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University of Baghdad
College of Engineering
Department of Civil Engineering



Development of Integrated Sustainable System for Oil Industry in Iraq

A thesis

Submitted to the College of Engineering of the University of
Baghdad – Iraq in a Partial Fulfillment of the Requirements for the
Degree of Doctor of Philosophy in Civil Engineering
- Construction Management-

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Supervised by

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8/9/2019

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

"إِنَّا كُلَّ شَيْءٍ خَلَقْنَاهُ

بِقَدْرٍ"

صدق الله العظيم

سورة القمر- آية (49)

Notice

The research assignments have been represented in the thesis as part of the contract that has been concluded with the Ministry of Oil - represented by Missan Oil Company as first part, and the College of Engineering/University of Baghdad, as the second party.

Supervisor's Certificate

I certify that this thesis titled “Development of Integrated Sustainable System for Oil Industry in Iraq” has been prepared by **Ryad Tuma Hazem** under my supervision at the Civil Engineering Department, University of Baghdad, in partial fulfillment of the requirements for the degree of PhD in science of Civil Engineering-Construction management.

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Certification of Examining Committee

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Dedication

I would like to dedicate these words to:

To the one who taught me the first words of life...To those who guided me to the path of righteousness...To who helped me move forward...To *my dear father* who missed him so much ...

To *my dear mother* who has nurtured me for the love of goodness ...
The prayer of my mother protects me all the time.

To my great family for their support and encouragement of my (*brothers and sisters*).

To my great heart (my *wife and my children*). Looking at your beautiful faces around me makes me overcome all the pain-difficulties ...You are all hope and love ..Your eyes are the umbrella of family devotions...My big heart full of your emotions and your feelings all times..

Ryad Tuma

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Researcher

ABSTRACT

Iraq acquired a huge development in the investments in the oil sector, which was accompanied by the establishment of many camps and control fields and the development of production oil. The facilities are being established by the same investing companies or by sub- contractors represent the basic infrastructure and main super-structures of companies operating in the oil industry. The process of investment and development of the oil industry has been accompanied by a range of outputs and negative impacts on the environmental and social levels. One of the main reason behinds those negative impacts that the traditional contracting system focus on the economic dimension and ignore the environmental dimensions plus societal effects of the oil industry and construction mechanisms. The research focused on how to build a comprehensive sustainable system in which sustainable standards are adopted as a basis for accelerating the application of laws and contracting methods, changing the methods of purchasing equipment, raw materials, industrial, construction, etc., and directing logistics operations which are one of the main axes of work in both oil companies and its facilities. The sustainable approach needs to be known in traditional legislative disciplines to help decision-makers identify the weaknesses needed to be strengthened and the places of force to be developed and overcome the obstacles and influencing factors associated with the establishment of a sustainable system. The study focused on the extrapolation of previous studies to determine the nature of the negative effects that hinder the preparation of the target system and the adoption of the field survey as a research formulation, starting with an open questionnaire to obtain outputs to be transferred to the closed questionnaire. The study has been identified the obstacles (stumbling blocks) and influenced factors which related to the research aspects in contracting operations, procurement procedures, logistic activities. Two main techniques have been used the first one (5-whys) to reach to required actions to overcomes of stumbling blocks and second technique is focus group discussion (FGD) to overcome of influence factors via expert's opinions. Based on the practical outputs, a comprehensive system of the main stages of sustainability has been

developed and formulated, which represents an extended series of project cases of various kinds that may be traditional in terms of design and contracting methods.

The proposed system can be tracked periodically to raise those projects to a higher grade of sustainability level. If the project is sustainable in terms of design and planning, the proposed system will help decision makers to take contractual action with implementing partners with experience in sustainable applications. The researcher has supported its proposed system by preparing and configuring the TPI-SS software applications software to track construction projects in the oil industry and the TPI-SS will contribute for improving position of the projects the sustainable path based on sustainable core criteria via proposed models. The proposed system is applied to a number of case studies to ensure the ease, accuracy, reliability and flexibility of its application. The evaluations of this application based on views of experts is 92% as its verification level. Adoption of the proposed system designed according to sustainable standards is to contribute in the creation of sustainable contract systems and procurement procedures as well as sustainable logistics activities that contribute to access to sustainable facilities in the oil industry.

