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Inclusive Economic Development: The case of the South African Biofuels Cluster

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ABSTRACT

There is growing debate and interest by global institutions such as the World Bank, World Economic Forum and academics alike, in the field of inclusive growth and development. The current debates pivot on the pace, patterns and process of including marginalised groups such as women, youth and persons living with disabilities (PWD) into the market economy. Inclusive growth focussed on the use of broad-based participation in the market economy, while inclusive development pivots on the inclusion of the marginalised in the process of economic development. The debate, however, fails to incorporate the role of industrialised economic development.

The purpose of the study is to understand the latent potential the South African biofuels sector may hold in local economic development and the participation opportunities. An inclusive economic development construct was developed with the intention to incorporate localised industrial development, thereby increasing the participation of marginalised groups in the process and pace of development. The theoretical construct was applied to the contentious biofuels industry development process.

The draft position paper on the biofuels regulatory framework was used as the foundation of the research data gathering and analysis of the two-phased qualitative method. The qualitative content analysis instrument was used across both phases, and triangulated to increase the validity and reliability of the findings.

The evidence suggests that the biofuels industry holds the potential for inclusive economic development. The achievement of inclusive economic development is, however, dependent on the policy development and process legitimacy and coherence across and within existing structures. Demand and supply-side policies are still outstanding to stimulate the development of the new industry, while possible diversification opportunities exist through the use of co-production to enter existing high value markets and value chains.

Keywords

Inclusive development, biofuels, draft position paper on the biofuels regulatory framework, industrialisation

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DECLARATION

I, Nazeema Ismail, declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Nazeema Ismail

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ACCRONYMS

Abbreviation	Meaning
AsgiSA	Accelerated and Shared Growth Initiative for South Africa
CAD	Comparative Advantage-Defying Strategy
CAF	Comparative Advantage Following Strategy
CASP	Comprehensive Agriculture Support Programme
DEA	Department of Environmental Affairs
DoE	Department of Energy
E.C	Eastern Cape
F.S	Free State
GEAR	Growth, Employment and Redistribution
GDP	Gross domestic product
GDP/C	Gross domestic product per capita
IEP	Integrated Energy Plan
IRP	Integrated Resource Plan
KZN	Kwazulu-Natal
N.C	Northern Cape
N.W	North West
NDP	National Development Plan
REFIT	Renewable Energy Feed In Tariff
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
FDI	Foreign Direct Investment
RDP	The Reconstruction and Development Programme
WEF	World Economic Forum
W.C	Western Cape

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1. CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 Chapter Introduction

Dani Rodrick (2013) highlights that swift action is required to eradicate the constraint of achieving economic growth. In South Africa, the underinvestment in electricity supply capacity is suppressing existing productive capacity (REEP, 2014). Further strain was placed on aging infrastructure by the connection to the electricity grid by more than 5.7 million households since 1994 (Bongwe, October 2013), representing only between sixteen and 18% of consumption (REEP, 2014). The renewable energy sector development is deemed to be one of the mechanism to add a further 1,456 MW capacity to address the shortage (Ernst & Young, 2015).

South Africa urgently needs to cultivate underdevelopment of other sectors such as agriculture and manufacturing that are beyond the mineral wealth (Hausmann & Klinger, 2008). The economy's long-term economic stability is dependent on expanding economic activity and exports diversify (Barth, 2013; Hidalgo, Hausmann, & Dasgupta, 2009; McMillan, Rodrik, & Verduzco-Gallo, 2014; Morris, Kaplinsky, & Kaplan, 2012; Naudé, Bosker, & Matthee, 2010). Diversification would reduce the boom and bust cycles associated with global commodity consumption of her mineral wealth and stabilise the currency (Torres-Fuchslocher, 2010).

Ajit Singh (2011), Joachim Jarreau & Sandra Poncet (2012) and Wim Naudé, Maarten Bosker, & Marrianne Matthee (2010) emphasised the importance of aligning microeconomic structures and diversification to stimulate growth encourage growth. Biofuels cluster development has the potential to reduce middle-income economies' legacy of adopting capital-intensive developmental strategies, while introducing a new product into the local market. The primary objective of the study is to examine the potential that the biofuels industrial cluster could have in increasing economic opportunities, generate microeconomic changes and contribute towards export-led growth. This investigation assumed the new cluster would ignite productive spillovers in services sectors, human capital and technological innovation, resulting in economic development and growth and increase the country's productivity (Nijaki, 2013, p. 253).

Justin Lin (2012), Robert Hamwey, Henrique Pacini & Lucas Assunção (2013) Cesar A. and Hidalgo, Ricardo Hausmann & Partha Sarathi Dasgupta (2009) identified that the choice of tradable goods selected in diversifying the economy is a crucial decision in facilitating

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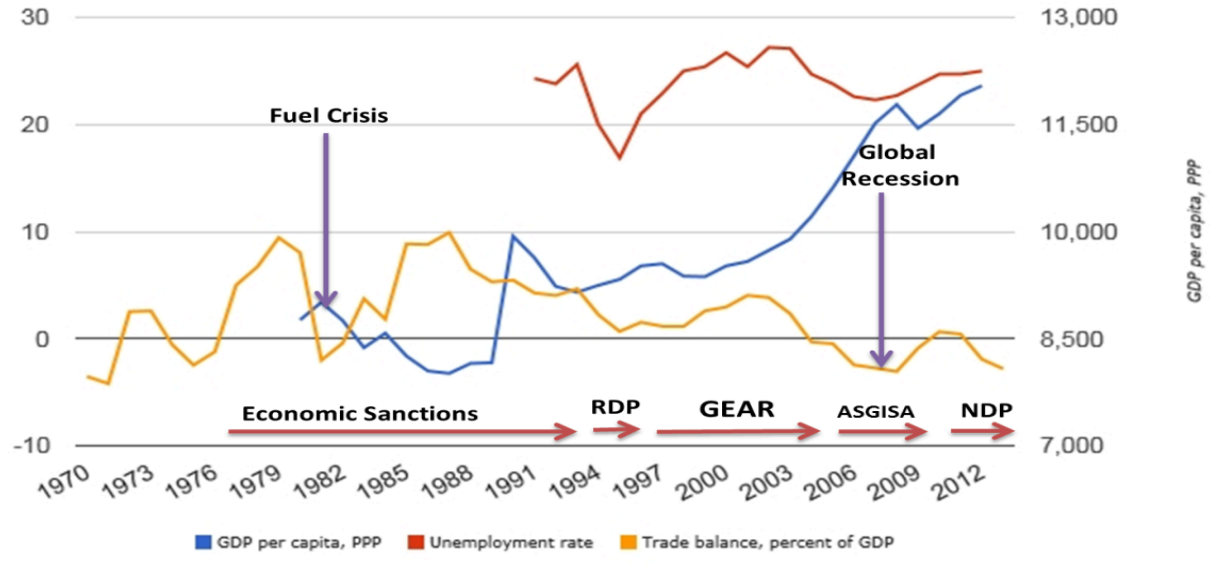
sustained growth, while also taking into account that sustained economic development and growth require structural transformation (McMillan et al., 2014).

Dani Rodick (2010) argues that conventional economic development strategies provide inadequate guidance on how high middle-income resource-endowed countries are able to sustain growth, while the World Economic Forum (WEF) (2014) recommends middle-income countries to shift towards knowledge-based economies (Scharb, 2014). This however is a constraint seeing that under-utilisation of the existing labour force distorts the economy's productivity structures.

1.2. Country Background and Economic Development

The National Development Plan (NDP) (2009) was adopted as the social and economic development framework to accelerate growth and eliminate poverty and reduce inequality (National Treasury, 2014, p3). Industrial development is one of the key policies that would facilitate the achievement of these social and economic goals (National Treasury, 2014, p. 29). The state has positioned the economy to focus on the semi-skilled manufacturing and services sector (National Planning Commission, 2011; 115). However, the current skills base of the economy is dispersed, from highly to low skilled. Structural unemployment is an on-going binding constraint to the economy's growth. The agriculture sector is identified as a means to increase the economic participation of low-skilled employment, while simultaneously contributing towards the export-led growth (National Treasury, 2014, p. 27).

Figure 1: The Impact of SA Economic Policies on Trade Balance, GDP per capita and Unemployment (1970 – 2013)



Source: TheGlobalEconomy.com, World Bank

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The underdevelopment of segments of the economy accentuated the inequality within; resulting in a dual economic structure whereby there is co-existence of a modern economy (manufacturing) and traditional (agriculture) sectors (Vollrath, 2009, p. 287). The mineral cluster and manufacturing sector fundamentally depicted South Africa's economic activity in the mid-1990's (Scholvin, 2014, p. 187). The country's dependency on its mineral base remains as high, with mining contributing approximately 6% towards GDP; however, it contributes sixty percent towards total exports by revenue (BMI, 2014, p. 16). Productive growth is consistently identified as a means of shifting the existing economy structure (McMillian et al., 2013, Lin, 2012).

The succeeding economic strategies, Growth, Employment and Redistribution (GEAR) (1996) and Accelerated and Shared Growth Initiative for South Africa (AsgiSA) (2006), however focussed purely on economic development and growth under the umbrella that growth would result in employment. The decoupling of social and economic development resulted in jobless-growth and low growth economic growth as highlighted post the Reconstruction and Development Programme (RDP) period, illustrated in Figure 1.

