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## The UK oil and gas supply chains: An empirical analysis of adoption of sustainable measures and performance outcomes

Yahaya Y. Yusuf<sup>a,\*</sup>, A. Gunasekaran<sup>b</sup>, Ahmed Musa<sup>a</sup>, Nagham M. El-Berishy<sup>c</sup>, Tijjani Abubakar<sup>a</sup>, Hafsat M. Ambursa<sup>a</sup>

<sup>a</sup> Lancashire Business School, University of Central Lancashire, Preston, PR1 2HE, UK

<sup>b</sup> Charlton College of Business, University of Massachusetts, Dartmouth, MA, USA

<sup>c</sup> Production Engineering, University of Bremen, Bremen, Germany

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### ABSTRACT

As the world shifts its emphasis from hydrocarbons to cleaner alternative sources of energy, the question of how oil and gas companies react to such a dynamic change has been of interest to academic and policy makers. Such a shift in demand is a result of both the on-going campaign against greenhouse gas (GHG) emissions and forecasts of future rapid depletion rate of hydrocarbon reserves. Although deposits are still vast, hydrocarbons are not renewable and the cost of extraction is rising mainly because of location complexities of viable reserves. Over the years, some research efforts have centred on the problems of possible depletion of oil reserves whilst others have been on how to reduce GHG emissions in the oil and gas supply chains with the view to achieving sustainability. It is in respect of the latter case that this paper examines the concept of sustainability, its essence and historical evolution as well as the depth and extent of its adoption and related benefits in the UK oil and gas supply chains. The paper reviews existing literature on the subject to generate an appropriate and adequate context for the analytical investigations that follow. Furthermore, data on sustainability and performance were collected from the UK oil and gas industry through survey by questionnaire. The statistical analysis of the data shows the impact of sustainability on the operational and business performance of the UK oil and gas supply chains.

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### 1. Introduction

The Kyoto Protocol came into force in February 2005 and commits industrialised nations to stabilise greenhouse gas (GHG) emissions ([www.unfccc.int](http://www.unfccc.int)). According to Bracho (2000, pp. 380), industrialised nations did not only refuse to embrace this protocol but also they believed that the targets set within it are insufficient for solving the problem of global warming. At the United Nations climate change conference held in Cancun from 29 November to 10 December 2010, Latin American countries threatened to withdraw if a negotiating text that included a commitment by rich countries to set new targets for another second period of the Kyoto agreement beyond 2012 was not prepared and adopted at the conference (Lavanya, 2011; Liu, 2011; Streck et al., 2011). This implies that developing countries tend to believe that the industrialised nations are not doing enough and that more stringent targets should, therefore, be set in order to reduce GHG emissions.

The International Energy Agency (IEA)'s World Economic Report of 2008 suggested that an increase of up to 30 million barrels per day (MBD) will be required by 2015 in order to forestall an oil supply crunch by 2030 (Nelder, 2008). The IEA attributed the possibility of a crunch to low investments in the market and a rapid increase in demand for energy. However, in order to forestall such an event, the Organisation of Petroleum Exporting Communities (OPEC), during its second summit in Caracas in 2000, emphasised its concern for the global environment and the need to focus on developing, inter alia, the relationship between consumers and producers in the market and innovations in technology. Recently, there has been a lot of investment in cleaner sources of energy in various industries, especially in transportation (IEA, 2012; BP, 2012), but recent draught in the US could affect production prospects. Transportation remains the oil industry's largest customer (Bracho, 2000; IEA, 2012; BP, 2012). Biofuels account for only 3% of transport fuels used presently. If managed properly, and barring severe weather events, this could rise to more than 30% by 2050.

Based on the foregoing, oil companies are investing heavily in alternative cleaner sources of energy and in re-engineering their supply chains in order to meet sustainable measures and

\* Corresponding author. Tel.: +441772894534; fax: +441772892904.  
E-mail address: [yyusuf@uclan.ac.uk](mailto:yyusuf@uclan.ac.uk) (Y.Y. Yusuf).

