Sustainability in the UAE Logistics Sector

A Research Report conducted in association with the *Australian Supply Chain & Logistics Institute* and the *University of Cumbria, UK*

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Abstract

The logistics sector could be described as the engine room of global and regional trade; it provides the means of fulfilling human supply chain needs but is typically kept out of sight and out of mind for most people. Never described as glamorous, it is also well known for its poor record in environmental and social sustainability. And as the world becomes increasingly aware of the criticality of sustainability, practitioners in and customers of the logistics industry are now actively seeking initiatives to address this need.

Now sustainability initiatives such as ‘green-energy’ and ‘green-buildings’ are quickly becoming the minimum standard that organisations seek to adopt in their development ambitions.

The United Arab Emirates (UAE), as an emerging global logistics hub and currently one of the highest carbon emission producers in the world per capita, is well positioned to transform itself into a showcase for responsible ‘green supply chain’ (GSC) practices.

The following report examines the worth of the progress made in sustainable logistics in the UAE to date and explores new opportunities that organisations could consider.

Sustainability initiatives that have been implemented in the UAE logistics sector are analysed in the context of their worth, resilience, and relationship to the key drivers of their success. In considering these key drivers, precedents that have been successfully employed elsewhere in the world are explored as potential new opportunities for the UAE.

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Chapter 1 - Introduction

Environmental responsibility has become a business imperative, according to Christensen *et al.* (2008), and many senior executives are now looking to their supply chains as a previously unexplored activity to deliver the sustainability results their organisations need to deliver.

Amongst the list of supply chain sustainability initiatives claimed by organisations in the United Arab Emirates (UAE), some genuine attempts at sustainability may be successful and enduring, whilst others are perhaps not lasting in nature or are commercially unattractive. This research attempts to define the degree of worth of pursuing sustainability in the logistics sector in the UAE.

The UAE is a country formed by the federation of seven emirates. It is positioned on the southeast tip of the Arabian Peninsula. Whilst rich in oil and gas reserves, its leadership has attempted to reduce its dependence on this sector by diversifying into other industries, particularly trade, logistics, tourism, and finance.

Being strategically positioned on the Gulf of Oman and the Persian Gulf, and at a natural junction between the eastern hemisphere of production and the western hemisphere of consumption, the UAE has sought to develop a significant logistics hub infrastructure to cater to the needs of both regional and global logistics.

A successful logistics hub is where the various elements of the supply chain intersect and add optimum value to the entire chain. The key features of a logistics hub were suggested by Fernandes (2009) as being:

- A strategic location along major shipping routes
- World class air and sea ports
- Efficient and adequate logistics infrastructure
- Ability to provide value added services
- Reasonable charges and cost effectiveness

- Limited government bureaucracy.

Although ranked 27th in the 'Logistics Performance Index' (World Bank 2014) globally, the UAE is the highest ranked country regionally.

With its extensive network of seaports, airports, and "free zone" logistics parks, the UAE now hosts a multitude of global trading and logistics organisations. It has emerged as somewhat of a pioneer in the advancement of logistics infrastructure that both private and government organisations around the world look to.

During the past 30 years, the UAE has been on a drive for growth. Along the way, it could be said that this focus on growth, in combination with low energy costs, low immigrant labour costs and regulations, and a booming economy, led to a lower regard for sustainable buildings. It will be discussed in more detail later that a lack of knowledge about green building, particularly in warehouse construction, is likely to have exacerbated the problem.

Numerous logistics operators in the UAE now promote their array of green and social initiatives, such as emission reduction programs and warehouses with sustainable features as a key part of their marketing strategy. Yet are these initiatives actually delivering sustainable benefits and commercial returns to the organisations and community?

In an environment where 60% of electricity consumption can be devoted to simply cooling the average building during the challenging summer months (Yassine & Elgendy, 2011) and carbon emissions per capita are amongst the highest in the world, the challenges in the UAE are clearly both environmental and attitudinal.

The following research studies initiatives from around the globe as well as those employed in the UAE, and evaluates the experiences and outcomes produced by their implementations in the logistics sector. Through an examination of recent innovations, experiences and barriers encountered, new opportunities are also suggested.

The Council of Supply Chain Management Professionals defines Logistics as 'that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related

information between the point of origin and the point of consumption in order to meet customers' requirements' (CSCMP 2015).

The largest specialist logistics organisation in the world, DHL, defines logistics much more simply as 'involving the planning, creating and monitoring flows of goods and information' (DHL 2015).

The UN Global Compact extends the definition to encompass the whole product lifecycle of the goods or services, including final disposal (UN Global Compact 2010). It states that not only is sustainability management key to ensuring business continuity and managing operational costs, it has become essential for maintaining the integrity of a brand. Furthermore, it goes on to state the sustainability objective is to create, protect and grow long-term environmental, social and economic value for all stakeholders.

The logistics market in the UAE is made up of ground transport; air and sea freight modes; warehousing; and supply chain management services. It has witnessed high growth in recent years achieving a total value exceeding US$30 billion by the end of 2013 (Transport Intelligence 2014).

With substantial growth rates and attractive operating margins, the sector is relatively fragmented and unregulated, containing a diverse spectrum of participants from large progressive multinationals and local enterprises, ranging to small basic local service providers.

In the UAE, specialist logistics organisations such as DHL and Kuehne & Nagel are bringing their contemporary practices and latest technologies as part of their standard service offering to global clients.

Regional specialist logistics service providers such as Agility, Aramex and GAC are focused particularly on having a strong footprint across the Middle East, with less emphasis on some of the major global markets. Their strategic position is therefore tailored towards regional customers in an effort to become the dominant logistics organisations regionally, and hence their corporate values tend to reflect those of the regional culture.

Although the transportation sector is forecast to grow at approximately 7 per cent CAGR, the logistics services sector (warehousing, contract logistics, and freight forwarding) is expected to show substantially higher annual growth rates of 10 per cent or more in the coming years (Transport Intelligence 2014).

In the Middle East region, basic road transport services typically yield operating margins of around 6 to 10 per cent. Freight forwarding, which requires more sophisticated capabilities, typically yields a slightly higher margin of 8 to 12 per cent. Warehousing and contract logistics services have been achieving margins of around 10 per cent, or even 15 per cent in the case of comprehensive supply chain solutions (Kogler, Majdalani & Kuge 2009).

Hence, the forecast volume growth and stable profit margins lays the ground for increasing future opportunity and competition for business. Establishing a distinctive competitive advantage will be critical to retain customers and gain share in such an expanding and profitable marketplace.

Furthermore, there are four factors that suggest an attractive logistics business environment and an encouraging growth potential for the future in the UAE:

- Solid economic growth and substantial on-going investments in logistics infrastructures by government and the private sector
- Local government in a clear and committed ‘lead by example’ approach with initiatives such as the Masdar Sustainable City and Dubai’s Green Building Code
- Establishment of numerous organisations regional logistics headquarters in the UAE, thanks to significant road, rail, sea, and air hub developments and efficiently managed free zones
- Evolution of the UAE as a key logistics hub due to its strategic location along the Europe-Asia trade route, and good access to markets in the Middle Eastern, Persian and Central African countries.

For organisations seeking to gain an enduring market share, integrating a comprehensive sustainability strategy in the overall strategy of the organisation will be a key imperative in the future.

By examining logistics infrastructures and practices in the UAE, this report seeks to evaluate the extent to which their claimed or expected sustainability benefits are being realised. And by understanding the key drivers of success, it also seeks out new opportunities that may be successfully implemented.

Statement of Problem

As sustainability is defined as 'using resources to meet the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987 p43), then it is clear that supply chains around the globe are not operating sustainably yet. However, they are becoming, as it were, less non-sustainable.

Linton, Klassen and Jayaraman (2007) suggest that the drivers of the cultural change to sustainability in the contemporary age are current and pending legislation, public interest, and competitive opportunity.

There is more to sustainability than just the environmental perspective. Social and economic sustainability is also important. Achieving balanced results across the financial, social and environmental spectrum needs to be managed.

Here there are challenges for the UAE in progressing the sustainability of the country's logistics practices. The UAE climate experiences extremes of heat during the summer months, and resources, particularly fresh water and human capital are in limited supply locally. This leads to heavy energy consumption and the costly importation of resources from outside the region.

Further, since the 'Logistics Performance Index' (LPI), was first launched in 2007 as an international scorecard to benchmark countries logistics performance, the UAE has slipped from a ranking of 20th down to 27th place (World Bank 2014). This is a reflection of a perceived deterioration in the UAE's competence and timeliness. The World Bank LPI surveys indicate that reliability and quality of services are considered by organisations to be the most important feature of their supply chains. So, the UAE supply chain sector is challenged to recover and then continue to deliver a balance of improved service coupled with sustainability.

While the research demonstrates there is an existing awareness of the need to be more sustainable, and a willingness to act upon it, the industry is challenged by a lack of knowledge of what to do.

Research Question

The central research question this report attempts to address is:

- How authentic are the sustainability initiatives in the United Arab Emirates logistics sector?

In answering this question in a clear and meaningful way, the following specific objectives will also be addressed;

1. To assess the key drivers of successful and enduring sustainability initiatives in UAE supply chains
2. To assess what initiatives are being implemented elsewhere around the world, and their reasons for success
3. To consider and propose what initiatives could be implemented successfully in the UAE and why they might prove successful.

In posing the core research question, the descriptive word *authentic* is chosen in the context of its Oxford Dictionary definition as being “factual, accurate or reliable” (Oxford Dictionaries 2010). In establishing the authenticity of the sustainability initiatives, their underlying drivers, degree of success and durability will also be determined.

It is proposed that for a sustainability initiative to be successful and enduring, it must have a clear commercial benefit to the organisation.

Research Interest in Issue

Interest in this subject is a result of observing a number of successful leaders in the general field of sustainable development. Seeing these leaders featured in media articles and on TV, reading their books and articles, and then witnessing their accomplishments in successfully balancing business and sustainability objectives prompts us to seek to understand their methods more deeply. These notable persons

include Yvon Chouinard founder of the Patagonia organisation, and Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE. These contemporary leaders exhibit great personal enthusiasm for progressing sustainability, and have demonstrated significant and seemingly enduring results in its pursuit. A key part of their actions concerns changing both organisations and countries patterns of development. Creating change in an organisation or country that leads to a behavioural or cultural shift in its people is a remarkable achievement, particularly if it is enduring. What then is the factor or factors that drive and build upon this change toward genuine sustainability?

Structure of This Research

This report contains five chapters, including this introductory chapter. The introductory chapter provides background data on the subject matter, including an overview of the United Arab Emirates, a definition of logistics in the context of the research, and a brief discussion on sustainability and the supply chain.

The second chapter, the Literature Review, will discuss each of the components of the supply chain, investigate the sustainability initiatives undertaken in the UAE in relation to them, and describe how the success of each is measured.