South Africa's cumulative share of exports has declined from 29.6% in 2008 to 24.7% in 2013. The gains from trade also declined due to the weak exchange rate (Euromonitor, 2014). Manufacturing accounted for 23.9% and crude materials, excluding fuel, amounted to 19.1% (Euromonitor, 2014). South Africa's foreign trade partners with developed countries, such as OECD, European Union and Brazil, Russia, India, and China (BRIC's) countries, that has high demand for its mineral resources. The country's trade partners have not increased in the past 12 years. However, the value thereof has increased significantly, which may be attributable to the increase in mineral (commodity) prices.

In 2012, the major export destinations were Asia-Pacific (32.3%), Europe (24.2%), Africa and the Middle East (20.2%), North America (8.4%) and Latin America 2.4% (BMI; 2013). The developed nations constitute the majority of the country's exports, which makes it vulnerable to financial shocks that are experienced there (National Treasury, 2014). The trade linkage to identified high growth economies, however, is not fostering and incentivising the nation to shift its economic structure. The diversification of its trade partners and the increase in the share of export trade is required. The geographic location of the country needs to be leveraged on, to increase its trade to other southern and African countries (National Planning Commission, 2011).

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1.3. Biofuels Prescriptions

Biofuels industrialisation offers new economic development opportunities for petroleum in developing economies, as opposed to dependence of crude imports (Demirbas, 2009). Moreover, it has the inherent capability to expand the existing export basket (Hamwey et al., 2013; Resnick, Tarp & Thurlow, 2012). The biofuels industrial development would reduce the dependency on crude imports, therefore having a positive impact on the trade balance without impeding local energy demand (Bell, Silalertruksa, Gheewala & Kamens, 2011). The increase in bioethanol supply could reduce the demand for fossil fuels and result in the substitution-effect, thereby reducing the overall price of oil and gas. The aggregated supply and demand for energy of the economies and countries would therefore reduce the fossil-fuel commodity price and overall volatility (McMillan et al., 2014; Inglesby, Nyquist & Pinner, 2013, p. 33; Lin, 2012).

The biofuels strategy (Department of Minerals & Energy, 2007) and position paper (Department of Energy, 2014) clearly prescribe the feedstock to be used for biodiesel as canola, sunflower, soya beans, sorghum, while sugarcane and sugar beet are the choice of feedstock for bioethanol. Feedstock expansion and its choice are important in biofuel development as feedstock may be varied to reflect different climates, soil types and water demand (Pradhan & Mbohwa, 2014b).

Each prescribed crop has specific climate conditions and growth cycles (Brent, 2014) – refer to Table 1. These climatic conditions limit crop production and subsequently biofuels production feedstock supply. These conditions however are inconsistent with the geographic locations of licensed producers and existing provincial crop production. Canola is only commercially produced in the Western Cape as a winter crop (GrainSA, 2014; National Department of Agriculture, Forestry and Fisheries, 2010).

The Free State and Mpumalanga produce in excess of seventy-five percent of the country's soya beans and sorghum (GrainSa, 2014). While the production is concentrated in these regions, it can also be produced in most provinces, except the Western Cape. These feedstocks' require between four and five months to grow respectively and are produced from November to March. The Free State, Western Cape, Kwazulu-Natal, Eastern Cape, North West and Gauteng are also able to produce sunflower crops; the data however is not available.

Previously disadvantaged black areas have been identified as producers of the agricultural feedstock for biofuels production, namely the Eastern Cape, Limpopo and KwaZulu-Natal

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(Department of Energy, 2014). These regions have the necessary climate conditions that would promote feedstock development, while simultaneously having a labour pool that could be attracted to the industries. The investment into new productive capacity in previously underdeveloped regions will increase the provincial economic development and growth opportunities, including infrastructure development and job opportunities.

Table 1: Biofuels Feedstock Production Requirements

	Province Produced	Mean Average Precipitation (mm)	Mean Monthly Rain and Annual Temperatures	Planting date	Growth cycle
Canola	Western Cape	500-1000	-	01 Jun	140
Cassava	Limpopo, Mpumalanga and KwaZulu-Natal	> 1000	- 20-29”C	-	-
Sorghum	Free State, Limpopo, Mpumalanga, KwaZulu-Natal, Northern Cape, Eastern Cape, North West, Gauteng	-	450-650	Mid-Oct	115
Soya bean	Free State, Limpopo, Mpumalanga and KwaZulu-Natal, North West, Gauteng	-	550-700	01 Nov	150
Sugar beet	-	550-750	- 15-25”C	01 Aug	200
Sunflower	Free State, Western Cape, and KwaZulu-Natal, Eastern Cape, North West, Gauteng	-	400-600	01 Dec	125

Source: Brent, 2014 and South African Department of Agriculture, Forestry and Fisheries, 2010

Eight biofuels producer licenses were issued (Department of Energy, 2014), which are concentrated in the Eastern Cape; refer to Table 2 below. While the production activity will empirically stimulate the agricultural and economic development within the province, it also has the potential to spillover to the production of biomass electricity generation. The proposed biofuels producers will be in close proximity to the two state-owned petroleum refineries, PetroSA and the proposed Mthombu refinery Coega port, which holds the potential to contribute towards export diversification.

The Eastern Cape’s (EC) socio-economic development historically has not been able to address the structural inequality that exists. The EC contributes 7.5% towards the national GDP growth, slightly higher than Mpumalanga and Limpopo, yet significantly lower than other provinces (Statistics SA, 2012). In 2013, the unemployment rate within the province reached 30,8%; this however excluded discouraged employment seekers (Eastern Cape Department of Development, 2013). The expanded definition of unemployment to include

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discouraged employment seekers ups the unemployment rate to 45.2% (ibid), the vast majority of whom have not completed high school (51%).

Table 3: Provincial Distributions of Biofuels Production Capabilities

Province	Ethanol			Biodiesel		Undefined	Total
	Sorghum	Canola	Sugar cane	Soya bean	Waste vegetable oil		
WC							0
NC							0
FS	158						158
EC	90	500		288	50		928
KZN							0
Mpumalanga			50				50
Limpopo							0
Gauteng					12	42	12
NW							0
Total	**248**	**500**	**50**	**288**	**62**	**42**	**1148**

Source: Brent, 2014 and Pradhum et al

There are two technologies that are currently available, each offering varying degrees of employment and diversification opportunities. Biofuels derived from agricultural crops that have high-energy density such as sugar cane and canola typically represents first-generation biofuels (1G) that produce bioethanol, biodiesel and biogas (Bacovsky, Dallos & Wörgetter, 2010). Second-generation biofuels (2G), on the other hand, are derived from organic waste such as agricultural, wood milling and vegetable oil waste (WVO) to create biosynthetic gas. Pradham et al., 2014, stated that the technology has not however been proven to be commercially viable. Costantini, Crespi, Martini & Pennacchio (2015, p. 581) stated that the cost of second-generation technology costs between two and three times higher than the current price of petrol, while third-generation (3G) biofuels derived from algae cost more than seven times higher than the current price of diesel.

1.4. Research Motivation

1.4.1. Social and Economic Rationale

South Africa has a deep history of institutionalised inequality that is evident in the spatial distribution of the economy (National Planning Commission, 2011). It is estimated that 42.9% of South Africans live on less than $2 per day, while the unemployment rate is high at 25% (BMI, 2013). A total of 70% of South Africa's poor live in rural areas (Kepe & Tessaro, 2014, p. 267). The geographic dispersion of capital-intensive extractive commodities located inland has, however, not resulted in the economic prosperity of the local communities, contributing to the high level of unemployment in these regions. It is therefore inferred that

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the capital-intensive exports are a potentially important determinant of spatial inequality within the country.

South Africa is focusing on improving its microeconomic productive structures to enable it to accelerate growth, eliminate poverty and reduce inequality (National Treasury, 2014; National Planning Commission, 2011). However, in order to achieve this objective it needs to diversify and increase its economic sophistication beyond its mineral wealth (National Treasury, 2014). The South African economic dependency and specialisation on resource-based exports increased the volatility of the currency (National Treasury, 2014). The long-term stability of the economy is therefore dependent on its ability to diversify (Barth, 2013; Hausmann & Klinger, 2008; Mcmillan & Rodrik, 2014; Morris et al., 2012; Naudé et al., 2010). This is only achievable through alignment to the endowment structure of the current economy model.

Targeted industrialisation will be used to facilitate the achievement of these social and economic goals (National Treasury, 2014, p. 29). Structural unemployment remains a binding constraint to the economy's growth. Since 1997, the unemployment rate and human development index regressed by 150.1% and 2.3%, respectively (IRR, 2014). The NDP identified the agriculture sector as a means to increase the economic participation of low-skilled employment, while simultaneously contributing towards the export-led growth (National Treasury, 2014, p. 27).

The South African energy crisis is being addressed through the implementation of the renewable energy sector development; the capital-intensive sector however offers limited opportunities for the structurally unemployed. The agriculture sector is identified as a potential major source of low-skilled employment and export growth (National Treasury, 2014, p. 27). Haussman & Klinger's (2008) analysis of South Africa's economy identified quick wins that are able to expand and diversify the country's export basket while simultaneously increasing the productivity and creating labour absorption opportunities. While trade-offs must be made between the existing energy crisis and the need to address the structurally unemployed problem, high impact labour absorptive economic development opportunities need to be executed, as expressed in the NDP (National Planning Commission, 2011).

