommended LCH Auditing Steps

6. CONCLUSION AND RECOMMENDATION

The development of LCH guidelines for tourism business in Koh Chang and its neighboring islands lead to a total of 9 categories, with 24 indicators, and 128 criteria, covering policy and administration to CO₂ emission calculation. The guidelines are based on those key factors, and also on good practices indicating low carbon emission within hotel operations and management, such as corporate commitment towards sustainability of tourism industry, energy management, water & waste management, and CO₂ emission to the environment. It is a simple yet effective set of guidelines that will benefit not only to the hotel owners, in terms of cost saving for business promotion and marketing, increase competitiveness and earned recognition, but also to the

environment.

The aim of developing the LCH guidelines for the future implementation is to reduce operation expenses, increase hotel competitiveness, and improve environmental quality. These aims need the participation of key stakeholders, in combination if adequate support in terms of legal and institutional frameworks for LCH. DASTA should be the main authority to announce and publicize the LCH research as a pilot project for a period (approximately 1 year) with potential and willing hotels, so improving indicators and criteria according to the practical use that can be achieved. The LCH guidelines and recommended supporting system developed in this study should be applied in the study area and may be adjusted and/or improved further to be more applicable in the area and other tourism destinations for possible improvement towards sustainable tourism.

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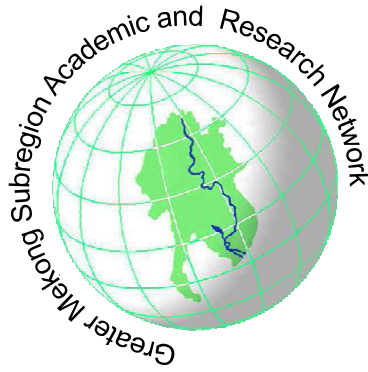
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