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LIST OF ABBREVIATIONS

Abbreviations	Full Means
A2A	Ability to Ably
API	American Petroleum Institute
AM	Arhmatic Mean
ATT	Area-Transshipments &Triage
BREEAM	Building Research Establishment Environmental Assessment Method
Cont.	Contract
Ccs	Core Criteriaons
Ccs-C	Core Criteriaons-contract
Ccs-P	Core Criteriaons-procurement
Ccs-L	Core Criteriaons-Logistics
C/B	Costs-Benefit
SCM	Supply Chain Management
CIB	International Council for Building
CPL	Contracting, Procurement and Logistics

EU	European Union
Eco.	Economical
Env.	Environmental
e-PR	Electronic-Purchase Request
FGD/Is	Focus Groups Discussions/Interviews
FIDIC	International Federation of Consulting Engineers or in French (Fédération Internationale Des Ingénieurs-Conseils)
FPA	Forwarding-possible Action
GPP	Green Public Procurement
GSCM	Green Supply Chain Management
HVAC	Heating, Ventilation, Air-conditioning
HSE	Health Safety and Environmental
IPIECA	International Petroleum Industry Environmental Conservation Association
IOGP	International Association of Oil & Gas Producers
ITT	Invitation to Tender
IFs	Influenced factors
ISO	International Organization for Standardization
IPT	Integrative Project Team
JCT	Joint Contracts Tribunal
LCA	Life Cycle Approach
LCSP	Lowell Center for Sustainable Production
LEED	Leadership in Energy and Environmental Design
LCC	LCC: Life Cycle Cost
Log.	Logistics
MoC	Missan Oil Company
MoP	Ministry of Planning

OPEC	Organization of the Petroleum Exporting Countries
OECD	organisation for Economical Cooperation and Developments.
PA	Possible Action
PPI	Public Procurement Innovation
Proc.	Procurement
PR	Purchase Request
PAF	Performance Action Form
QA	Quality Assessment
QC	Quality Control
UN	United Nations
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
USA	United States of America:
UK	United Kingdom
Ref.	References
RFT	Request For Tender
4Rs	Reduction, reuse, recycling and recovery
SPP	Sustainable -Public Procurement
SSCM	Sustainable Supply Chain Management
SBs	stumbling blocks
SPSS-IBM	Statistical Package for the Social Sciences- International Business Machines Corporation
SD	Standard Deviation
Soc.	Social
TPI-SS	Tracking program Integrated –Sustainable System
TQM	Total Quality Management

CHAPTER

SIX

CHAPTER SIX

Conclusions and Recommendations

6.1 Introduction

To reach the general concepts, this chapter is guided the scanning process to reflect the level of matching between on what extent the research reached from the principles of practical and applied scientific implications. For further illustration in this chapter on the final outputs via Conclusions/Recommendations/field annotations that can be studied in the future to represent the outlines of future research titles which are closely related to the importance of increasing the knowledge and awareness of interesting in the targeted modules are part of the proposed integrated system.

6.2 Conclusions

During the study in this specific topic that be a part of the achievement of the research objectives associated with the nature of the structure of the research, it is necessary to place all the general conclusions which are explained in the following points:

- 1- The suggested integrated sustainable system in one package is serving of the construction process in oilfield/Camps by give high attentions about (core criteria) such as sustainable owner's project requirements which got (87.7%) to be very important for contracting process.

- 2- Supportive core criteria are appeared to sustainable procurement procedures its range was (86.6%)for compliance all the suppliers and venders to low emissions and others. Recycle and reused contents and its packaging system was ranking over 80% all of these core criteria can support to build activities sustainable procurement in the integrated system in each oilfields/camps.
- 3- For sustainable logistics, many standards have emerged that exceed 80% such as water, energy and land use efficiency and alternative transportation. This reflect the high importance of logistics activities in both construction and oil-industry.
- 4- The methods and mechanisms of contracting foreign companies with local contractors to carry out the work of a degree suited to their experiences. The work is required transition from traditional aspects to sustainable approach.
- 5- The technical committees have to work on possible actions (PA) as treatments on each part of problems during the implementation stages of the integrated sustainable system.
- 6- Methods of selection participators in each processes and others is to assist the establishments of all sizes, activities and locations, to integrate sustainable process.
- 7- The limited evaluation of contractors/vendors/suppliers even transporters and logistics agents or the lack of a real methodology and a truly sustainable dimension contribute to the establishment of a sustainable local market and make the participants work in a competitive environment based on the benefit-based economy and cost analysis according to the principles of sustainability.

- 8- It has been reached in the adoption of the most appropriate standards such as: selection appropriate project based on human health and other standard. Iraqi projects in the oil industry through international standards related to the issues of contracting, procurement and logistics activities, which are familiarity with internationally.
- 9- The study reflected that technique of rigorous performance reflecting of measurements the importance of high performance evaluation and time allocation will make the system of work priorities and methods of achieving them in order to reach the required quality in the applications, it is necessary to know the roots of the problems and the main root associated with them in order to reach the goals of prioritization in an easy manner and enable companies to meet the requirements of the standard time, which must be subject to strict follow-up and scrutiny.
- 10- There are a few companies that have sufficient experience to apply the sustainable approach in an integrated manner and has the ability to employ it in a way that serves all contractual parties. Therefore, it required an indispensable action to develop the system of communication to exchange experiences in this field between foreign companies and local Iraqi companies to raise the efficiency of the application of the proposed system in the research.
- 11- The software (TPI-SS) specifies a comprehensive vision for decision-makers through valuable values of sustainable criteria that represent sustainable basis that fits projects in the oil industry. Through values of outcomes, stakeholders can identify the best economic options that reflect environmental and social values.