1.4.2. Business Rationale

The South African petrochemical cluster is globally competitive, as it is linked to the economic activities within the country and, to a lesser extent, the southern African region

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(BMI, 2014), despite being a net importer of crude oil. This cluster produces high value strategic products that are exported globally (BMI, 2014) and contribute towards expanding the country's export basket beyond the country's minerals (Haussmann & Klinger, 2008), despite having low oil reserves. This cluster though offers limited opportunities to employ unskilled and unemployed workers, due to the high specialisation. However, the agricultural sector is labour intensive and is able to absorb the unemployed, particularly in rural areas. The biofuels cluster has the potential to bridge the gap between the traditional agrarian and high technology sectors, while simultaneously creating more than 1 million employment opportunities (National Planning Commission, 2011, p.145).

Teece (2010) highlights the petroleum refining firms' desire for control over the product flow to the market. However, the SA Petroleum Products Amendment Act restricts local operating oil firms from forward integration into the retail market (SAPIA, 2013). Product differentiation, in particular product quality, is key to enable an increase in the firm's brand equity. The focus on maintaining and developing the intangible assets is therefore part of the core component of the firm's competitive advantage that affects its market share. The low carbon green economy was identified as having the potential to promote industrialisation and employment opportunities, especially within the rural communities (Nijaki, 2013; Resnick et al., 2012),].

The biofuels industry is identified as a R15bn-a-year industry, with the forecasted local demand for bioethanol and biodiesel being 200 million litres per year, at 2% blending requirement at 2013 demand (Gebhardt, January 2014). Current projected production capacity is in excess of the first phase blending requirement, however it is presumed that additional blending capacity will required to supply southern African countries that are dependent on the South African refining capacity for their transportation fuels needs. The growth of the Fast Moving Consumer Goods (FMCG) sector impacts the road logistics industry, due to the nature of their products (Viljoen, 2013, p.17). Fuel is one of the top cost drivers within the logistics industry, accounting for sixty-one point two percent of the logistics industry is refined products needs such as petrol and diesel transportation costs, as exhibited in Figure 4 below, which consists of fuel and wage related costs, constituting 7,6% of GDP (Viljoen, 2013, p.8). The growth potential for this segment increases the prospects of the projected demand of the liquid biofuels industry.

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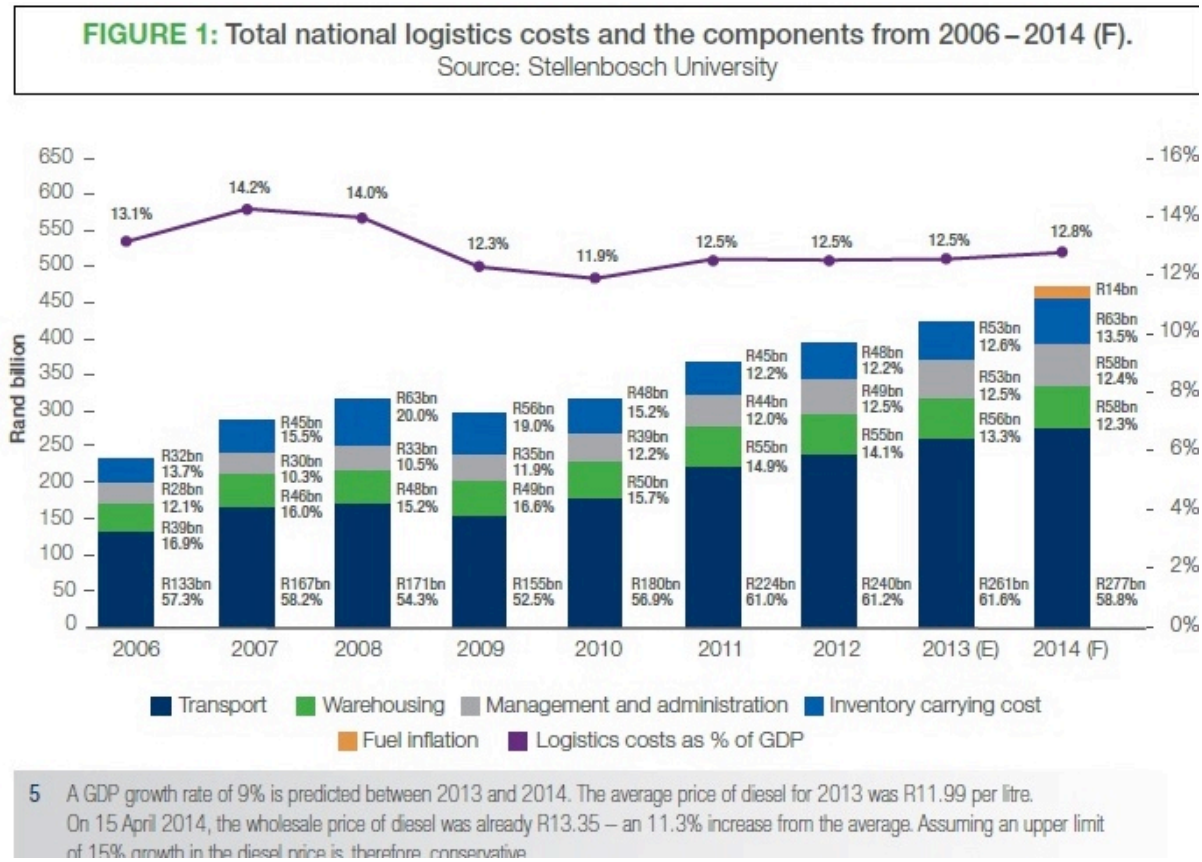
Figure 2: The Total South African Logistics Cost



Source: Stellenbosch University cited in "The tenth State of Logistics Survey for South Africa, 2013"

Furthermore, the developed nations' increased demand for biofuels products, such as Europe and Asia, offers export opportunities to developing nations (Jumbe & Mkondiwa, 2013). The existing trade relations and routes, in comparison to other Asian biofuels exporters such as Thailand, Singapore, Malaysia and Indonesia, places South African firms in a favourable position. The proposed local blending requirements and increased global demand for biofuels offers new investment opportunities and export opportunities.

While the draft biofuels legislative framework is already in place, several uncertainties remain, such as the pricing mechanism. This uncertainty has deterred investment in the productive capacity of bioethanol (Voegele, 2013). Additionally, existing commercial farmers are prohibited from switching their crops to bioethanol feedstock to ensure food security. Instead, the framework is targeted at small and emerging black farmers (Department of Energy, 2014). This is aligned to the liquid fuels and agricultural sectors' transformation charters and Broad-based Black Economic Empowerment (BBBEE) legislation (Department of Energy, 2014)

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Growing income and economic inequality is driving social unrest in South Africa. Social unrest, service delivery protest and industrial action have impacted firms' ability to operate in areas where there is social unrest, impacting the country's overall productivity and firms' profitability. In 2013, 131 working days was lost due to industrial action, representing an improvement of 46.3% from 2012 (Department of Labour, 2014). The aggregated perspective however does not fully provide insight into the growing trend of strike-related loss of productivity. During 2013, the mining, manufacturing and transportation industries experienced the highest productivity losses year on year. Each has in excesses of an 18% loss in working days (Department of Labour, 2014).

1.5. Research Objective

The primary research objective was to investigate the potential of the prescribed biofuels sector on the contribution towards the economic development of South Africa. It is believed that this can create a prototype socio-economic developmental model that localises development that links the globally competitive petroleum sector capacity of the rural poor to the liquid fuels consumption patterns. Furthermore, it has the potential to create other opportunities (part-time and full-time employment, as well as entrepreneurial) that can absorb the structurally unemployed, as promoted by the United Nations Environment Programme (UNEP) (2013), while simultaneously providing diversification opportunities towards high value strategic products in the chemical and energy related markets. This is underpinned by the assumption that the development of new industries and products will ignite productive spillovers in services sectors, human capital development and technological innovation, resulting in economic development and growth and subsequently increase the country's productivity (Nijaki, 2013, p. 253).

1.6. Contribution of Study

Sujatha Raman & Alison Mohr (2014) highlight that the social and technological interface requires further investigation. Existing research on the biofuels industry examines the employment effects, economic growth, export diversification and trade balance effects. While employment opportunities and the feasibility of the biofuels renewable sector has fully been interrogated, limited research appears to examine a country's social policies' impact on the sector's development.

The expansion of the liquid fuels sector to include the liquid biofuels renewable energy segment requires institutional changes. Boschma, Asier Minondo, & Mikel Navarro (2013, p. 47) explicitly highlight the need to explore the influence of institutions and the need for institutional change to enable the development of new industries.

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The literature presented highlights the sophistication in diversifying an economy to achieve increased national productive efficiency. There is limited research that has been conducted on the inter-sectorial integration linkages between two primary commodity families (Morris et al., 2012) and the impact on creating social and economic opportunities for the rural poor (Hull, 2014). Moreover, the biofuel blending prescription is supposed to occur on 1st October 2015.

The following section discusses the theoretical background for the biofuels industrial cluster. Section three provides the propositions that are examined. Chapter Four defines the method used in the study. The qualitative content analysis technique was used to analyse the two phased data collected. In Chapter Five, the results of the five-year historical documentation and semi-structured interviews with industry key informants are presented. This is followed by the discussion of the results in relation to the technology choice, economic and social transformation policies, impact of institutional arrangements and diversification opportunities. Finally, Chapter Seven provides recommendations to stakeholders and further research into the field.