The approach, limitations and areas of further potential research are discussed in the third chapter, Methodology, and then the fourth chapter will present and analyse the findings. Finally, the fifth chapter will summarise the findings and attempt to draw conclusions.

Chapter 2 - Literature Review

In order to fully answer the core research question posed, three separate subject matters being: supply chain management; the country of the United Arab Emirates; and the concept of sustainability were identified as the foundation parts of the research, and a systematic review was conducted on each, before drawing them together.

Content was sourced from government and United Nations institutions, industry associations, relevant text books, commercial reports including company annual reports, and online articles from news media, industry and academic repositories.

The body of literature was used to study and understand the structure and components of the entire supply chain, and how they may relate to each other. Further study was then undertaken on existing green supply chain issues that are specific to the UAE.

In order to establish comparability over time, between regions, sectors and organisations, a review of the methods of benchmarking and measuring inputs, activities and outputs was then conducted.

The secondary research focussed on reviewing commercial reports, government and company reports such as annual reports, corporate social responsibility reports and sustainability reports. This research was complemented with online news articles, government, industry and interest groups publications and websites. The intent was to investigate further detail into:

- Corporate and government environmental and social stewardship behaviours. What the behaviours generally are currently and how they compare across organisations was analysed in a matrix to highlight the degree of commonality and suggest how they may be evolving.
- The commercial impacts of sustainability initiatives were reviewed in isolation and collectively where possible to determine if they provide financial returns on the initial investments, considering payback periods and perceived level of risk. Various surveys and industry leaders' commentaries were reviewed in an

attempt to establish if customers are actually willing to pay more for sustainability in practice.

- As 'green' and environmental issues featured predominantly in the initiatives found, further exploration was made on the social profile of the UAE and the social sustainability initiatives in that country.
- A study of stock market results comparing common industry indices and sustainable business indices was conducted, as a possible indicator of long term commercial returns and investor confidence.

For the purpose of review and analysis, the supply chain is broken down into functional components, where the issues and opportunities can be identified and discussed. The analysis looks at six separate components that together comprise the entire closed loop of the contemporary supply chain: product design and manufacturing; sourcing and procurement; operations; facilities (warehouses); transportation; and reverse logistics.

In order to present the analysis in an accessible structure, each of the supply chain components are discussed separately, with cross-referencing where appropriate. This is followed by discussion on benchmarking and measurements in order to establish a standard of empirical data to facilitate further comparability. The next step is the review of current corporate sustainability behaviours. Then, in this context, the commercial impacts, their viability and longevity are revealed. Finally, the current UAE social profile is discussed in line with its social sustainability ambitions.

Components of the Supply Chain

As its name suggests, the supply chain is an inherently linked chain or series of activities and information, all interconnected and reliant on each other in sequence. Increasingly, many supply chains are now being reconsidered from their traditional concept of a one way chain with a definite beginning and end point. Thanks to the advent of recycling, repairing, refurbishing, reusing, and efficient disposal, supply chains are now increasingly becoming closed loop, facilitating not only the maximum utilisation of materials and energy, but also allowing better control and efficiency over processes such as quality assurance, transport operations, data collection and waste assimilation.

Figure 1 below demonstrates the chain of activities and events in a closed loop supply chain, and the key components that are described as the physical logistics enablers. These components each have their own unique capacity to employ sustainability initiatives.

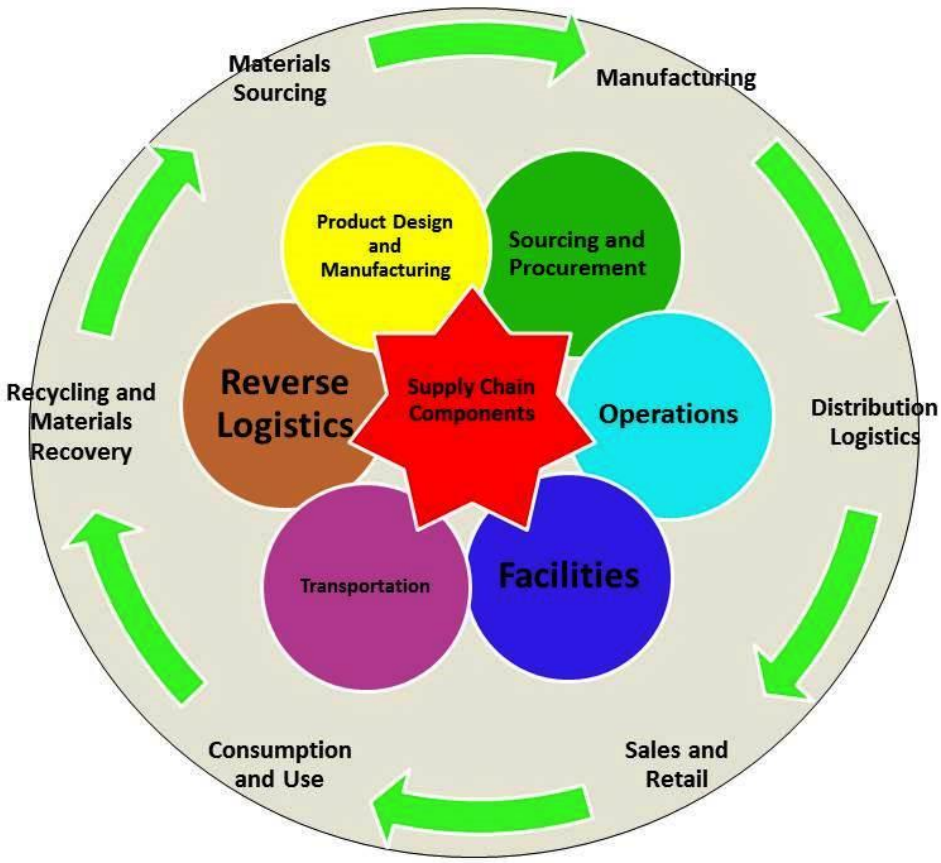

Figure 1. Closed Loop Supply Chain and the Logistics Components.

The entire supply chain must be considered in the scope of this research due to the close relationship between components, however the core focus is on studying the physical logistics enablers that support the provision of the supply chain, such as infrastructures, equipment and other resources.

As a service activity that connects all parts of the globe, logistics and the wider supply chain is a heavy consumer of social and environmental resources, since movement is its principal action.

Over the past 30 years or so, humanity has become increasingly aware of its own harmful effects on the environment and social wellbeing. Bloemhof-Ruward *et al*. (1995) claim that the global supply chain has become the main source of current environmental problems. As a result, organisations have found themselves under increasing pressure to 'green' their supply chain. The term 'Green Supply Chain' (GSC) was coined to describe the emerging organisational approach that seeks to minimise a products environmental and social impacts (Rettab & Ben Brik 2008).

Most of the businesses that seek to define green supply chain goals and business goals do so separately, according to Kangangi (2011). Yet by aligning an organisation's green supply chain to its overall goals and strategy, a competitive advantage may be created. Expanding on the widely shared capability based view of business strategies, Sehgal (2011) contends that building a superior supply chain, in performance terms, not only supports efficient operations, but it can be leveraged to create competitive advantages. Wilkerson (2013) further argues that, even where green supply chain programs are integrated within a generic corporate green strategy, without a direct alignment to the overall business strategy, a company risks wasting resources on efforts that do not deliver business value.

Hence, whilst the collective realisation of the need for sustainability in supply chains grows, it is clear that if a sustainability proposition is integrated into the organisation's core strategy, it can produce a competitive advantage for the organisation, as well as social and environmental sustainability. It is here at the convergence of core strategy and sustainable supply chain management that the potential exists for new business models to be developed.

Interestingly, although greening the supply chain can generate advantages such as differentiation, customer satisfaction, improved brand perception, reduced production and logistics costs, and improved production and logistics flow, a survey in the UAE (Rettab & Ben Brik 2010) found that the greatest barrier to adopting green supply chains was insufficient knowledge. Yet training in green supply chain management, one of the means to such needed greater knowledge, is, they argue, practically non-existent.

A pan-Arab survey (Tolba & Saab 2009) of the general citizen population's awareness of climate change and the need for sustainability reveals that an overwhelming 98% of respondents believe that the climate is changing and 89% believe the change is the result of human activities. There appears to be a broad and widely shared public awareness and desire for change, and therefore potential for improvement in the short term.

Looking more specifically at the potential of so-called green supply chains in business environments, numerous studies have been conducted on the barriers to green supply chains (Rettab & Ben Brik 2010). These studies have generally found many different reasons for why initiatives are not forthcoming, and many of them can be traced back to the influence of the organisation's leadership.

Balasubramanian (2012) posed a set of twelve criteria as being the barriers to adoption of GSC. Four of the criteria; lack of sustainable vision, lack of support, lack of organisational culture and paucity of green initiatives could be described as direct symptoms of poor, ignorant or even bad leadership. The remaining eight criteria could all be argued as being susceptible to leadership influence, and therefore indirectly subject to it, being rooted in the level of knowledge and understanding, resources and technology, government support and financial incentives, competition and demand.

According to the EPA (2000) and Michlowitz (2010), one of the most profitable areas for strengthening both operational efficiencies and environmental stewardship is an organisation's supply chain. Through the re-use of materials, reduction of waste, and introduction of energy efficiencies, contributions are made to the bottom line. Thus, stronger returns on investment and the implementation of a green supply chain are strongly linked.

Considering that the UAE and surrounding GCC countries have the highest carbon footprints per capita in the world (World Bank 2013), there appears to be much scope for improvement and resultant benefits to the bottom line. Indications from survey efforts (Barloworld 2013) are that UAE organisations have expressed their intentions to explore the potential of the supply chain as a source of competitive advantage in the coming years.

Hence, the following discussion illustrates a considerable opportunity and increasing awareness of the commercial benefits of greening the supply chain and reaping the financial benefits as a result. This is directly linked to a cultural shift where the barriers posed by a lack of understanding and willingness are gradually diminishing.

In the next section, each of the six supply chain components that were identified earlier in this chapter are taken in isolation and discussed in detail, commencing with the first stage of the value stream: product design and manufacturing.

Component 1 - Product Design and Manufacturing

The core focus of this research is to analyse actual and potential sustainability initiatives in the context of key physical logistics enablers and to determine the likelihood of achieving a lasting effect.

The supply chain starts at the very beginning of the value stream at the design, manufacturing and packaging stage. Hence, this stage offers the initial opportunity to instil features into the product to facilitate the establishment of a greener supply chain.

As a part of the product design process, each step in the supply chain can be analysed to identify waste and other by-products, particularly in areas of demand forecasting, production, physical logistics, and in the use of the product as well as looking for opportunities to extend the life of the product or to maximise its recyclability.