12- The Integrated sustainability system in authority manner: - it is given a sustainable authority prestige in implementation by contractual parties according to their positions in the contractual power.

6.3 Recommendations

The necessary actions have been outlined recommendations that contribute to guiding government employers in setting the substantial steps in adopting a sustainable system in accordance with the requirements of sustainability.

- 1- Monitoring the consumption of water using renewable energy and maintaining the external environment and care of ventilation and make the internal air clean and reduce the emission of toxic gases and other applications that contribute to the creation of a work environment with a productive and non-pollutant and economic profitability reasonable to evaluate the performance of the final project according to these principles. In order to avoid the errors caused by traditional style of evaluation and the performance of projects according to the time, cost mechanisms, budget variations, level of adjusted the schedule the traditional management methods associated with the capacity of implantation. Neglecting the degree of effectiveness in evaluating the stages of the project in design, contracting and others the effectiveness, resources efficiency, and Competence of contractors to be the importance parts in the annual budget and compliance with full instructions. To meet with goal of sustainability in any case.
- 2- The specialized teams should be involved in the corresponding sections of the foreign companies operating in the oil sector.

- 3- Recommending for the development of the department of contracts through the preparation of contracting. The foundations established the head of the pyramid drafting all kinds of contracts.
- 4- Recommending the work of the department to support the processes of preparation and development within the oil companies as well as the companies supporting them to take advantage of the proposed system outputs and core criteria adopted in the study.
- 5- The functions, plans and mechanisms of research and development of the Ministry of Oil. The sustainable criteria should be taken as priority in the formulation of development plans and scientific research to contribute to solving the environmental and economic problems associated with construction projects and in the oil industry in general.
- 6- To recommend to managers and executives to give importance to contracting methods and mechanisms of choice of contractors and contractors, logistics agencies and also the high interest companies for advisory services and the methods of selection and evaluate based on the sustainable approach to include international and local companies.
- 7- To encourage construction companies to recycle materials and construction waste according to policy and sustainability and optimal use of energy and water. Otherwise, the environmental fines system will be applied to oil companies and the use of methods of compensation for environmental damage resulting from the work of foreign companies and companies in order to support it and this will contribute to raising the level of real interest In environmental and community requirements.

- 8- Raising preventive awareness of logistics companies and local carriers in projects for construction materials and chemicals as well as developing sustainable transport mechanisms by increasing the level of control over the activities of logistics companies. As well as recommend attention to the designs of warehouses and make them part of the methodology of analysis of logistics contracts to upgrade the level of construction of warehouses companies in oil camps.
- 9- One important conclusion is to involve the local labors/staff and those interested in the construction sector and oil together to reach the possible solutions that are considered as a guide to the development of the system in the workshop to continue the development of field work methods to achieve efficiency in the application. To reduce the gap between conventional contractual methods and the new trend towards contracting methods governed by sustainable applications.
- 10- To encourage the oil companies to partner in government information to develop the tasks of tracking and monitoring traditional systems and to continue this partnership to be long-term with large foreign investment companies to cope with the rapid change in the sustainable aspects of the design and contracting systems and then the activities related to procurement and supply of materials and logistics in the industrial A state of industrial integration between the international and local partners.

6.4 Scope of Future Studies

In a very important way, research should reflect some studies that will contribute to establishing the main rules of the work environment in the oil sector or other industrial sectors as well as constructions and can be summarized as follows:

- 1- A study on the measurement of compliance of companies with monitoring and development plans according to indicators monthly and semi-annually and annually to note the deviation from sustainable criteria to return to the mechanisms of environmentally and economically.
- 2- Study contributes to the development of rules for measuring and evaluating the competitive market according to sustainable concepts.
- 3- A comparative study of a set of case studies according to the optimal method of selecting sustainable applications, taking into consideration the setting of suitable determinants for the work environment in Iraq.
- 4- Analysis and monitoring of industrial outputs in oil companies and the work of simulation program with the sustainable reality of the knowledge of the degree of variation and impact industrial output.
- 5- Contributing to the establishment of a research program facing e - mail developed to be a major recipient of the problems and converted to a program linked to electronic interface inputs to activate ways to address these problems through experts participating in the program.
- 6- Field study of the reality of international oil companies The aim of this study is to establish the basis for decision making and the mechanisms for adopting sustainable applications.
- 7- The study shows the importance of adopting creative ideas on the development of sustainable applications in terms of energy, water, pollution, materials, management of sources, climate impacts. The mechanisms of contracting methods can be evaluated on a periodically the contractors by using sustainable core criteria.
- 8- The research achieved its objectives of finding treatments and changing the traditional method of procurements logistic activities is

to be more active. The research provides a most powerful areas of the path of sustainability in an integrated system has become one of the necessities of life in the renewed world.

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