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2. CHAPTER TWO: LITERATURE REVIEW

2.1. Chapter Introduction

The literature review was done to understand the numerous aspects that are involved in developing a new industry, as well as the conceptual frameworks and constructs used to define the renewable sector. The literature discussed provides context for the South African economic development challenge to increase growth and will be critically examined to provide a theoretical and empirical foundation for this study. The literature related to economic development, institutional arrangements and industrialisation was examined to gain insight into the macroeconomic and microeconomic factors required to stimulate and support the development of a new industry. The debates relating to the liquid biofuels segment of the renewable sector are presented. Inclusive growth and development literature is presented under the heading of social inclusion policies and instruments. The biofuels industry was identified as a potential source of employment and economic development (Department of Energy, 2014). The purpose of the cluster is aimed at increasing opportunities for economic participation of the rural poor (Burger, 2014) through backwardly linking a modern globally competitive sector (petroleum production) to the agriculture sector. Furthermore, the establishment of the biofuels clusters has the potential to reduce the middle-income economies' legacy of adopting capital-intensive developmental strategies, while introducing a new product into the local and regional markets.

The agricultural sector has the most potential to drive structural transformation (Haussmann & Klinger, 2008, p.628). It will contribute 65% of the production input to biofuels and has been identified as having the potential to create more than 1 million employment opportunities (National Planning Commission, 2011, p.145). While the petroleum sector produces high strategic value products and diversifies the economy (Haussmann& Klinger, 2008), it nevertheless offers limited opportunities to employ unskilled and unemployed workers. South Africa is however a net importer of crude, thus negatively impacting the trade balance. The situation is further exaggerated due to the primary energy provider, Eskom's increased use of diesel to meet electricity demand.

Singh (2011), Jarreau & Poncet, (2012) and Naudé et al. (2010) emphasised the importance of aligning macro and microeconomic structures to stimulate growth. Local economic diversification was found to encourage growth, indicating that inward development strategies aid in economic growth. These findings highlight the importance of adjusting the country-specific market institutions and upgrading the human capital, to manage the external competition faced in the global market.

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Extensive research was conducted on the biofuels sector potential. In this chapter the literature pertaining to the renewable liquid biofuels industry will be presented. The literature and theoretical arguments are organized into theoretical and empirical evidence relating to the core constructs of the South African biofuels industrial cluster and will be presented. Firstly, the central arguments with then be distilled to the theoretical foundations underpinning the debate and subsequently linked to the proposed research of the biofuels sector, as presented by existing research and the biofuels draft policy prescriptions.

2.2. Middle-Income Countries Structural transformation

There are two classification techniques for economic development progress, namely that of the World Bank and the World Economic Forum (WEF). Gross Domestic Product (GDP) is one of the key drivers for economic growth and classification. Both reporting systems use GDP as a means to categorise countries' economies, while GDP per capita is an aggregated measure, indicating the rate of economic growth in relation to the population growth. Furthermore, it provides a proxy variable for wages (Schwab, 2014).

The WEF (2014) classifies economies into three distinct categories according to the GDP per capita, namely: factor-driven, efficiency-driven (middle-income) and innovation-driven (higher income) economies (Schwab, 2014). Efficiency-driven economies require decisive action to implement structural reforms that focus on productivity-enhancing production processes and increased product quality (Schwab, 2014). Mineral-based middle-income countries wrestle with the ability to develop the capacity to increase productivity, often referred to as the middle-income trap (Paus, 2012). Few countries have been able to graduate from the middle-income status, e.g. economies such as Brazil and Chile (Lin, 2012, p.255). The vast majority of countries grapple with the sustainably of increasing their GDP per capita over a long period.

While the Heckscher-Ohlin and Ricardo's trade theories posits the exploitation of bountiful factor endowments that reduce the opportunity cost of production (Morrow, 2010), labour (cost, skills) and capital (short-term flows and Foreign Direct Investment (FDI) are transferable comparative advantages, as they can be lost over time. On the other hand, natural resources such as climate, land and mineral wealth are inherited comparative advantages that are intrinsic to the country, therefore are non-transferable. (Colander, 2012, p. 170)

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Economic development is dependent on existing comparative advantage, whereby the nation has a lower opportunity cost than a competing nation for the product and/or delivery of the service (Lin, 2010). This then contributes to the relative-inexpensive factors of production such as labour and natural resources (Porter, 2000 & Lin 2012). Lin (2010) advocates that there should be optimal allocation across the country's existing endowment structure to ensure sustained growth. The overreliance on two of the factors, such as capital and natural mineral resources, would result in comparative advantage-defying (CAD) strategies. The factor endowments are the foundation for the development of competitive sectors and firms and achieve additional gains in trade. Subsequently, the trade deficit would be reduced as the economy expands her productively.

Existing literature, and international institutions such as the World Bank and WEF, recommend focussing on the increased use of either technology and/or a shift towards more knowledge intensive production to escape the middle-income trap (Paus, 2012). While the perspective and approach towards tackling the middle-income trap varies (Murshed & Serino, 2011), the central theme is that the aggregated productivity should increase for inclusive long-term economic growth (Ianchovichina & Lundström, 2009). Growing consensus is that industrialisation is the accepted means for achieving this imperative (Lin, 2011; McMillan et al., 2014; Singh, 2011; Wade, 2012); the pace however appear to be contentious.

Historically, developing nations associate the industrialisation process with the promotion of heavy capital-intensive industries to increase the productive capacity and accelerate the rate of convergence with developed nations (Lin, 2012). The consequence of this strategy, however, consistently resulted in the inequality and structural barriers that hampered longer-term growth potential. Lin (2012) defines this import substitution as a comparative advantage-defying economic development strategy, as it is misaligned to the countries' existing endowment structures and would therefore lead to lower growth rates. Singh (2011) contradicts the assertions of Lin (2012), based on import-substitution strategies employed in China, Korea and Japan. These countries' locally manufactured products were previously imported, while ensuring trade barriers were in place to prevent aid in the development of the microeconomic structure.

FDI inflow is a viable strategy that middle-income countries employ for improved quality and efficient upgrade of their exports (Harding & Javorcik, 2013). However, the effectiveness thereof is a key-determining factor to attracting FDI (Lin, 2012; Omri & Kahouli, 2013). Middle-income countries' industrialisation strategies need to direct the distribution of FDI to

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achieve their industrialisation focus (Lin, 2012; Omri & Kahouli, 2013). However, this diminishes the likelihood of reducing income inequality, as ownership would reside with the foreign investors.

Resource-dependent countries develop and accumulate specific assets, and consequently specific human capital, that ensure their efficient productive operations (Teece, 2014; Torres-Fuchslocher, 2010) The profitability of the primary sector attracts further resources into it, and results in the underdevelopment of other sectors such as manufacturing, also known as the Dutch disease (Torres-Fuchslocher, 2010). Existing comparative advantage therefore influences the adoption and innovation of technology. Resource dependency therefore limits technological capacity and reinforces the export specialisation (Weldemicael, 2014). The import of assets and technologies resulted in the development of dual economic structures whereby there is a co-existence of a modern economy (manufacturing) and traditional (agriculture) sectors (Vollrath, 2009a). A dual economic structure ensues, resulting in productivity discrepancy between high productivity in the manufacturing and resource sectors and low primary sectors. Labour and capital are therefore focused in capital-intensive sectors (Vollrath, 2009). The inability to absorb additional labour, and increased use of capital impacts the increase in unemployment, resulting in the further reduction in aggregated national productivity. Trade-offs need to be made in terms of low sector productivity and lost productivity.

Vertical diversification of resource-based products makes South Africa's economy vulnerable to the sector\s short-run cyclical fluctuations, thus impacting the country's exchange rate and overall macroeconomic stability (Lin, 2012b; Naudé et al., 2010). Further growth potential within these industries is therefore limited. Diversification beyond its natural mineral endowments is required to increase the likelihood of higher economic growth rates (Barth, 2013, McMillan et al, 2013).

Sustained economic development and growth require structural transformation (Mcmillan & Rodrik, 2014; Naudé et al., 2010) from low traditional industries (agriculture) to modern (manufacturing). The productivity gap between agriculture and manufacturing is an opportunity to enhance the efficiency of the economy. As the labour and capital structure shifts, the overall productivity and income increases (Mcmillan et al., 2014). The convergence rate with higher income countries is accelerated when labour is able to fluidly shift between sectors (McMillan et al., 2013). There is however limited recent literature exploring the potential of using low productivity sectors, such as agriculture sectors, to contribute towards expanding the aggregated GDP per capita growth.

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2.3. Economic Development

2.3.1. Economic Development for Diversification

Dani Rodick (2010) recommends that urgent binding constraints to economic growth should be prioritised, prior to implementation of industrial policy development. Similarly, the endowment structure needs to be interrogated for existing and latent capabilities and infrastructure (Hausmann & Hidalgo, 2011; Lin, 2012b). Economic Development theories unanimously agree that industrialisation is the accepted means for achieving growth (Lin, 2011; McMillan et al., 2014; Singh, 2011; Wade, 2012).

Ricardo advocates that countries should specialise in their comparative advantage to enjoy the benefit from international trade and increased productivity (Constitution, 2009; Morrow, 2010). The focus on existing comparative advantage economic development, however, has diminished potential for productivity enhancing structural transformation (McMillan et al., 2014) and is vulnerable to the cyclical fluctuations on the country's exchange rate (Lin, 2012b; Naudé et al., 2010).