Many producers (EPA 2000) now critically analyse products in the design stage to review the life cycle and disposability of the end product. They also explore options for product life extension to defer obsolescence, and packaging and form options to maximise storage and transport efficiency.

In pursuing Triple Bottom Line improvements in the supply chain, many organisations start with the very design of the product and the packaging. Common strategies employed include using less materials or energy, substituting toxic for non-toxic, cleaning up the outputs, and turning outputs into inputs (De Brito 2007).

There is a plethora of green initiatives by both government and the private sector in the UAE, but with a pronounced emphasis on energy production and consumption. As a finance, trade, logistics and tourism hub, the UAE does not possess a significant design and manufacturing industry, and hence there appears to be limited opportunity to expand upon this as an area within the scope of the core research.

Component 2 - Sourcing and Procurement

A comprehensive sustainable or green sourcing effort assesses how a company fundamentally uses consumable items either internally, in its own operations, or in its products and services.

Von Zastrow (2011) defines the components that are subject to green sourcing as being categorised in four ways:

- Raw materials for production or inventories for sale
- Equipment and supplies consumed in operations
- Materials and energy to create buildings
- Service providers and contractors

The sustainability practices behind the raw materials and inventories, although closely linked, are not included in the scope of this research. The impact of the logistics activities that support sourcing and procurement, such as operations, buildings and transport, and that have direct relationships with the logistics subject matter, are discussed at length further in this chapter.

Sourcing and procurement generally contributes to and affects not only the logistics operations, but every part of the business, hence the starting point for introducing sustainability into all parts of the business would logically be here.

It is important to note that many have observed the need for a sustainability vision to be infused within and shared across the entire organisation, and up and down the verticals. For the sustainability vision, and therefore the culture and behaviours within the organisation to be enduring, there is a need for the sustainability strategy to be aligned with the overall corporate strategy (Hanna, Newman and Johnson 2000).

By cascading the sustainability vision and strategy throughout the business by virtue of the sourcing and procurement value stream, much benefit can be accomplished in not only tangible results but also in communication.

Component 3 - Operations

The operational parameters for sustainability include facility utilisation, carbon emissions, processing time, employee satisfaction, and social and environmental impacts on surrounding areas (Andriansyaha, Etmana and Roodaa 2011). Each of these parameters has multiple layers that can be unpacked and analysed in isolation.

By definition, the term ‘operations’ implies the condition or function of being active. Thus, the key input into operations is energy. While energy usage and efficiency is relevant at every point in the supply chain, it is addressed within the Transport section in this chapter, due specifically to transport being the heaviest consumer of energy and the biggest beneficiary of energy subsidies on fuel.

Due to the nature of the UAE logistics sector, being a central warehousing hub for the wider GCC and intra-regional trade, the warehouse operations component holds substantial opportunity, and is discussed at length under the following Facilities section.

Component 4 - Facilities (Warehouses, factories, offices)

The American Council for an Energy-Efficient Economy (Nadel *et al*. 2013) has found that improving building shells could reduce heating and cooling demand by up to 90% in new structures. In the UAE, where summer temperatures can rise to as much as 50 degrees Celsius, cost reduction opportunities such as this are compelling. Yet the unique nature of the UAE environment means that proposals made in the European and American environments may not produce the same benefits.

Recently, the UAE government released its Green Building Regulations and Specifications (Dubai Municipality 2013). Designed specifically for the UAE environment, it covers all aspects from energy compliance to water use, ecology, building materials, and access and social impacts.

Sustainable building issues are becoming increasingly evident in the practices of the commercial sector of the UAE, driven by the high energy consumption per capita, the increasingly limited water supply, and the desire to demonstrate environmental and social stewardship. Leading the charge by example is the government itself, embarking on projects such as the Masdar Initiative, a fully sustainable city.

Slowly, new technologies are being combined with resurrected traditional approaches of the past to produce innovative sustainable solutions. Passive cooling and water saving techniques used in ancient local constructions, such as wind towers, shading and orientation are now being employed again in new constructions.

According to the Global Reporting Initiative's *Sustainability Disclosure Database* (GRI 2015), out of the total of 4,490 organisations that registered sustainability reports in the 2014 year, 34 of them are UAE based. The UAE ranks 34th out of a total of 85 countries represented in the database. Whilst not at the top of the list, this is a creditable assessment for a country with a population of less than 10 million people (World Bank 2015).

What is more, out of the 34 reports submitted from UAE-based enterprises to GRI, 5 are from organisations that are active in or are related to logistics activities.

Logistics activities often involve large investments in buildings such as factories, warehouses and distribution centres. Comparative measures of performance are of considerable value in tracking costs and benefits, and so-called benchmarking tools are used to structure these comparative assessments. In measuring the effectiveness of sustainability initiatives in the building design, construction and operation activities, the emerging benchmarking tool is LEED, which stands for Leadership in Energy and Environmental Design. LEED is a certification program based upon a points system. Under LEED, building projects earn points across nine basic areas that address key aspects of green buildings (USGBC 2014):

1. Integrative process
2. Location and transportation
3. Sustainable sites
4. Water efficiency
5. Energy and atmosphere
6. Materials and resources
7. Indoor environmental quality

8. Innovation

9. Regional priority

Based on the number of points achieved, a project earns one of four LEED rating levels: Certified; Silver; Gold; or Platinum.

Currently there are 78,373 LEED certified projects in 140 countries around the globe. 688 of those building projects are located in the UAE, representing 0.88% of total projects

Of the 688 UAE projects, 590 are rated as Certified (1.19% of the total rated as Certified globally), 32 as Silver (0.26%of the total), 56 as Gold (0.46%) and 10 are rated as Platinum (0.22%).

103 of the 688 buildings house activities directly related to logistics, with the balance of 585 buildings being mostly dedicated to accommodating residential dwellings and offices. This suggests that the UAE's logistics industry possesses a comparatively well-developed focus on sustainable buildings.

Warehouses, factories, offices, distribution depots, and port terminals are common tools in the physical logistics operation. They require significant capital investment and typically have a significant impact on the environment and local community. Having established itself as a major global logistics hub in recent years, the UAE has invested heavily in logistics facilities.

As buildings are responsible for more than 40% of global energy consumption (UNEP 2009) they offer great potential for delivering significant and cost effective emission reductions.

In the UAE, counteracting the extreme climate incurs great expenditure of energy. The current approaches and potential future adaptations to minimise energy and resource consumption in UAE logistics buildings are discussed below:

- **Cooling**

The summer months in UAE are particularly challenging, as temperatures can reach 50 degrees Celsius. Cooling the average building may draw 60% of the total electricity consumption (Yassine & Elgendy, 2011).

As a result of the need for cooling and its energy consumption implications, a shift is being observed towards use of passive cooling techniques in contrast to the energy hungry air conditioning that was historically regarded as standard practice. Passive cooling systems use non-mechanical means to maintain a comfortable temperature inside the buildings and are beginning to form a key part of UAE businesses sustainability practices.

It is easy to see why. Theoretical studies have shown the application of passive cooling techniques on buildings may decrease their building cooling loads between 50% and 70% (Kamal 2012), and when introduced in the early design phase, it is a relatively low cost exercise that will lead to savings in the capital and operating costs of the air conditioning plant.

Further productivity benefits also come from accommodating staff in the more comfortable atmosphere, as well as quality and longevity benefits for inventories, plant and equipment, and the resale value of the building is usually also enhanced.

There is an extensive menu of options for passive cooling of buildings. Of these are an almost infinite number of innovative and unique interpretations in their use. They vary in cost and complexity, and were found to be employed in varying frequencies in the UAE.

- **Shading**

Shading may initially be perceived as a very simple approach; however, there are many variants:

  - Shading of Roof
  - Overhangs, Louvers, and Awnings
  - Textured Surfaces

- Orientation of Building
- Earth Berming (adding earth mass)

- **Insulation**

Using natural or synthetic materials, insulation prevents heat transfer from the external roof and walls to the interior of the building. Its ability to slow the transfer of heat is measured as the “R” value. The higher the “R” value, the better the insulation ability.

Commercial returns are estimated at around 40% to 50% electricity reduction and higher property values when a building is well insulated.

New building codes introduced in the UAE require minimum insulation standards.

Although environmentally unfriendly polystyrene products continue to be popular insulation materials in the UAE, high “R” value environmentally friendly materials such as rockwool, newspaper, cotton, and aerogel are gaining acceptance. Experimentation is also being undertaken with other types of recycled materials such as used car tyres.

- **Wind Towers**

A Wind Tower is a traditional method used for many centuries in the Middle East, and it is emerging in some modern constructions in the UAE. A Wind Tower typically forms part of the building and is a low or no-energy solution for cooling the internal building envelop through the use of natural ventilation and evaporation.

It functions by catching cooler breezes that prevail at higher levels above the ground and then directs the cool air down the shaft and into the interior of the building. The higher the tower, the more effective it will be (Zarandi 2009).

Contemporary versions now use solar-driven internal fans to ensure a consistent stream of ventilated air, and therefore energy consumption is nil. One well known example in the Masdar City, a UAE government project to create the most sustainable urban and commercial development in the world, is the centrepiece Wind Tower. At 45 metres tall, it also combines modern techniques such as mist generators inside the tower and adjustable louvers to maximise the wind capture.

However, despite use in residential and some commercial facilities, a review of buildings and new projects in the UAE revealed no Wind Tower in use in a specialist logistics facility.

Numerous studies in Europe and worldwide have lauded the health benefits of natural ventilation over mechanical methods. Thus, in addition to significantly reducing energy consumption, the system will offer a cleaner and healthier environment for the buildings occupants and UAE citizens overall, supporting both a social and environmental sustainability perspective.

- **Venting and Ducting**

Roof vents are a common practice in roofs of all types around the world, and are very commonly found in logistics facilities in the UAE. Roof vents use natural convection currents to drive the warmer air upward and out through the vent. Some vents are also wind driven. It is also possible to use mechanically driven exhaust vents.

Roof vents are a practical and low cost method of reducing heat build-up inside the building, supporting energy consumption reduction.

- **Geothermal Cooling**

Geothermal cooling is a process by which shallow ground is utilised within a system to regulate temperature. The upper 10 feet of the earth's surface holds a stable temperature between 10 to 16 degrees Celsius, regardless of the surface temperature, even during the peak of summer days.

This stable temperature is commonly used in cold climates for heating but can similarly be used in hot climates for cooling, by effectively pulling the cool temperature from the ground by exchange of liquid.

A study was conducted in UAE to compare the cost impact of replacing an existing air conditioning system in a commercial building with a geothermal cooling system, a cooling tower or a mechanical air cooler (Salem and Hashim 2012). It was revealed that the geothermal system would provide the best commercial solution over a 20 year period.