**Table 1**  
Historical milestones of sustainability.

Year	Event and description
1946	Introduction of sustainable agriculture: Lady Eva Balfour described sustainable agriculture as “permanence”.
1949	First UN Scientific Conference: The issue of social and economic development through proper management of natural resources in order to avoid their depletion was first mentioned.
1968	Inclusion of environmental issues in the global consciousness and agenda: UN Economic and Social Council added environmental issues to its major agenda which was endorsed by the general assembly.
1972	First Earth Summit: The UN Conference on the Human Environment took place in Stockholm and came up with a declaration that first mentioned the issue of climate change. It also led to the establishment of the Governing Council of UNEP, Environment Fund and Environment Coordination Board
1983	Establishment of Brundtland Commission: The resolutions titled “The Environmental Perspective to the Year 2000 and Beyond” was passed by the UN Assembly
1987	Brundtland Report was published: The report first brought the issues of sustainable development to the spotlight.
1990	World Climate Conference: Indicated an urgent need for international action on the environment.
1992	UN Conference on Environment and Development: Requests for various countries to consent to the UNFCCC framework.
1997	Kyoto Protocol came into existence: The agenda was to reduce carbon emission to at least 5% of 1990 levels from 2008–2012.
2009	UN Climate Summit: Recognised the need to keep rising temperatures at $\leq 2$ °C but failed to provide the protocols to do so.
2010	UN Climate Change Conference, Cancun: Latin American countries threatened withdrawal if developed countries were not mandated to show more commitment to the Kyoto protocol.
2011	UN Climate Conference, Durban, South Africa, 28 November to 11 December 2011, was meant to establish a new treaty to limit carbon emissions. All the countries at the conference agreed to a legally binding deal that will be prepared in 2015 and to take effect in 2020. Progress was also made concerning the creation of a Green Climate Fund (GCF). The fund will distribute 100 billion US dollars per year to help poor countries cope with the predicted impacts of climate change.

standards (IEA, 2012; BP, 2012). It is in this context that this paper reports on the investigation of the prevalence of sustainability measures in the UK oil and gas industry and, more importantly, the impact of implementation of such measures on the performance of the companies in the industry. The paper explores the evolution of the concept of sustainability and the global dimensions of the fibres and issues surrounding sustainability. Following this are statements of research questions, contextualised in the challenges of sustainability in the UK oil and gas industry. The results and analysis of data from survey by questionnaire are presented as well as the conclusions from the study.

## 2. Evolution of the concept of sustainability

The Brundtland Report (United Nations, 1987), one of the earliest studies to look in detail at the challenges of climate change and the need to preserve the world’s resources for future generations, highlighted the need to sustain economic development without depleting natural resources to unsustainable levels and without putting too much pressure on the environment. It also identified the concept of sustainable development as a new and important form of governance ([www.iisd.org](http://www.iisd.org)). Lady Eve Balfour is believed to be one of the first people to raise the issue of sustainability to public consciousness. She introduced the concept of sustainable agriculture in 1946. She described sustainable agriculture as an approach that is permanent, in the sense of being able to retain natural state of the soil for future generations. This was to be realised by adopting farming techniques that maintain soil fertility indefinitely; that utilise, as far as possible, only renewable resources; that avoid techniques that grossly impair the environment; and that foster biological diversity and activity throughout the food supply chain (Pfeiffer, 1947).

It is now accepted by the public and ardent observers and campaigners that the concept of sustainability was strengthened and accentuated by the environmental movements of the 1950s and 1960s, which were of the view that the global patterns of development and growth would have to be checked in order to be sustainable. Human activity impacts negatively on the environment. It was the United Nations Scientific Conference of 1949 that first mentioned the issue of depletion of natural resources, and drew attention to the need to manage them judiciously for social and economic development. This, according led the UN Economic

and Social Council to subsequently include environmental issues in its major agenda of 1968. This agenda was endorsed by the General Assembly and led to the emergence of the first UN Conference on the Human Environment in Stockholm in 1972. This conference became known as the “First Earth Summit”. The summit set principles for the preservation of the human environment along with an action plan containing recommendations for environmental actions to be taken internationally. The conference also established the Governing Council of the United Nations Environment Programme (UNEP), Environment Fund, and the Environment Coordination Board.

Over time, UNEP developed various protocols and conventions with different focus points in fulfilment of the 1972 decisions. This led to the establishment of the Brundtland Commission in 1983, following the passing of a resolution by the UN General Assembly that was named “Process of Preparation of the Environmental Perspective to the Year 2000 and Beyond”. In 1987, the Commission published the Brundtland Report (United Nations, 1987) which first publicised the concept of sustainable development. The major event to follow this was the Geneva World Climate Conference held in October–November 1990, which adopted a resolution emphasising the urgent need for an international action on the environment. This was followed by the 1992 UN Conference on the Environment and Development, which was held in Rio de Janeiro, Brazil. This emphasised the need for various countries to ratify the UN Framework Convention on Climate Change (UNFCCC), which by the end of the same year had been signed by 158 countries. In 1997, the Kyoto Protocol came into being with an agenda to reduce carbon emissions by at least 5% during the period of commitment (2008–2012). According to Bracho (2000), industrialised nations, in embracing this protocol, noted that the target set within it was insufficient for solving the problem of global warming.

In 2009 the UN Climate Summit took place in Copenhagen and was considered a failure by many observers because, despite its recognition of the need to keep rising temperatures at a rate not exceeding 2 °C, it failed to provide ways and mechanism to reduce carbon emissions that will lead to the attainment of the stated goal. Many people still believe that this goal, in itself, was inadequate when compared to the kind of action that is required to address the urgent issue of climate change. Table 1 highlights the historical evolution of the global campaign in support of sustainability.

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