The Product Sophistication (PS) model enables the discovery of the existing revealed comparative advantage within an economy's structure (Haussmann et al, 2008). It examines the product's productivity complexity (Haussmann et al, 2006) and determines what factor endowments and factors of production are used in the economy (Lin, 2011). Furthermore, it demonstrates the capabilities that existing businesses use and the potential to develop similar products. It is therefore a quick and accurate tool that aids the identification of sectors that have a high probability to increase sustainable and profitable products (Pacini, Assuncao, & Hamwey, 2013, p. 10).

The incremental shifts in economic structure need to be aligned to the existing capabilities within the nation, to ensure alignment to its comparative advantage and enable the smooth and affective allocation of the existing competencies that exists in the country. It is therefore deduced that the distance between two existing products would be a quick win to accelerate structural transformation. The PS model provides the leading indicators that measure the intrinsic value within a product and implied productivity (Prody) and the nation's industrial structure sophistication (Expy).

There are many other econometric export diversification models available; namely the Sophistication Index (Si) (Weiss, 2010), Hirchman-Herfindahl Index (HHI) (Naude et al, 2010), Theil Index (World Bank) and EXPY (Haussmann & Hidalgo, 2012; Jarreau, &

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Poncet, 2012; Saadi, 2012; Pacini, et al. 2013). The HHI, Si and Theil index are aggregated measures and unfortunately do not aid in the product level disaggregation.

While the PS model provides instrumental insight into the potential of the economy, resource capital intensive governments are motivated by the potential of long-term employment creation, particularly within the agriculture sector and expansion of the beneficiation process of commodities (Morris et al, 2012; Torres-Fuchslocher, 2013). This also implies additional revenues through taxation. Tax accumulated could be used to redirect from commodity enclaves to support industrialisation and social welfare distribution (Morris et al, 2012). This relates strongly to new structuralism, which poses that fiscal policy directs investment (Lin, 2012). Existing evidence suggests that this fiscal linkage fails to take into account the unproductive firms that may develop, and advocates for predetermined and agreed incentive periods (Hausmann, Rodrik, & Sabel, 2008; Rodrik, 2004, 2010).

Productive linkages are deemed as the most sustainable means of diversifying economic structures (Hirschman, 1981, cited in Morris et al, 2012). Sub-processes of productive linkages are forward integration to the processing of commodities and backward integration to the inputs (feedstock) used in the processing of the commodity (Morris et al, 2012). The presence of these linkages is insufficient to stimulate growth, irrespective of the strength thereof (Amendolagine, Boly, Coniglio, Prota, & Seric, 2013a; Morris et al., 2012). The horizontal linkage is an additional dimension to Hirschman's concept. It highlights that productive linkages can occur across sectors through the creation of a new product (Morris et al., 2012).

Manufacturing, supply and value chain localisation is a mechanism that stimulates local economic diversification (Naudé et al., 2010; Torres-Fuchslocher, 2010). The encouragement of small and medium enterprises (SME's) into product value chains aid in achieving developmental goals of increasing employment opportunities and reduce poverty (Torres-Fuchslocher, 2010). Governments and firms should play an enabling role through coordinating externalities (Lin, 2012b; Torres-Fuchslocher, 2010). However, oligopolistic market structures, such as extractive industries, are not inherently geared towards these facilitating inclusion of new SME's.

The distance between the locations of currently produced products (proximity) highlights the similarities in the factors of production. The closer the products are to each other, the more similar the factors of production (Hausmann & Hidalgo, 2011). This therefore has the potential to diversify the economy, from low to high product complexity of capabilities. Over

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time, this integration becomes a new endowment factor within the economy, which facilitates the increase in mobility of the labour force (Morris et al., 2012).

Amsden (cited in Krueger, 2011) argues that the Product Space (PS) and Pretorian value chain approach is silent on the role of the firm-level knowledge. Jarreau et al. (2012) and Lin (2012) further echo this, highlighting method complexity and constraints to the PS model. The PS model is sensitive to country size and product names (nomenclature) and requires analysis of global tradable goods and services to determine the revealed comparative advantage, which is the foundation of PS model.

The Growth Identification Facilitation Framework recommends six steps to identify and facilitate economic development (Lin, et al. 2010, 2012; te Velde, 2011). These six steps can be collapsed to three basic phases. Firstly, it requires comparative countries' analysis of *dynamically growing emerging economies* that have more than double GDP per capita and similar endowment structure. Tradable industries that have grown well for more than 20 years should be honed in on as a product of interest.

Secondly, the government and related institutions should assist local infant and/or spontaneously emerging firms present in these industries and remove constraints to technology upgrade and innovation. When no private firm is present, foreign direct investment should be attracted from countries identified in the first phase. The development of the identified industry facilitates diversification of the economy through capital accumulation and technology upgrade, while simultaneously providing for increases in economic participation opportunities (Lin, 2012; Torres-Fuchslocher, 2013).

Finally, governments should be willing to incentivise pioneering firms; either through subsidies or reducing marginal costs associated with poor physical infrastructure or human capital. This can be achieved through the development of clusters (te Velde, 2011) or special economic zones (Lin, et. al., 2012, 2011, 2010). Rodrick (2006) however emphasises that subsidies should be for a limited time, and staggered to ensure that unproductive firms are removed from the programme. Governmental infrastructural development would contribute to the GDP growth.

While the GIFF provides guidance on the process of identifying specific industries to develop, determining the existing domestic sector structures is also required to conclude what mechanisms would effectively create the desired growth and development. The depth of the industrial strategy and trade liberalisation can be integrated through the use of the

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determination of the impact of the technology decisions on economic growth. Lin et al. (2012) offer a multivariable regression analysis framework that incorporates both technology and that aids in this enquiry, which uses the technology choice index (TCI) as a proxy for the industrial strategy used in a country (Lin, 2012, p. 321).

2.3.2. Economic Development Institutions

Arezki and van der Ploeg (2010) found that resource-dependent export-led growth is dependent on factors such as quality institutions and social environment. A study by Khan & Hudson (2013) found that middle-income countries' quality of institutions and human capital had significant impact on economic development. Huang & Chang (2013) found a causal relationship between highly developed financial systems development, particularly stock market development, with the increase in openness, which effectively enhances economic growth. Lin (2012) found consistent results and indicates that rule of law and corruption is a critical variable in redressing inequality. Moreover, countries with high human capital are less affected by the deterioration of the terms-of-trade and facilitates export diversification (Agosin, Larraín & Grau, 2010). Strategies focused on technological upgrading and the diversification of both markets and products are essential for sustaining and supporting any export-led growth strategy (Sannassee, Seetanah & Jugessur, 2014).

Torres-Fuchslocher (2010) state the alignment can be achieved at a meso-level through the development and implementation of sound policies.(Resnick et al., 2012) highlight that countries proclivity towards transitioning towards the green growth and development of the green economy is dependent on the government's capabilities and preferences. Policy development through capable institutions (Hausmann & Hidalgo, 2011; Lin, 2012a) and supported by the private sector (Morris et al., 2012; Rodrik, 2010, 2012) to co-ordinate and obtain full information required to develop a new sector. (Boschma, Minondo, & Navarro, 2013) argue that the development of new industries ignites the need for institutional shifts. It is therefore deduced that current soft infrastructure; which incorporates behavioural competencies are required to support the explicit intent to invite a new industry into an existing sector., and linked sectors; such as the biofuels industry's integration into the petroleum –based transportation fuels sector. The linkages of the agriculture sector as the feedstock source would assume the institutional capabilities and preferences towards development is present.

2.3.3. Industrial Economic Development

Industrialised economic development is the widely accepted means for achieving economic development (McMillan et al., 2014; Singh, 2011; Wade, 2012). Hamwey et al. (2013),

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Hausmann & Hidalgo (2011) and Lin (2012b) identified that the choice of tradable goods selected in diversifying the economy is a crucial decision in facilitating sustained growth. Growth is the primary driver of industrial policy (Saad-Filho, 2013; Wade, 2012). The process of shifting the economic structure entails the shift from low productivity to high productivity modern sectors (McMillan et al., 2014). There are two dominant forms of industrial policy, each with its own unique characteristics and effects; namely horizontal and vertical.

Vertical Industrial policy targets specific industries and firms through government incentives and protection to stimulate export growth. This targeted industrialisation is informed by the resource-based view (RBV) and Ricardo's trade specialisation perspective (Lazzarini, 2015; Neffke & Henning, 2014). It however requires specialised knowledge, skills, capabilities (soft infrastructure) and physical infrastructure, as well as asset-specific capital (hard infrastructure) that have low applicability in other economic activities (Lin, 2012b). This infrastructure development reduces the transactional cost and improves the return on investment at firm level. Also there are minimal spillovers to other sectors (Lazzarini, 2015; Rodrik, 2004).

Alternatively, governments are able to adopt a decisive co-ordinating role through the development of infrastructure and institutions that would stimulate a conducive business environment (Rodrik, 2004, 2010), namely horizontal industrial policy (Lazzarini, 2015). Governments, in collaboration with firms, should play an enabling role through coordinating externalities (Lin, 2012b; Rodrik, 2004; Torres-Fuchslocher, 2010). Rodrik (2004) advocates that governments should focus on crosscutting collaborative support in new economic activities, aligned to its comparative advantage. The focus on generic support for new activities has the potential to provide technological and human capital spillovers to other sectors (Rodrik, 2004).