No specialist logistics facility in the UAE was found to be using geothermal cooling currently, but there are many public and commercial buildings elsewhere successfully employing this method (Rehau 2015).

The initial capital cost is the most significant expense for this system, with little maintenance and generally with a life equal to that of the buildings concrete floor itself. Hence, while the reduced energy consumption and costs saving were demonstrated in the study, there appears reluctance to employ this method so far due to the length of the payback period.

- **Construction**

The seven emirates that form the UAE have all issued their own municipal building codes, with each espousing excellent regulatory controls relative to sustainability. The two most developmentally progressive emirates, Abu Dhabi and Dubai, have issued very detailed and strict regulations governing all facets of construction including materials and recycling, energy and water efficiency, ecology and planning, and building vitality. Dubai has actually titled their code as *Green Building Regulations and Specifications* and Abu Dhabi has complemented their Building Code with interconnected codes on mechanical (air quality controls), property maintenance and energy conservation.

This demonstrates an effort by the government towards sustainable building in the future.

- **Building Design Features**

There are a number of methods that can be employed in the initial building design that will contribute to a favourable impact on sustainability:

- Roof Height; higher roof height will also improve air flow internally and achieve a cooler floor temperature.
- Colour; the use of lighter colours on the exterior façade of the building may contribute to reducing heat absorption from solar radiance. The Dubai Municipality (2011) Green Building Regulations even demands that a minimum 75% of the building must be painted in light colours.

- Location; logistics activities are hardly visually aesthetic, and their industrial nature often results in air and noise pollution. Hence from a community point of view, locating logistics facilities and large scale operations in and around residential and lifestyle environments is undesirable. To resolve this issue the UAE has set up demarcated areas for different types of industry and activity. This also allows similar and complementary organisations to locate in close proximity to each other, thus enabling collaboration synergies as well. Close proximity of related activities reduces transport demand.

- Lighting systems; the UAE building codes demand that a minimum amount of natural light must enter the building, and also specify minimum energy efficiencies in lighting systems, such as a minimum "lumens per watt". UAE facilities demonstrated a wide scale use of energy efficient fluorescent lighting, and an increasing use of LED systems and movement sensors for automatic on and off switching.

- **Construction Materials and Waste**

There are various examples of the increasing use of recycled construction materials in the UAE, with a corresponding reduction in industrial waste in the past year of 13% and registration of 26 separate waste recycling companies (NBS 2015).

At this point the regulatory requirements (Dubai Municipality 2013) demand only a minimum 5% recycled content in new constructions. Yet some recent projects are testaments to the increasing scale of recycling successes in the UAE:

- The Etihad Rail Project has used many hundreds of thousands of tons of building and demolition debris as rail track sub-ballast.

- Shurooq, the Sharjah Investment and Development Authority use recycled tyres for roads and tracks, kerbstones and landscape mulch.

- Lucky Group, an international metal manufacturer, now has two metal recycling plants in the UAE supplying both domestic and international demand.

Dubai alone produces 30,000 tons of construction and demolition waste per day (NBS 2015). This seemingly enormous volume is more a reflection of the large scale of new developments underway rather than an indication of a disregard for sustainability. However, the amount of landfill being used to dump this volume could be a problem for the future, and the opportunity here to neutralise this is evident.

- **Facilities Conclusion**

Currently more than 50% of the world population live in urban environments, yet urban areas account for approximately 80% of the planets carbon emissions (UN 2014). As population distribution is forecast to shift to 70% of people living in cities by 2050, the need to progress towards sustainability in buildings and built up areas becomes more immediate.

Less developed nations generally lag behind the global average in progressing towards sustainability, as their desire to accelerate improvement in standards of living for its population and the generally less regulated business environments provide less motivation to key decision makers.

In the UAE, both Abu Dhabi and Dubai, the main population centres, lack the natural resources to support their populations and rely heavily on imported commodities such as food and consumables, and on sea water desalination for fresh water supply.

Anticipating an increasing population density, the government of the UAE have and continue to use a double edged approach combining increasing mandatory sustainability regulations on building and energy usage, such as the Green Building Code (Dubai Municipality 2013), in combination with marketing and incentives, such as the Hero's of the UAE program (EAD 2015).

The most compelling motivation of commercial payback is still lacking in many new building constructions due to split incentives (Orts and Spigonardo 2013). As pointed out previously, the commercial viability of many sustainability initiatives in buildings require upfront capital investment that may pay off over 20 years. Hence, an organisation that owns and operates a building will reap the full financial benefits eventually. However, the common case of a landlord developer constructing a facility and then leasing to a tenant to operate sets up the split incentive conundrum. The landlord will not typically invest more in capital costs if the tenant will be the party to

reap the energy saving benefits for example. Hence there needs to be a mutual understanding and sharing of the benefits between all parties.

Whilst there is clear and genuine progress in facilities construction and use in the UAE overall, there appears to remain a reluctance in the logistics industry to invest on a large scale at this time. Simple and low cost initiatives such as insulation and shading are readily employed, however the length or payback period and split incentives are impeding larger investments.

Component 5 - Transportation

Known as a significant contributor to global greenhouse gas emissions, ample opportunities are offered in the transportation sector in the UAE to become more sustainable; the approach being to reduce the miles travelled per unit of goods or service through trip minimisation approaches. On-the-ground observation of many partly filled vehicles and vessels suggests that the use of more efficient processes, collaboration and technology might reap large improvements, not only in sustainability but also financially too. This is because empty carriage is extremely wasteful.

Britain's Carbon Trust (Carbon Trust 2014) found that 10% of processed foods' lifecycle greenhouse emissions are due to transportation and distribution. Yet, Guide (2012) argues that transportation may only be 4% of the total global supply chain, thus while the existence of opportunity is agreed, the scale is debatable.

In contrast to the popular "buy local" campaigns that often focus on food mile calculations, Singer & Mason (2006) suggest that food production in another country may be less energy intensive than domestic production, with energy reductions more than equal to enhanced trans-shipment costs. They cite the example of where rice produced in Bangladesh and then shipped to California for consumption is better than producing the rice in California, both from an energy and ethics perspective.

With the transportation sector generally being a heavy consumer of energy and producer of waste and carbon emissions, it features a direct correlation between generating efficiencies, sustainability benefits and cost savings.

The UAE's predominant in-country transport mode has been vehicular, while transport into and out of the UAE has been a blend of road, air and sea, with rail making an appearance thanks to significant recent investment.

Serving the relatively small UAE population of 9.4 million (World Population Review 2014) is a good quality road network of approximately 4,080km. The WEF Global Competitiveness Report 2014 (Schwab 2013) ranks the UAE as 5th on a global scale for quality of roads, sea ports, airports and other infrastructure.

The key inputs and impacts in the logistics sub-sector of transportation involve fuel consumption and emissions output, and are directly influenced by vehicle utilisation. These inputs and impacts are individually examined and discussed below.

- **Fuel Subsidies**

The Middle East region has one of the heaviest subsidy regimes for its domestic supply of fuel, electricity, water and food in the world. With such a ready supply of low cost inputs, there is an understandably lesser motivation in the region for users to become more energy and water efficient.

The issue of fuel subsidies is of great significance to the transport industry. Although subsidies are relevant to other areas of input in logistics activities, such as electricity and water supply, it is discussed here in a transport context, as fuel is one of the largest inputs and expenses for transport organisations.

The IMF estimates, using data from the Abu Dhabi Department of Finance that "subsidies and transfers" account for nearly 20 per cent of annual government expenditure in the UAE (Sdralevich 2014). In addition to this financial cost, being the difference between production cost and market price of the fuels and other inputs, there are the additional unmeasured external values of carbon emissions, environmental and health costs. While this places non-renewable energy at a distinct unfair advantage over renewable energy in UAE, the government claims to be reviewing the current subsidy structure.

Price increases as a result of a subsidy restructure will reduce the high electricity and water consumption rates, which in the UAE are among the highest in the world per capita and twice that of the United States. However, any increase in utility costs would likely contribute to increased living costs. With inflation last year at 3.1 per cent, and the effects of the 2008 recession still fresh, the government is very conscious of and sensitive towards incurring any negative financial market sentiments that may adversely affect continuing investment. The government must continue to balance the need for sustainability with the need for continuous economic growth.

Over the past five years, the cost of solar panels has fallen by 75 per cent (IRENA 2012). So as costs for renewable energy technologies continue to fall and removal of subsidies for non-renewable energy increases its price, the business case for

renewable energy will change its polarities. Driven by commercial pragmatism, it is reasonable to expect that business will drive energy supply reform of its own volition.

In pursuit of the UAE Vision 2021 to achieve a sustainable environment in terms of air quality, conserving water resources, more reliance on clean energy, and implementing green development, Dubai has launched the Mohammed bin Rashid Al Maktoum Solar Park, which currently has a capacity of 13 megawatts but with a phased rollout to achieve 3,000 megawatts. The Dubai Integrated Energy Strategy 2030 aims to diversify electricity production sources to include 71% from natural gas, 15% from solar energy, 7% from clean coal, and 7% from nuclear power.

The government of Abu Dhabi has also commenced construction of solar power stations aiming to produce 24% of its electricity demand.

This again reflects a government committed to increasing renewable energy sources, despite being in the top 10 oil producing countries in the world.

- **Emission Controls**

The UAE features specific industries that are particular polluters of air, such as oil and gas processing plants, power generating plants, cement manufacturing and its dynamic construction and demolition activities. Emissions from transport vehicles are also a significant contributor to air quality depletion.

Over recent years, the governments of UAE have progressively introduced and upgraded their emission control regulations. Included in the regulations are frequent periodic inspections of vehicles in order to allow them to be registered, visible smoke from exhausts being a traffic infringement punishable by penalties, and consideration is being given to limiting the age of vehicles to a maximum of 10 years only.

More recently, Emirates Authority for Standardisation and Metrology introduced new regulations (ESMA 2013) to control the standard of diesel fuel being sold in the UAE.

These initiatives again reflect the UAE government's policy to move towards a more environmentally sustainable community. Enactments of legislation compelling organisations to adopt these initiatives are mandatory and therefore can be considered as genuine.

- **Vehicle Engineering**

Vehicle manufacturers are increasingly looking at vehicle engineering from a whole life cycle perspective, taking into consideration the raw materials, design, powertrain, fuels, manufacture, maintenance, disassembly, recycling and re-use of components and materials.

Low mass, low emissions, economical fuel consumption, safety and ready recovery of components and materials are key initiatives in their drive for more sustainable vehicle usage.

Whilst the UAE lacks a vehicle design and manufacturing industry, it contributes to sustainability in vehicle engineering through recycling and recovery at end-of-life. With approximately 11,000 vehicles reaching their end-of-life each month, the UAE recognised an emerging problem with disposal of the materials. In 2014, Bee'ah opened the first car recycling plant in the UAE. It aims to recover 100% of the vehicles materials with a zero resultant landfill diversion whilst also being independently commercial viable.