Diversification of South Africa's mineral resources makes the economy vulnerable to the sector's short-run cyclical fluctuations, thus impacting the country's exchange rate and overall macroeconomic stability (Lin, 2012a; Naudé et al., 2010). Further growth potential within these industries is therefore limited. Diversification beyond its natural mineral endowments is needed to increase the likelihood of higher economic growth rates (Barth, 2013, McMillan et al., 2013). This is consistent with the Presbirch-Singer hypothesis, which demonstrates that diminished gains of trade are experienced by commodities trading countries (Costinot & Donaldson, 2012).

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Resource-dependent middle-income countries have the option to adopt a two-track approach to shift their economic structure. This would entail using the existing capabilities (knowledge, technology and capital) to develop previously under-developed sectors to increase the sector-specific and subsequent aggregated economic growth (Lin, 2012b; Vollrath, 2009b). The two-track approach aids in transitioning from CAD capital-intensive industrialisation and attracts FDI to invest in Comparative Advantage Following (CAF), labour-intensive sectors (Huang, Lin, & Yeh, 2012).

In order to reform an existing economic structure, pragmatic incremental shifts are required to align with an existing endowment structure towards its latent comparative advantage. The optimal use of the existing capabilities (knowledge, skills and technology) could enable the smooth and affective allocation of the endowment structure (Ju, Lin & Wang, 2009). China was able to bridge the gap between their dual economic structures through the implementation of a two-pillar industrial strategy (Lin, June 2011). This was achieved through focus on the microeconomic structure as well as its macroeconomic institutions (Lin, 2012b). CAD industries were permitted to continue operations, however, new productive assets were aligned to China's latent comparative advantage. Moreover, Lin (2012) states that foreign direct investment into CAD industrial development will not be self-sustaining without government incentives and protection.

This dual track development strategy enables a minimal crowding-out effect and allows a period of socio-economic adjustment (Stevens as cited in Barth, 2013). The social adjustment period may relate to the country's ability to develop the capabilities beyond the existing skills pool that was developed to service the capital-intensive industry (Barth, 2013), and enable the country to shift from that are capital-intensive enclave are indicatives of comparative advantage-defying (CAD) strategies such as mining industries, towards comparative advantage focused (CAF) strategies that is aligned to its endowment structures (Lin, 2012b).

The existing renewable energy sector is aligned to targeted industrialisation, as it is focused on diversifying the existing energy sector to meet consumption demand. Yet, opportunities are created for specialised knowledge and capabilities (IRENA, 2014). Research conducted into the employment effects of the renewable energy sector has found that liquid fuels, also referred to as biofuels, were the single largest employment creator (IRENA, 2014). The development of this renewable liquid fuels sector would therefore enable developing countries such as South Africa with high structurally unemployed persons, as indicated in Appendix 2.

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2.3.4. Agro processing Development

Alfredo Saadi-Falio (2013) and Lin (2012) agree that labour intensive manufacturing holds the inherent potential to diversify an economy. Resource-based manufacturing agro-processing (RV) inherently has low technology sophistication and is labour absorptive (Lall, Weiss, & Zhang, 2006; Lin, 2012b). This sector has the potential to pull other segments within the economy through demand for critical inputs. Ensuring that critical components such as feedstock is sourced from the local market could spillover into more employment and new business development opportunities (Torres-Fuchslocher, 2010) and further diversification of the existing economic activities.

Applying Hirschman's productive backward linkage perspective to the RV manufacturing, local demand for biofuels specific feedstock such as canola, sorghum, etc. would be created. The prescribed sourcing from black emerging farmers could secure demand and induce investment into production. While cereal agriculture products are commodities, the inter-sectorial linkages impact on pricing remains under-studied (Morris et al., 2012). Local mechanisms are required to ensure the minimal impact on food inflation (Pradhan et. al, 2014). The potential however remains that there are probabilities that could result in the increase in agriculture development. The draft biofuels regulations however do not explicitly express the potential of this avenue.

Alfredo Saad-Filho (2013) contends that the manufacturing sector can *pull* other sectors' development through productive linkages, resulting in increased export diversification potential. Foster & Valdes' (2010) study into the pro-poor development strategies indicated that the agriculture sector contributes two-and-a-half times more towards poverty alleviation than non-agriculture sectors, using the Hirschman multiplier effect method. The productive and consumption linkages between agriculture and low-sophistication manufacturing therefore increase the employment opportunities (Hirschman cited in Morris et al, 2011). The development of the biofuels industrial strategy prescription of productive linkages between the agriculture and manufacturing sector therefore inherently holds the potential to diversify the economy while simultaneously reducing poverty. Moreover, the sector development holds the latent probability of absorbing the structurally unemployed within the economy.

Lin (2012) and Singh (2011) highlight that countries should focus on tradable goods to diversify the economy. Hausmann & Hidalgo (2011) highlight that exploring quick wins would be focussing on high value strategic products that used the infrastructure of existing products while simultaneously having the potential to contribute towards the diversification of

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the export basket. However, linking new sectors to the existing petrochemical sector high value strategic products may be perceived as changing the productive structure of the country, merely increasing the cost of production of existing firms. The narrow focus on sector- and firm-based productivity, however, is not distracted by potential spillover effects that do not affect their individual profitability and sustainability.

The biofuels strategy prescriptions by the Department of Energy in the Biofuels Strategy Position Paper (DoE, 2014) clearly prescribes the feedstock to be used as canola (rapeseed), sunflower, soya beans and sorghum as feedstock for biodiesel, while sugarcane and sugar beet are the choice of feedstock for bioethanol. Feedstock expansion and its choice are important in biofuel development as feedstock may be varied to reflect different climate, soil types and water demand (Pradhan & Mbohwa, 2014b). Access to means of production, such as land tenure and crop financing, are constraints to the development of the biofuels sector (Jumbe & Mkondiwa, 2013).

2.4. Renewable Energy Market Development

The green economy is perceived to be an option for achieving the objective of inclusive economic growth (Schmalensee, 2012). The green economy, specifically green sectors such as renewable energy, offer the greatest potential for diversification and growing economies (Pacini, Assuncao, & Hamwey, 2013, p.2). This is aligned to the drive from the World Bank to ensure that increased participation in the employment opportunities are predominately predicated to be within the agricultural sectors (UNEP, 2012). The underpinning assumption is that the initial phase of green technologies is labour intensive, which provides the feedstock for alternative energies (Schmalensee, 2012). It is noteworthy that development of certain segments within the green economy such as renewable energy (wind, solar, hydroelectric power) are capital intensive that would create limited employment opportunities for skilled professionals (UNEP, 2013, p. 46). This argument however only aids in capital accumulation and security of energy and does not necessarily results in knowledge and skills development required for human capital upgrade; neither does it support the development of export-potential in the longer-term.

There is growing debate on the short- and long-term benefits of implementing the green economy framework. Advocates for its adoption and implementation of green industrial development highlight that it can effectively contribute towards alleviating persistent developmental challenges of poverty, inequality and economic growth, while simultaneously ensuring environmental security for future generations (DTI, 2010; UNEP, 2012). Resnick et al., (2012) highlight the detrimental effects of green economic policies, especially on the

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poor. The transition towards the green economy from the existing economy, also known as brown industrialisation, may result in job losses (UNEP, 2012). The technology used might result in structural unemployment due to the specialised skills required. The IDC (2012) however hold firm that there will be a net gain in employment from implementing green economic development strategies. This recommendation neglects to incorporate the existing pool of structurally unemployed that the green economy is to absorb into formal employment or entrepreneurial activities.

Duer & Christensen (2010) highlight that biofuels are more expensive than fossil fuels, though they do note that high global crude prices increase the benefits derived from biofuels. However, the recent global development of carbon emission taxes is increasing the cost of using fossil-derived fuels (Ambec, Cohen, Elgie, & Lanoie, 2013). The implementation of carbon emission taxes is aligned to the Porter hypothesis (PH) (Ambec, et al., 2013). The PH suggests that government should use market instruments such as fiscal (carbon taxes), productive (capital investment, technological upgrading, FDI) and redistributive instruments (use fossil-fuel carbon emission taxes to provide subsidies to stimulate green economy development). Raman & Mohr (2014) and Resnick et al. (2012) argue for state intervention into the global economy and highlight that other instruments can be used to aid the transition towards green growth. Empirical evidence supporting this hypothesis is mixed, with certain researchers (Ambec et al., 2013) advocating further research to find empirical evidence to support the hypothesis. Costantini, Crespi, Martini, & Pennacchio (2015, p. 578) indicate specific policy recommendations that would aid in the shift towards greener technologies, and distinguish between demand-push and technology-pull technologies.

Furthermore, the PH doesn't necessarily result in export diversification for developing countries, but can result in import substitution policies found under the Washington consensus neoliberal reform. The productive structure doesn't necessarily increase, however the capital accumulation and decline of permanent employment in the formal sector. Lin & Rosenblatt (2012), Saad-Filho (2013) and Saadi (2012) cite that the only means of increasing the productive structure is through the focus of tradable goods, especially labour intensive industries such as light manufacturing.

2.4.1. Biofuels Cluster Development

The development of new industries and products requires operational mechanisms beyond financial incentives that would increase incentives for the development sectors by lowering transactional costs. There are distinct difference between agglomeration and cluster formation. Agglomeration refers to intra-sector linkages can result in the geographic

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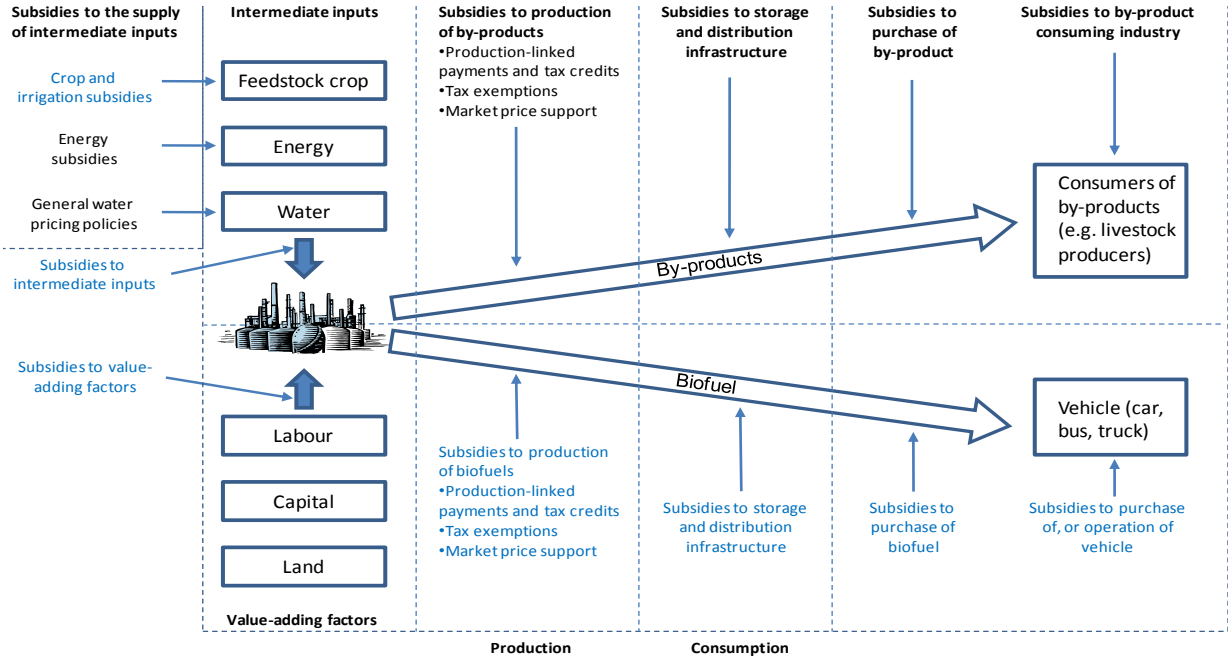
concentration of similar firms (Almeida & Fernandes, 2013; William J. Wales, Vinit Parida, & Patel, 2013). The geographic concentration is spurred by the availability of resources, as in input into firms' processes (Ellison, Glaeser & Kerr, 2010; Wang, et al, 2014). Agglomeration is found to attract related industries that are aligned to the product value chain (Wang, et al., 2014). Agglomeration and clustering can lower the cost of production through the sharing of tangible (production related assets and cost) and intangible infrastructure (knowledge transfer, relevant labour pool market development) (Lin, et. al, 2011, 2012).

Industrial clusters develop around labour linkage, customer-supplier linkage and technology linkages across sectors (Almeida & Fernandes, 2013; Potter & Watts, 2010). The geographic proximity to feedstock for the production plants enables government to focus on infrastructure development that further reduces transactional cost. Almeida & Fernandes' (2013) study into the Chilean manufacturing sector found that industrial clusters contribute towards faster total factor productivity growth than high geographic concentration of similar firms.

Figure 3: Biofuels Value Chain and Incentives



Source: OECD (2013)

As mentioned previously, the choice of feedstock technology employed impacts a firm's ability to diversify their products beyond transportation fuels. By-products such as soya-cakes and biogas provide linkages to both the energy sector and increased breadth in the agriculture sector (OECD, 2013). Food security and inflation is the most cited risk in the

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literature (UNEP, 2010; Pradhan & Mbohwa, 2014; Doku & Falco, 2012; Pradhan & Mbohwa (2014); Jumbe & Mkondiwa, 2013; Silalertruksa, Gheewala, Hunecke, Fritsche, 2012; UNEP, 2012); Demirbas, 2009) and by local social partners, such as the Congress of South African Trade Unions (COSATU, 2007). Crop selection therefore is a key driver in reducing this risk. Consequently, government has excluded staple foods such as maize as a crop for biofuels production. *Jatropher*, a potential bioethanol feedstock, was excluded based on bio-diversity consideration (Brent, 2014) and has the lowest energy ratio in comparison to other crops (Pradhan & Mbohwa, 2014). Pradhan & Mbohwa (2014) identified that fourteen percent of under-utilised arable land can be used without impacting food security; this is lower than the required land to produce the prescribed two percent blending penetration.

2.5. Social Development Policies

The biofuels industrial strategy is identified as a source of economic development and opportunity (Department of Energy, 2014). The primary aim is to increase opportunities for economic participation of the rural poor (Burger, 2014) through backwardly linking a modern, globally competitive sector (petroleum production) and fuel consumption to the agriculture sector. The increase in opportunities especially to the rural poor is indicative of inclusive economic growth (Deng, Sherraden, Huang, & Jin, 2013; Roemer, 2013).

There are two causes for inequality, namely personal effort and circumstance, which is a reflection on the market-based incentives for promoting innovation and entrepreneurship (Deng, et.al,. 2013, p.42; Roemer, 2014). The promotion of access to the means of production aims to address the circumstance inequality whereby it intends to improve the living conditions by personal effort to achieve economic growth (Deng, et.al,. 2013, p.45). Conversely, inequality that results in low personal effort when the production means are available is deemed to be “good” inequality (Deng et al., 2013, p.45).

Individual effort supported by market-based incentives is recommended to promote innovation and entrepreneurship, through changing the context of individual circumstance (Deng, et al., 2013, p.42). This is coherent to Roemer’s (2013) argument. Conversely, inequality in opportunities as a consequence of low personal effort when the production means are available is deemed to be “good” inequality (Deng et al., 2013, p.45).

The productivist model incorporates personal effort in participating in the market economy as well as entrepreneurial effort. Income and personal productive gains of entrepreneurship incentives are obtained from participating in the market economy, which is regulated by macroeconomic labour-related and business-related institutions and regulations. Industry

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however views this as being beyond their scope and should instead be within the government's influence. The increased employment and economic opportunities within the market-driven economy implies additional revenues through taxation. Tax accumulated could be used to redirect from commodity enclaves to support industrialisation and social welfare distribution (Morris et al., 2012). This is aligned to Roemer's (2014) personal effort principal, however it disregards the personal circumstance barriers that prevent individuals from participating (Kozuka, 2014; Roemer, 2014).

Developing countries frequently implement hybrid social policies to bridge the poverty and inequality gaps within their country. Safety nets such as welfare are provided to prevent poverty traps, while simultaneously achieving the social and ethical needs of justice and fairness (Roemer, 2013; Chan et al., 2013). The implementation of this approach is coherent to the redistributive social policy model. This model however does not increase the productive capacity of the economy, though it does reduce the poverty-gap of the vulnerable in society such as the elderly, people living with disabilities and children.

Developmental social policies are aimed at increasing the investment social capital and economic participation, unlike the redistributive model that is a political bargaining approach (Chan & Lin, 2013, p. 3). This hybrid model is characterised by the market regulation and implementation of social policies that promote social equality and partnerships with non-governmental institutions to engage citizen participation (Chan et al., 2013). Collaboration between civil society, the private sector and the state is required as it ensures the coordination and execution of the social and economic objectives

The South African Broad-Based Black Economic Empowerment Act (BBBEE) may be perceived as a market instrument to overcome hindrances to overcome both level of development and circumstance. 'Black' falls under the race-based apartheid classification of African, Coloured and Indian females and males. This social and economic development instrument is focussed on demolishing the racial capitalism of white political and economic extractive institutions (Patel & Graham, 2012). The legislative inclusion creates market-based opportunities for the previously disadvantaged, therefore providing the framework for local market-based incentives for individual effort, while simultaneously being indicative of the hybrid social policy as described Deng et al. (2013). Furthermore, it is aimed at re-balancing opportunities for the broader population and therefore inherently holds the opportunity to increase productivity and the national GDP (Roemer, 2014). The desired spillover effect is the improvement of individual and family living conditions and aid in economic growth.

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The OECD South African Economic Surveys (2015; p.73-4) indicate that the amendment from the Broad-Based Black Economic Empowerment Act 53 of 2003 became more severe after the promulgation of the Broad Black Based Economic Act of 2015, effective 2016. Priority elements of the reviewed generic scorecard elements are debt-free Black South African citizens' ownership and management, skills development and enterprise and supplier development (OECD Economic Surveys South Africa, 2015). The amendment is aimed at addressing the shortcomings of the narrow benefit of the few elites (Juggernath, Rampersad, & Reddy, 2011; Patel & Graham, 2012) and fronting practices (The Presidency, 2014, p. 4; Oecd Economic Surveys South Africa, 2015, p. 74). These statutory amendments are partially included in the biofuels manufacturing licence requirements (Energy, 2014, p.26); refer to the table below.