This is a good example of the private sector seeking to introduce sustainability as a commercial enterprise. Although it is still in its formative period, the initial results appear promising.

- **Vehicle Capacity Utilisation**

Maximising the use of the capacity of a vehicle has always been an economic concern and a common 'key performance indicator' for transport operators.

The main two indicators of capacity utilisation are load factor and empty running.

The load factor is the ratio of the average load to total freight capacity, usually measured in tons for cargo, and number of passengers for public transport. In calculations for cargo vehicles, the load factor is often expressed as the number of ton-km divided by the number of vehicle-km.

The rate of empty running is defined as the rate of vehicle-km without cargo or passengers.

Both of these utilisation factors are important in analysing the level of efficiency in the employment of a transport vehicle, predicting impacts such as fuel usage and emissions.

For example, a half loaded truck uses more than 90% of the fuel per kilometre used by a fully loaded truck. Hence, the fuel use per ton-km is almost twice as high for a half loaded truck (Adra et al. 2010). The same truck then returning to the depot empty will again double the fuel use per ton-km.

The value of the load factor achieved in the transport industry typically ranges from 35% to 80% (Adra, Michaux and Andre 2010). Hence a significant variation exists between fleets, with the lower load factors pointing to poor efficiency and significant potential for improvement, which could result in both financial and environmental sustainability benefits.

- **Route Planning**

Route planning is the science of seeking the most optimal travel route for a particular vehicle to service its objectives, which may be a single delivery to a depot, multiple deliveries, a combination of deliveries and collections, or the meeting of specific time windows.

Historically, increasing efficiency and reducing wastage in the distribution of goods has typically been driven by a cost reduction ambition. However, the growing awareness of the environmental cost of poor transport productivity and the increasing volumes of reverse logistics is an additional motivation for organisations to plan their vehicle movements with optimum routes and sequences for drops and collections at the maximum load factor.

In cities such as Abu Dhabi and Dubai, where traffic congestion is a growing problem, the use of sophisticated route planning software is being increasingly employed by owners of large fleets. Modern route planning software typically interfaces with in-vehicle Track & Trace systems and in cloud based traffic monitoring systems such as Google Traffic to allow it to respond to changes in conditions and select alternative routes or sequences even when the delivery trip is underway.

The result is typically less ton-km travelled and results in both financial and environmental sustainability benefits.

- **Vehicle Track & Trace and Telemetry**

The evolution of vehicle 'track & trace' technology using the GPS network has developed a low cost vehicle tracking and diagnostics capability, allowing organisations, small and large, to manage their fleets more efficiently through the use of real time and historical data.

While there is no consolidated data for the UAE, the Dubai government Roads and Traffic Authority (RTA) stated that Dubai's economy was set back by USD790 million in terms of loss in working hours, time and fuel in 2013 due to traffic congestion. Traffic congestion in Dubai appears to be on a par with most major cities in the world, costing the economy in this one of seven emirates USD194,000 per kilometre.

Not only does 'track & trace' technology improve transport efficiency, with its resultant sustainability benefits described above, but it is a good example of how accumulating knowledge is contributing to understanding and providing better solutions to sustainability problems.

- **Vehicle Driver Expertise and Behaviour**

Statistics reveal that truck and bus drivers are considered the most dangerous category amongst road users, and traffic accidents involving heavy vehicles often result in considerably higher levels of trauma in victims in addition to the economic and environmental costs.

The technical expertise required to drive a heavy vehicle is often underestimated, particularly in the UAE and surrounding region, where the role is considered a minimum wage occupation, and virtually solely filled by expat labour possessing little in the way of education, safety training, mechanical or advanced driving expertise.

Acceleration rates, correct gear selection, braking and general maintenance all have a heavy impact on the environmental cost and economic efficiency of the vehicle. A proficient driver will produce far better results.

In a case study presented to the 2degrees Champions Awards 2015 (Carlin 2015), a UK based distribution organisation with a fleet of 120 trucks embarked on an improvement program directly targeting driver engagement as the key to improving their results.

The strategy comprised a number of tactics;

- Gathering data and setting benchmarks with the introduction of vehicle track and trace
- Improving the technical skills of the drivers with classroom training, practical driving instruction and assessments
- Motivation and morale building through a friendly competitive environment.

The organisation claimed (Carlin 2015) to have saved 173,052 gallons of fuel, translating into a short project payback of six months.

Research did not reveal any similar projects in the UAE, and the cultural social attitude towards truck drivers appears to have shifted little in recent years. However, led by government transport organisations such as RTA and private sector organisations such as Tristar, there are frequent examples of advanced driver training being provided in the UAE and a more public profile towards safe driving with many vehicles now bearing the “hows my driving” sign and customer service phone number.

Despite this, the need for quality in human capital appears to be an issue that has received inadequate focus from a social sustainability point of view.

Component 6 - Reverse Logistics

An increasing part of the so-called new value chain, reverse logistics, also known as closed loop supply chain or Product Recovery Management (PRM) is a relatively new discipline and a key step towards sustainability in supply chains.

Its development has been triggered by government regulations controlling the disposal and recycling of products and waste, and by customer pressure as a result of concern for the environment and rising disposal costs. Some businesses are now looking at ways to formalise and extract new value from reverse logistics.

Reverse logistics involves maximising the capture of all used and discarded products, components, materials, packaging and waste generated along the entire supply chain including the product end-of-life and disposal activities. Ideally, reverse logistics will recover the maximum amount of, or hopefully the entire value of the product and its associated by-products.

As found in the common definitions of logistics outlined in chapter 1, the flow of information is deemed to be as important as the flow of goods themselves. To analyse the opportunities and threats in the total closed loop of the supply chain, new information is now needed that may not have been captured previously. Many businesses are now finding that the acquisition of the data required to make accurate analyses and informed decisions are now a barrier to progress (Kaval 2011). Often the relevant data is scattered throughout the organisation or across other external partners in the supply chain, or is simply not available at all.

This reflects the finding, as mentioned earlier, that businesses believe the greatest barrier to speedier sustainable practices is the lack of knowledge (Rettab & Ben Brik 2010).

According to Thierry *et al*. (1995), organisations developing a Product Recovery Management strategy generally require detailed data that can be split into four categories;

1. Composition of products
2. Magnitude and uncertainty of return flows
3. Markets for reprocessed products, components, and materials
4. Product recovery and waste management operations

Without this comprehensive data, businesses are limited in what they can do, what options they can explore and what decisions and commitments they can make.

As previously noted, these information requirements can be partly met by benchmarking.

Benchmarks and Measurements

The issue most frequently raised across the entire spectrum of sustainability discussions is the lack of knowledge and understanding of the subject. Understanding is fundamental in order to determine the appropriate data to be measured and recorded for current and future decision making, benchmarking and consequently developing further understanding.

When the European Union adopted the Energy End-Use Efficiency and Energy Services Directive (ESD) in 2006, it found during the survey of progress that member countries generally had an insufficient understanding of the benefits of implementing energy efficiency measures (Mileva and Gilfanova 2014). Interestingly, a large number of experts consequently stressed the important role of legislation rather than education as a means to drive national energy efficiency policies.

Even in the UAE, a survey found the majority of respondents felt that the greatest barrier to adopting green supply chains was insufficient knowledge (Rettab & Ben Brik 2010).

The European Union, in its 2012 Energy Efficiency Directive (EED), a precursor to developing common legislation in the EU, emphasised there is significant potential for energy savings in buildings, manufacturing, energy conversion and transport; each of these sectors have a direct correlation to logistics activities. Again, it cites a lack of information as a key barrier to success.

As organisations become increasingly interested in improving their sustainability impacts, it becomes imperative that they must understand exactly what those impacts are, and what the key drivers are.

There is a plethora of various measures being recommended by experts and stakeholders (Kaval 2011) and as mankind's collective understanding progresses, so does the nature of the measures being developed.

Sustainability impacts can be recorded and benchmarked in three ways; metrics, key performance indicators, and values.

Policy instruments, having a direct relationship with benchmarking, are also key in the context of progressing measurements and understanding through their setting of standards.

The measurements are defined thus;

- A metric is simply a technique used to determine the magnitude of a quantity.
- A key performance indicator (KPI) is a strategic value driver that measures a core objective, vision or purpose. Hence, a KPI is a metric, but a metric is not necessarily a KPI.
- A value is the monetary worth of an activity or impact. In order for an organisation to put its impact into perspective, it must express it in a financial way. As discussed previously, the success and enduring pursuit of any sustainability initiative is usually dependant on an organisation achieving a commercial return on the investment in the initiative, even if it is indirect.

An example of a metric would be how many kilograms of carbon dioxide are released annually from an organisations transport fleet.

A related value would be to determine the financial cost of offsetting the carbon emission from the organisations fleet.

And a related KPI may be to declare the kilograms of carbon dioxide released annually per metric ton of goods delivered.

A review of 180 different academic and practitioner studies of sustainability measurement tools was conducted by (Kaval 2011) and the top 20 were identified, as outlined in Figure 2 below.

Measurement Tool/Method	Application	Frequency	Ranking
Balanced Scorecard Approach	Environment, social, financial	8%	3rd
Carbon Footprint	Environment	5%	
Destination Environmental Scorecard	Environment	1%	
Ecological Footprint	Environment	15%	2nd
Environmental Evaluation Matrix	Environment	1%	
Environmental Management System Modelling	Environment	8%	3rd
Epstein Roy Framework	Environment, social, financial	1%	
Genuine Wealth Accounting Model	Environment, social, financial	1%	
Green Globes Design	Environment	1%	
Green Productivity Index	Environment	1%	
Life Cycle Analysis	Environment, social	27%	1st
Lowell Centre Hierarchy	Environment, social, financial	1%	
Materials Flow Analysis	Environment, social, financial	1%	
Responsive Business Scorecard	Environment, social, financial	3%	
Whole Life Value	Environment, social, financial	1%	
Cost Benefit Analysis	Financial	3%	
Ecosystem Service Valuation	Environment, social, financial	7%	4th
Environmental Input-Output Model	Environment, social, financial	7%	4th
Sustainable Value Added	Environment, social, financial	4%	
Triple Bottom Line Reporting	Environment, social, financial	3%	

Figure 2. Top 20 of Sustainability Measurement Tools.

The most commonly used tool was the Life Cycle Analysis, followed by the Ecological Footprint, and then the Balanced Scorecard and Environmental Management System Modelling were equal third, with Ecosystem Service Valuation and Environmental Input-Output Model in equal fourth place.

It is interesting that 74% of the cases in the study were used to measure the entire organisation, rather than just one activity or event. By measuring the entire organisations impact, it more accurately captures the net effect of interconnected consequences. As discussed previously; the effects may ripple across entire organisations, supply chains, industries and regions.

Of the 20 methods identified, the top 3 are briefly outlined below;

- Life Cycle Analysis accounted for 27% of the frequency in the study. As its name suggests, the Life Cycle Analysis follows the entire supply chain of a product, from raw material acquisition through to production, use, maintenance and disposal. The analysis allows comparisons to be made between products on their environmental and social impacts. The level of detail and integrity of the data is of vital importance to the success of the analysis. There are a number of software packages that facilitate the creation of Life Cycle Analyses, and once done, allows for informed decision making.

- Ecological Footprint, accounting for 15% of frequency in the study, is the area of ecologically productive land required to accommodate particular resource demands, such as food, energy, housing or even waste. The Ecological Footprint is good in that it is simplistic and provides one number that can be easily compared across demand types, regions, and years. The increasingly relevant Carbon Footprint calculation is based on this measure also. Its disadvantage is that it is limited to measuring only environmental impact, and would need to be balanced with appropriate social and financial measures if used in a full sustainability context.

- The Balanced Scorecard Approach is a popular strategic planning and management tool devised by Kaplan and Norton (Kaplan and Norton 1996). It has become widely used by organisations to balance and evaluate financial and non-financial objectives with great success. Sustainability advocates have added social and environmental perspectives to the mix.

There are a number of organisations emerging now that seek to set common sustainability measures and benchmarks, and offer a wealth of information to organisations on devising appropriate measuring and reporting systems.

The Global Reporting Initiative (GRI) is one such organisation, upgrading and reissuing its guideline versions as the governance of sustainability continues to evolve

and widen. The benefit of GRI is that it enables measurement data to be made accessible and comparable, effectively spreading knowledge and expertise.

Should it be confronted with a lack of data, a business should not necessarily avoid or defer changing to sustainable practices. Haanaes et al. (2013) found one of the most successful common approaches employed by organisations in greening their supply chains is to leverage small changes for maximum return.

When embarking on initial steps to sustainability, it is logical that organisations must first establish willingness within the leadership team, and this will cascade to each level of decision making.

The first steps may be small or simple. A survey conducted found that 63% of companies in the UAE that declared they factored green supply chain concerns into their decision making, employed the sale of used materials and recycling as their main green supply chain practices (Rettab & Ben Brik 2008). These practices form the current core of reverse logistics activities. Yet, organisations have always recycled and reused materials, long before sustainability became fashionable. These practices used to be called ‘cost reductions’ but are now claimed as ‘green initiatives’. This may suggest that some corporate behaviours have not changed but have merely been relabelled. Yet, that this behaviour may be increasing due to improved awareness, more physical enablers such as recycling centres, more collaboration amongst stakeholders in the supply chain, more government regulations and incentives, and increasing commercial pressures to generate new efficiencies.

The UAE, as a central logistics hub for the region, is well placed to be a common nucleus facilitating the reverse flows and required material repositories for PRM.

Competitive advantages for business can come in the form of being able to offer ‘green products’ as a differentiator as well as gaining a positive public image, and commercially there are ample opportunities to increase efficiencies and reduce the cost of operations and materials.

Corporate Social Responsibility

Corporate Social Responsibility (CSR), once the exclusive domain of social impact concerns, is now closely connected to environmental impacts and both are typically combined in corporate strategy and reporting, as observed by Rohm and Montgomery (2011).

Advocates of CSR in the UAE, such as Aramex's former CEO Fadi Ghandour (ASC Staff, 2008), are leading their organisational communities towards being more sustainably minded. Government initiatives such as "Heroes of the UAE" have been established to raise the profile and reward sustainable practices locally (El Saad, 2011), and the UAE now claims the title of having the highest LEED rated building in the world.

However, it is likely that goodwill alone will not be enough to ensure that each sustainability initiative is enduring. Discussion now turns to looking at possible linkages between commercial viability of sustainability initiatives and their durability.

Commercial Viability of Sustainability Initiatives

The success of many sustainability initiatives will depend on their cost of implementation or the return on investment; will it be cost negative, cost neutral or cost beneficial to the organisation?

The question that every business must face before proceeding with any sustainability initiative that may increase their operating cost is 'are customers willing to pay?'

Nielsen, a leading global information and measurement company, conducted an extensive survey of 30,000 consumers in 60 countries in 2014 to gauge their willingness to pay extra for sustainable products and services (Nielsen 2014). The survey revealed that 55% of consumers say they will pay more.

According to Wong (2014) however, people do not always practice what they preach to public-opinion pollsters. The NBS (2011) suggests that consumers' behaviour may be all in the context of product and consumer type, and company. In fact, it appears that consumers are expecting to see sustainability from organisations as a baseline.

Haanaes *et al*. (2013) found three common approaches undertaken by organisations that resulted in their sustainability initiatives paying off financially;

1. A long term view was taken, investing in methods of sustainable operation that eventually led to dramatically lower costs and higher yields.
2. They started with small changes to their processes that generated substantial cost savings.
3. They spread their sustainability efforts to the operations of their customers and suppliers.

Yet, they also proposed two other relevant conditions;

- The innovators adopt a different attitude about costs: They focus on increasing the efficiency of the system as a whole.
- The companies consider their total return on resources rather than the traditional accounting focus just on assets.

It appears that for any environmental or social sustainability initiative to be sustainable itself there must be a commercial return or benefit that ensures a wide enough spectrum of stakeholders support is generated.

In short, each initiative must pay for itself, as commercial viability is the key.

To test this proposition on a broad market scale with empirical data, a review of two well-known market indices, the Dow Jones Industrial Average (DJIA) and the Standard and Poor's 500 (S&P500), was conducted in conjunction with two well-known sustainability indices, the Dow Jones Sustainability World Index Composite and Northern Global Sustainability Index.

The intention of the review was to determine if a correlating trend exists where sustainably focused companies are achieving better, same or worse financial returns over time than non-sustainably focused companies.

Market indices of common industrial stocks were chosen as the best indicator of business success to compare with similar market indices of sustainably-oriented industrial stocks.

The results are graphically illustrated in Figure 3 below.

Figure 3. Five Year Stock Chart; Dow Jones IA and S&P500 versus Dow Jones Sustainability World Index Composite and Northern Global Sustainability Index.

The chart demonstrates that, while the sustainability indices track the market fluctuations somewhat, they are trailing behind the market in overall performance over the past five years.

This suggests that investing in sustainability oriented organisations will produce less than average returns for the investor. This appears contrary to the findings earlier in regard to organisations mostly pursuing sustainability initiatives that also promise a financial return.

It is likely that the five year review period is inadequate, as the earlier findings also point to sustainability initiatives typically being a long term proposition, some suggesting paybacks of 20 years or more, a fact that has been highlighted as one of the commercial weak points of taking a sustainability stance.

Thus, it may be too early in the evolution of sustainability initiatives to extract a conclusive picture from the share market.

Social Profile and Sustainability Initiatives

The UAE total population of 9.4 million consists of 85% expatriate workers and the remainder native born Emiratis (World Population Review 2014). The disproportionate number of immigrant workers, mostly imported to support the massive rate of construction activity, creates a unique social profile.

Whilst most local Emiratis and management level expatriates appear to enjoy comfortable lifestyles, the same may not be stated for the majority of the population; consisting of unskilled and semi-skilled labour in such roles as construction, cleaning, drivers, warehouse workers and other service industries. Salaries for unskilled manual labour can be as low as US$220.00 per month, plus accommodation. Accommodation for workers is typically large scale dormitory style facilities situated close to places of work in industrial areas.

This does not permit a high quality of life for these workers, many of whom work six or seven days per week.

Improving their conditions can be challenging, as workers unions are illegal in the UAE. The plight of the workers is generally dependent upon the benevolence of the government to continue to upgrade the labour laws to improve conditions, remunerations and quality of life. Increases in minimum salary, medical benefits and working conditions have been enacted in regulations in recent years.

Nevertheless, the UAE government and many organisations, particularly in the construction sector, are regularly challenged by human rights groups on the level of their observance of the UN Global Compact principles in regards to human rights abuses and limiting the workers freedoms of association.

It could be argued that the salaries and living conditions of the workers are still better than they would be experiencing in their home countries, however, there is still much to be considered and researched further on the effects on quality-of-life and mental health when one is isolated so far from home, family and loved ones.

The root of this social conundrum appears to be the disproportionate allocation of the wealth that is generated as a result of the completion of the building or project, or by

the growth and profitability of businesses. The vast gap between the richest and the poorest in the UAE suggests there is opportunity to close this margin.

However, as a global citizen, the UAE demonstrates positive stewardship. As examples, the UAE is home to the International Humanitarian City, the largest humanitarian aid logistics hub in the world, and annually donates aid to more than 65 countries (Smith 2011).

The private sector in the UAE also demonstrates a socially supportive culture, as three out of the five 3PL's CSR reports revealed that the firms concerned donate services during humanitarian disasters, four out of the five practice social diversity initiatives inside their business, and five out of the five claim to undertake skills training for their employees and invest in community projects.

Literature Review Conclusion

Based on this review, it is evident that the most significant issues in the UAE, and therefore the greatest areas of opportunity, are related to managing the local climate impacts, the use of resources, particularly energy and water, and the stewardship of social equity.

The opportunities present themselves predominantly in four out of the six functional components of the supply chain, namely in operations, building construction and their use, transportation and reverse logistics.

While governments and the private sector are acting towards sustainability, they are hampered by a general lack of knowledge and measurements. Commercial viability is key to the durability of sustainability initiatives but are generally only being realised over the longer term and only if implemented with a total value chain net benefit in mind.

This affirms that the research methods should provide a balanced view across the supply chain in order to identify the sum of benefits realised from sustainability initiatives. They may be employed elsewhere in an alternative supply chain component that may not initially exhibit interconnectedness.

Chapter 3 - Methodology

Research Design

The research involved three key subject matters: logistics activities, the country of the United Arab Emirates, and sustainability initiatives. The approach in this study was to employ a blend of qualitative and then quantitative research.

As the report author possesses nearly 30 years of experience in the supply chain sector, and 15 of those years based in the UAE, it was deemed that two of the three subject matters could be approached initially from a descriptive research methodology.

Descriptive research can provide an accurate and reasonably comprehensive portrayal of the existing situation (Dawson, Kothari and Kumar 2005) in this case of the UAE and supply chain environments.

To suitably research the subject matter of sustainability, an exploratory research methodology was used. Exploratory research is ideal in areas where little is known, particularly if it is employed with an unstructured inquiry approach to allow flexibility. It provides a platform to discover and clarify variables through inductive reasoning, and to give direction.

Moving from qualitative to quantitative research, empirical data was sought by surveying industry and regional performance. Benchmarks and measurements were used to validate the emerging trends and theories. Company commercial results were used to develop deductive reasoning to support correlational research regarding the robustness of financial returns on sustainability investments.

The objectives of this approach to the research were to:

- Verify important facts
- Discover new facts
- Understand trends
- To find potential new solutions for some of the issues facing the UAE's logistics sector

Admissible Evidence

The nature of the problem posed by this research implies that it is time sensitive. That is, the nature of sustainability development is one of continuous evolution. Coupled with the fast pace of development in the UAE and the increasing competitive pressure in the supply chain, the subject matter research demands current data, or it risks losing relevance.

Literature must have a direct connection to the problem, including from a timeliness perspective (Rajasekar, Philominathan and Chinnathambi 2006).

Hence, the preferred research material was news articles, industry journals, corporate reports and websites, provided the source was proven reliable and factual. In other words, preference was given where possible to peer-reviewed material. Given the risk of out-dated data, text books were used in a cautionary manner and mainly to research proven strategic, management and measurement methodologies.

Due to the possibility of bias and subjectivity, people were consulted seldomly, and only if they are recognised subject matter experts.

Data Collection and Analysis

In order to examine current behaviours of what were deemed broadly representative organisations active in the UAE's logistics sector, five of the major Third Party Logistics providers (3PLs) in the UAE were identified (DHL, Agility, Aramex, Barloworld and Emirates Transport), and their most recent CSR and Annual Reports analysed and consolidated into a matrix of typical sustainability initiatives. The results are set out in Figure 6.

In constructing the analysis, a cross section of typical sustainability-related initiatives was sampled in order to gauge the frequency that typical 3PL's are engaging in each. This would determine the popularity of the initiative, but not necessarily its success, return or authenticity.

Data of an empirical nature was more broadly collected on various sustainability initiatives and then analysed for conclusive answers to the questions of environmental, financial and social benefits.

The rationale for this approach is that if the initiative can be linked to one of more of the TBL perspectives, then it can be deemed as a sustainability initiative. If it demonstrates a clear benefit, either directly or indirectly, and that benefit can then be linked to a resultant return on investment for the initiative, then the initiative can be considered as successful, enduring and therefore authentic.

Documents Used for Secondary Analysis Purposes

The following corporate documents were used in the secondary analysis research (See Figure 4).

Company	Reports Used
Agility Logistics	• Corporate Social Responsibility Report 2013 • Annual Report 2013
Aramex	• Carbon Footprint Report 2012 • Annual Report 2012
Barloworld Logistics	• Annual Report 2013 • Annual Report 2014 • Supply Chain Foresight Report 2013
Deutsche Post DHL	• Corporate Social Responsibility Report 2013 • Annual Report 2013
Emirates Transport	• Annual Report 2013

Figure 4. Corporate Documents Used for Secondary Analysis.

Research Ethics

The research was performed within the framework of the University of Cumbria's Ethical guidelines for research and the ESRC Framework for Research Ethics (ESRC 2015).

Although structured surveys were not conducted as part of the research, subject matter experts were informally consulted at times as part of the exploratory research process, and were treated as participants nonetheless.

The following six research ethics principles formed the core guiding framework;

- The research was designed and undertaken to ensure integrity and quality
- Participants were informed fully about the purpose and possible uses of the research
- Confidentiality was respected at all times
- Participants involvement was fully voluntary on their part
- Harm to research participants was avoided
- The research design ensured that independence was maintained throughout, and that conflict of interest was avoided.

Chapter 4 – Analysis and Findings

This chapter sets out the synthesised results of the secondary research conducted and attempts to summarise the existing situation of the country and the sector, and then identifies the key initiatives and drivers of sustainability. Remaining in a sustainability context, it goes on to propose the core challenges specific to the UAE's supply chains, and analyses the current corporate behaviours and reverse logistics areas in detail.

The Key findings are then discussed in turn.

In order to summarise the business environment in the UAE, a PEST analysis was constructed from the secondary research (See Figure 5).

Political:	• A constitutional federation of seven emirates in a framework of a federal, presidential, absolute monarchy • Modern administrative structure • Government structure includes a Supreme Council, Council of Ministers, parliamentary body, Federal National Council, and an independent judiciary • Stable political environment • Well regulated, pro-business
Economic:	• GDP US$409 Billion, growing at 4.6% • 8th largest oil & gas producer in the world • Finance, Trade & Supply Chain hub, & Tourism destination • US$132 Billion infrastructure & construction investment • No taxation • Total area of 88,600sq km
Social:	• Population of 9.44 million, young and growing at 3.3% • Population density mostly centred in Abu Dhabi and Dubai • Increasingly well educated, affluent and mobile • High expatriate proportion • "Emiratisation" employee quotas placed on business
Technological:	• Rated 2nd best road network in the world by WEF • Low fuel costs and extensive high quality road network have resulted in a heavy dependence on road transport • Metro rail system • Developing regional rail network for cargo and passenger Comprehensive air hub and sea port infrastructure • Comprehensive modern mobile network, with one of the worlds highest mobile penetration rates

Figure 5. PEST Analysis for UAE.

Sources: World Bank 2015; UN 2014; Kogler, Majdalani and Kuge 2009; NBS 2015; Schwab 2013; World Population Review 2014.

The PEST analysis reveals the UAE to have a wealthy, young and growing population concentrated in two key urban areas, and with a comprehensive modern civil infrastructure.

Economic indicators are strong, however, the fast pace of economic growth places pressure on the government and private sector to continue this momentum, potentially leading to decisions being made for short term gains.

The social profile indicates a high proportion of expatriate labour, potentially exposing the country to the vulnerabilities of a transitory workforce such as short-term decision making, lack of expertise, and low consideration for local sustainability.

The analysis now turns to drawing the three subject matters; supply chains, the UAE and sustainability together.

Green Supply Chain Issues Specific to the UAE Environment

Whilst a great deal of literature is written generalising the issues and opportunities on a global scale, prioritising the most problematic issues and greatest opportunities is specific to regions and environments. A closer look at the UAE shows a unique set of issues and opportunities.

As a predominantly desert environment, the UAE experiences some of the hottest seasonal temperatures on the planet, and annual temperatures are trending upwards. 2014 was the hottest year on record according to NASA (2015). Additionally, and exacerbating the challenge, natural supply and regeneration of fresh water is extremely limited.

Being a country of relatively small land area, the level of urbanisation is high and increasing quickly. The emirates of Dubai and Abu Dhabi in particular are famous for their recent speed and scale of urban development. Along with urbanisation, the UAE has one of the fastest growing economies in the world, and a high GDP level per capita.

These achievements are being attained at a price in terms of natural resources. Thus, the UAE is one of the highest carbon polluters in the world per capita.

As a significant oil production nation, petroleum products are readily accessible and are low priced, and the cultural attitude to fossil fuel usage is of less concern than would be found in oil importing cultures.

Driven by the challenging climate and local culture, it has an energy-hungry behaviour, with 80% of energy used by buildings alone, and 60% of electricity used in cooling.

With a high proportion of migrant labour, brought in to drive the country's building boom, it also has a significant gap between the rich and poor.

Thus, the most significant, but certainly not all, sustainability issues in UAE could be summed up as;

- Energy usage, predominantly for buildings and cooling.
- Water access
- Heavy subsidies on and low cost of non-renewable fossil fuels
- Social welfare

There are many examples of both government and private sector organisations addressing these issues, such as:

- Employment of new technologies, such as solar energy, vehicle track & trace, and LED lighting
- Imported contemporary tactics, such as improving employee welfare, and operational collaboration between organisations.
- Local traditional methods in combination with their own continuous innovation and improvement such as use of Wind Towers and earth berming for cooling of buildings.

It is clear that sustainability initiatives are best employed together as an inter-related web. As argued by Tan, Ahmed and Sundarum (2009), only the study of the logistics system as a whole will lead to an effective solution for the benefit of the Triple Bottom Line.

Tan, Ahmed and Sundarum (2009) provided an example of an organisation purchasing carbon credits that had diverted funds away from training and capital expenditure, which leads to reduced job satisfaction and productivity. Conversely, research may reveal that an organisation's initiatives and success in recycling and reducing waste will result in a corresponding increase in employee job satisfaction and retention, which may lead to increased productivity and enhanced net income for the organisation.

Thanks mainly to the economies of scale that volume brings, coupled with intensifying competitive pressures in the marketplace, organisations have come to recognise the supply chain as one fluid value stream rather than the aged concept of fragmented departments, businesses and agendas. It is known now that by optimizing along the entire sequence of steps of the production and supply of a product, the greatest value can be produced at the lowest possible cost (Linton, Klassen and Jayaraman 2007). In some cases, this may even mean that some steps must operate sub-optimally in order to produce the best value result from the entire supply chain as a whole.

In order to examine the typical corporate behaviours prevailing in the logistics sector currently, five of the major Third Party Logistics providers in the UAE were identified (DHL, Agility, Aramex, Barloworld and Emirates Transport), and their most recent Corporate Social Responsibility (CSR) Reports analysed and consolidated into a matrix of typical sustainability initiatives. The results are set out in Figure 6 below.

Initiative	DHL	Agility	Aramex	ET	Barloworld	#
3P's Benefit – People						
• Soft Skills Employee training	Y	Y	Y	Y	Y	5
• Anti-corruption policy	Y	Y		Y	Y	4
• Scholarships donated	Y		Y		Y	3
• Social diversity initiatives	Y		Y	Y	Y	4
• Donates logistics support in disasters	Y	Y	Y			3
• Invests in community projects	Y	Y	Y	Y	Y	5
3P's Benefit – Planet						
• Carbon reporting	Y	Y	Y	Y	Y	5
• Carbon Offsetting (credits)	Y			Y		2
• ISO14001	Y	Y	Y	Y		4
• Green electricity	Y				Y	2
• Vehicle; alternative fuel, drive systems (pa)	Y			Y	Y	3
• Emission reductions (pa)	Y	Y	Y	Y	Y	5
• Data collection; for better decision making	Y	Y		Y	Y	4
• LEED rating on buildings			Y			1
• Facilities energy use reduction (pa)	Y			Y	Y	3
• Produces an annual CSR Report	Y	Y	Y	Y	Y	5
• Waste reduction			Y	Y	Y	3
• Recycling			Y	Y	Y	3
3P's Benefit – Profits						
• Expansion of footprint and services	Y	Y	Y	Y	Y	5

Figure 6. Major 3PL Organisations Global CSR Initiatives

Sources: Agility Logistics, 2013; Deutsche Post DHL, 2013; Aramex, 2012; Emirates Transport, 2013; Barloworld Logistics, 2013.

CSR initiatives appear to be commonplace, now a fundamental expectation rather than a unique identifying competitive advantage. Clearly, as a matter of differentiation,

each organisation must go well beyond this averaged and normalised level, if they are to stand out in their industry.

Increasingly, there is recognition of this in industry, such as demonstrated by Barloworld Logistics in their strategic sustainability objective as 'to realise cost savings through energy efficiency and other sustainable business practices' (Barloworld 2014).

This may come in the form of efficiency gains or waste reduction, demonstrated directly through measured cost savings, sales revenue, margin or share price increases, or it may come in the form of competitive advantage, demonstrated through measurements of customer satisfaction or loyalty, differentiation or improved brand perception, or increased market share.

Waste Minimisation and Recovery

Attitudes are changing towards recognising waste in a new context. Waste that is relevant to the logistics sector comes from two generalised sources: inefficiencies or non-value added practices, and by-products and waste created by products as they move through the supply chain.

Inefficient and non-value added practices are discussed in other sections of this document, and involve the logistics practitioners themselves seeking new and innovative ways to introduce better processes in the supply chain to reduce energy consumption and time.

On the other hand, a relatively new activity known as Product Recovery Management, or reverse logistics has emerged. It represents a different opportunity as it involves the recovery and reuse of products and materials along and at the end of the supply chain. As illustrated in Figure 7 below.

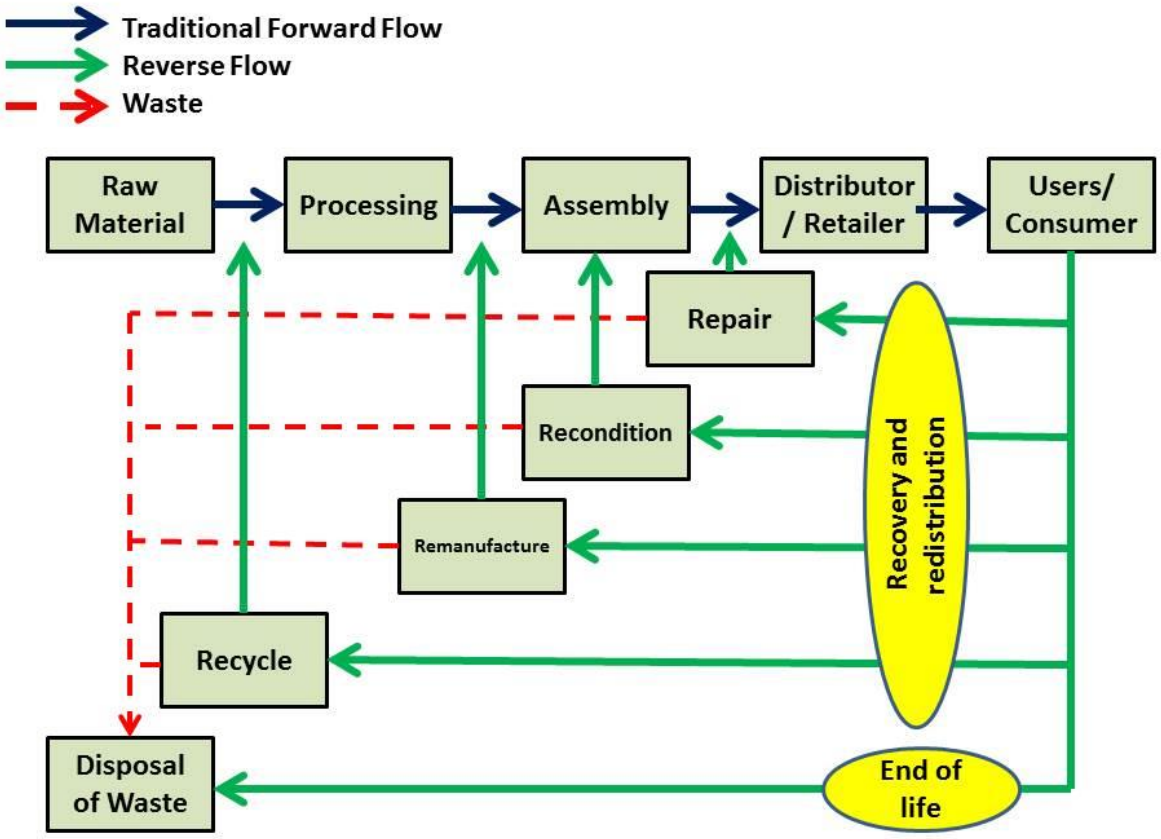

Figure 7. Reverse Logistics Cycle

Reverse logistics provides an extension to the existing logistics industry as it increasingly handles the backflow of the products and their by-products such as waste packaging and end-of-life disposal.

Through larger economies of scale in the use of existing forward flow logistics enablers, such as distribution fleets and facilities, new operational efficiencies are achieved for the logistics organisations.

The recovery and reuse of products and their components reduces the net raw materials inputs at the beginning of the supply chain, resulting in benefits across the Triple Bottom Line.

The Triple Bottom Line Approach

Recognising the Triple Bottom Line (Elkington 1997) as an approach philosophy, it has been used throughout the research and analysis as a check point continuously referred back to in order to provide a consistency of direction and appraisals.

Using the TBL as a guidance tool has facilitated equal focus and measurement across the three perspectives.

Demonstrating its attractiveness, over 4,000 organisations around the world produce TBL and Corporate Social Responsibility reports using GRI guidelines (GRI 2013). The Global Reporting Initiative (GRI) is a non-profit organisation that maintains one of the most popular standards for TBL reporting. Given this standard as a common platform globally, it promotes more organisations to develop their TBL initiatives further, and provides more comparability.

Commercial Returns

Establishing conclusive financial outcomes for each sustainability initiative in isolation is challenging for the following reasons;

- There is limited detailed financial data released by private sector organisations.
- There is a need to connect inter-related financial results, as benefits may manifest themselves elsewhere in the supply chain, and perhaps in another organisation, although it may bear a net benefit across the wider value chain.
- Many returns are long term propositions, and are yet to bear conclusive results.

The research evidence supports the proposition that for a sustainability initiative to be enduring, it must either bear a recognisable commercial return or be linked to a mandatory government regulation.

There is an initial reluctance by some organisations to invest capital where the payback period is lengthy, where there is uncertainty or insufficient knowledge, or where there is the likelihood of split incentives. This is evident in areas such as building constructions.

Organisations are more likely to embrace initiatives where the commercial return can be realised readily and in the short term. Examples of this are transport efficiency improvements where energy (ie. Fuel) expense savings are measurable and quickly converted to the bottom line.

The research into the stock market returns provided a more inconclusive result. If the proposition that sustainability initiatives provide longer term (20+ years) benefits rather

than short term benefits, then the stock market review should be performed over a longer period, rather than the 5 years in the review.

Relationship between Strategies

Throughout the research, the superiority of aligning an organisations sustainability strategy with the core business strategy became evident. There is evidence that this practice is gradually emerging in some organisations. Further research and analysis on how the strategies relate and the effectiveness of aligning or combining them would be a logical next step in this research.

Availability of Knowledge

The most prominent point that is repeatedly raised in the research is that businesses believe the greatest barrier to implementing and practicing sustainability is the lack of knowledge.

While studies show that the community is generally well aware of the need for more sustainable practices, there appears to be uncertainty about what exactly can be done. This is not unreasonable, as the goal of becoming a truly sustainable global community is formidable, and the journey will involve a great deal of discovery along the way.

The worth of each initiative must be considered from the whole TBL perspective as well, which is challenging due to the lack of data.

Many initiatives that require upfront investment and a long term payback can seem daunting when arguing the business case financially. The longer the term, the more uncertainty it brings, and the less attractive it becomes to investors.

Chapter 5 - Conclusion

This chapter sets out the overall conclusions resulting from the research and analysis. It summarises the findings and sets them out as a series of conclusions in the broader context of the secondary research literature assembled in Chapter 2. These are followed with a number of stakeholder specific recommendations.

In the UAE, the logistics sector is clearly profitable and growing, led by large multinational organisations but diverse in the size and structure of the broader spectrum of participants.

The UAE environment demonstrates strong economic growth, with substantial investment in infrastructure both from government and private sector.

Highly urbanised, and situated in an oil rich region, the UAE is struggling with one of the highest carbon footprints per capita in the world. Achieving efficient energy use, particularly for cooling and water supply in this desert environment, is one of its main challenges.

The government has a very clear green commitment and a positive encouraging approach to business and the community, with both the government and notable multinational organisations leading the path to sustainability by example.

Using the principles of the Triple Bottom Line, where an equal focus was applied to each perspective of people, planet and profits, the research into the logistics sector in the UAE suggests the following;

- A strong and enduring financial platform has been established, thanks to a balance of government and private sector investment and a strategy of focussing on and accommodating the key industries of tourism, finance and trade.
- A poor environmental baseline has challenged the UAE community, but through government and private sector initiatives, the UAE is transforming itself gradually into a greener business community, with aspirations to be a globally recognised “green” leader.

- While demonstrating benevolent leadership on the world stage, the UAE continues to struggle with the need for a large and low cost supply of labour to feed its growth ambitions while at the same time supporting its social stewardship.

The logistics sector shares a common problem with the rest of the world's industries in achieving adequate benchmarking and measurements. Standards are still developing as the global community becomes increasingly aware and informed. Knowledge is building upon itself exponentially.

The key drivers of reform in sustainability practices are as follows;

- Commercial returns, particularly over the long term
- Companies choosing to practice responsible stewardship
- Government regulations
- Public profile
- Technology, such as the price drop of solar panels and the increasing sophistication of planning and efficiency software packages.
- Subsidies on energy and water, although this is a negative driver of sustainability

Recommendations

- One of the most profitable areas for organisations to achieve operational efficiency and environmental stewardship gains is in their supply chains.
- The most enduring success is the result of organisations making small-step changes progressively. Initiatives such as introducing recycling or better transport planning into an organisational culture can be readily achieved.
- In the UAE, buildings represent the biggest scale of opportunity. Commercial returns over the long term of employing sustainability initiatives in construction, such as use of better insulation, recycled materials, and efficient energy use are being increasingly realised.

- There is ample opportunity for the transport sector to reduce its energy consumption and carbon footprint by introducing efficiency measures.
- World trade is experiencing an increase in reverse logistics, and the UAE possesses the existing platform to be a centralised reverse logistics service hub as demand develops further.
- Green supply chain strategies should be integrated with the organisational core strategy in order to maximise synergies and benefits.
- Data accumulation should be a focus in order to build a sufficient knowledge bank in order to make informed decisions. Increasing certainty in decisions such as calculating returns on sustainable buildings will accelerate the development of greener buildings.

There are varying degrees of success in many of the sustainability initiatives in the UAE, and much potential to implement new and innovative methods. Through sound leadership from government, business and the community, it is clear that there is an authentic ambition towards sustainability in the UAE. The UAE logistics sector is far from being truly sustainable, but is genuinely becoming less unsustainable.

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