Table 2: Biofuels Position Paper Broad-Based Black Economic Empowerment Prescriptions

Element	Position Paper Prescriptions	Weighting
Ownership	Minimum of 25% HDSA's ownership	25 points
Management Control	Minimum of 25% control of biofuels manufacturing	15 plus 4 bonus points
Skills Development	-	20 plus 5 bonus points
Enterprise and Supplier Development	Mandatory feedstock sourcing from small holder farmers, emerging farmers and HDSA with the combined minimum of 10% biofuels feedstock sourced from emerging & HDI farmers within 4 years; who employ a minimum of 70% SA citizens. Procurement spend on SMME, cooperatives and community initiatives	40 plus 4 bonus points
Socio-Economic Development	Mandatory spend on rural SMMEs, cooperatives and contribute to community initiatives. These include type and training opportunities to local SMME, cooperatives and community members	5 points

Extracted from Biofuels position paper 2014

The BBBEE minimum licensing priority criteria are lower than the statutory prescription of the BBBEE Act of 2014. The BBBEE Act prescribes as subminimum for the three priority

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elements as forty percent to score in the category, while the licence minimum indicated in Table two is twenty-five percent. The Act was promulgated on 23rd January 2014, while the draft position paper was issued for comment on the 10th February 2014. A pessimistic view may hold that there is minimal intra-governmental collaboration and communication on policies relating to social and economic instrument integration. On the other hand, a more pragmatic perspective may indicate the draft nature of the position paper, which will be reviewed and aligned to existing regulatory requirements after the consolidation of stakeholder feedback on the draft regulations.

2.6. Inclusive Growth and Development

Government interventions are motivated by the potential of long-term employment creation, and expansion of the beneficiation process of commodities (Naudé et al., 2010; Naudé, 2011; Torres-Fuchslocher, 2010) Manufacturing supply and value chain localisation is a mechanism that stimulates local economic diversification (Naudé et al., 2010; Torres-Fuchslocher, 2010). The encouragement of small, medium & micro enterprises (SMME's) into product value chains aids in achieving developmental goals of increasing employment opportunities and reduction in poverty (Torres-Fuchslocher, 2010). Governments' and firms should play an enabling role through coordinating externalities (Lin, 2012b; Rodrik, 2004, 2010; Torres-Fuchslocher, 2010).

Increased industrialisation typically denotes an increase in employment opportunities, however it fails to take into account that capital-intensive industries are technology absorptive and favour skilled labour. The import-substitution behaviour is misaligned to the country's existing endowment structure, resulting in high unemployment rates (Lin, 2011). The import of assets and technologies inadvertently resulted in the development of dual economic structures whereby there is co-existence of a globally competitive modern economy (manufacturing) and low productive traditional (agriculture) sectors (Vollrath, 2009).

Inclusive growth is a long-term strategy that requires the expansion in the sources of economic growth opportunities; namely employment and entrepreneurship (Lanchovichina et al., 2009). The green economy is perceived to be an option for achieving the objectives of economic development and inclusive growth (Schmalensee, 2012). This is aligned to the drive from the World Bank to ensure that increased participation in the employment opportunities are predominately predicated to be within the agricultural sectors. The premise underpinning this assumption is that the initial phase of green technologies is labour intensive, which provides the feedstock for alternative energies (Schmalensee, 2012). As

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technological progress is made and adopted, it has the potential to shift the economic structure to become more complex coupled with the increase in knowledge that was accumulated.

The increased labour participation assumes integration into the existing market without any particular focus on one segment of the population, such as the poor, and is not sector-specific. Inclusive growth incorporates the principal of absolute pro-poor growth through economic development (Anand et al., 2013, p. 3; Kozuka, 2014, p. 113). This strategy is characterised by the focus on poverty reduction. The broad-based focus on increasing economic participation does not address growing inequality within sectors or within the nation. Relative pro-poor growth is focussed on reducing income inequality between the poor and non-poor. This income inequality gap-closing strategy focuses on increasing the pace of income growth of the poor segment of a country (Anand et al., 2013; Kozuka, 2014).

Agness Andersson Djurfeldt (2013, p. 217) argues that pro-poor agricultural growth is considered to be an inclusive development strategy when two main criterian are met: the inclusion of smallholding farmers in the process and that there are opportunities for the entry into commercial-scale development to gain accesss and contribute towards global value chains. Moreover, it is an attempt to address market-based failures that may be attributed to the Dutch disease. Predetermined factors that need to be incorporated to stimulate the sector's productivity are emerging farmer incentives for their development and the proximity of the market to the produce, both of which are are critical.

AnderssonDjurfeldt's (2013) agriculture-led pro-poor growth strategy doesn't explicitly highlight which pro-poor growth category it is within. It is assumed to be a sector-specific relative pro-poor strategy, which is driven to close the gap between the commercial-scale agriculture segment and smallholders. The sector specific growth strategy adds to the discourse within international institutions such as the World Bank, namely that green growth can stimulate inclusive growth, yet is still aligned to the inclusive development strategy. Elize Kozuka (2014) states that inclusive development does not incorporate the subcategories of pro-poor growth. The most discernable characteristic of inclusive development is the process of growth that results in reduction of income inequality. Principals of personal effort and removal of personal circumstances barriers are critical to inclusive development.

2.6.1. Inclusive Growth and Development Instruments

John E. Roemer (2013), Richard Schmalensee (2012) and Daron Acemoglu (2012) agree that economic growth is required to reduce poverty and inequality. Development economists

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typically use aggregated measures such as GDP per capita as measures of increased welfare (Roemer, 2013). Kuznets' inverted-U hypothesis (Lin, 2012) posits that the increase in economic development initially increases inequality; however it declines as the economy grows. Over time, income inequality diminishes the economic growth due as the patterns of lower consumption and savings; as measured within the Gross Domestic Product (GDP) (Acemoglu & Robinson, 2013; Schmalensee, 2012). It therefore assumes that new economic activities, such as investment and increased state and private spending would increase the average welfare of its citizens.

The aggregated GDP per capita growth is often referred to as the trickledown effect. The increase in productivity is assumed to increase demand for labour if the relevant skill-pool is available. The increases in employment opportunities will be created as the economy expands and result in the decline of poverty (Muinelo-Gallo & Roca-Sagalés, 2011). It is pertinent to note that this is achievable over the long-run, however in the short-run the income inequality will widen, before declining (Acemoglu, 2012).

Roemer (2013) defines these aggregated measures as consequential inequality, reflecting the economic performance and consumption patterns. The consequentialist perspective assumes that increased economic activity would result in increased employment opportunities as the economy expands and will therefore result in the decline of poverty (Muinelo-gallo et al., 2011). However, development of capital intensive and technology intensive industries, such as in segments of the renewable energy sector such as solar, hydro and wind, hold the potential to worsen income inequality due to the favouring of experienced skilled labour (Acemoglu, 2012). The opportunities for the poor will therefore decline, increasing the probability of increased inequality (Lin, 2012).

Participation in the economy is not sufficient; access to factors of production and income equality is also required (Lawson, 2010; Schmalensee, 2012). The equal opportunity perspective is gaining momentum, which poses that access to factors of production and opportunity to partake in the economy is needed to bridge the income inequality gap (Roemer, 2013; Deng, et al., 2013; Tartakowsky, 2011). Inclusive growth stresses the role of social policy in expanding disadvantaged people's economic participation (Deng, et. al, 2013.) However, inclusive is a long-term strategy that requires the expansion in the sources of economic growth opportunities, namely formal employment and entrepreneurship (Torres-Fuchslocher, 2010), and has nominal impacts in the short term as formal institutions reposition towards the changes.

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Specific institutions are critical in removing barriers and personal circumstances, such as education. Policy cohesions between economic and social inclusion policies are required to ensure inclusive development. It is therefore deduced that social inclusion policies are fulfiled as a supporting role in economic development.

2.6.2. Land Reform and Rural Development

The biofuels draft position paper explicitly highlights the use of under-utilised land of previous homelands (Department of Energy, 2014). Ngomane (2012) provides a graphic representation of the fragmented spatial development of rural areas concentrated in previous homelands, refer to Figure 4 below. .

Land redistribution policies are aligned to social redistribution policies, discussed previously. It contains characteristics of a relative pro-poor agriculture growth strategy (Andersson Djurfeldt, 2013) through the distribution of the means of production such as land, developmental finance and supported by capital and capability building (Ngepah, 2011; Torres-Fuchslocher, 2013). South Africa's land redistribution policy is cited as being inefficient and has not resulted in the improved livelihoods of rural communities (Kepe & Tessaro, 2014). Nasterlack, von Blottnitz, & Wynberg (2014, p. 5) study found the redistributed land, in the Eastern Cape Province was in a poor condition due to lack of financial and skills development support.

Biofuels producers are dependent on the local agriculture activity to ensure feedstock security. The literature consistently highlights biofuels industry's competitiveness is dependent on cost of production inputs such as energy crop cost, the use of water and use of state incentives (Baffes, 2013; Brent, 2014; Favretto, Stringer, & Dougill, 2015; Gasparatos et al., 2015; Nasterlack, von Blottnitz, & Wynberg, 2014; Raman & Mohr, 2014; Resnick, Tarp, & Thurlow, 2012; Yaoyang & Boeing, 2013).

The draft policy communicates the biofuels producers' selection of energy crops and the license investment region. The majority of license holders and potential investment would occur in the Eastern Cape. The province currently has no existing production capability in Canola, sugar beet and soya beans; refer to table 1 above, which is required for biofuels production. As stated previously, under-utilised land was identified as a mechanism to reduce the impact on food security. The biofuels policy identified approximately three million hectors of potential land in the Eastern Cape (Department of Energy, 2014, p. 23).

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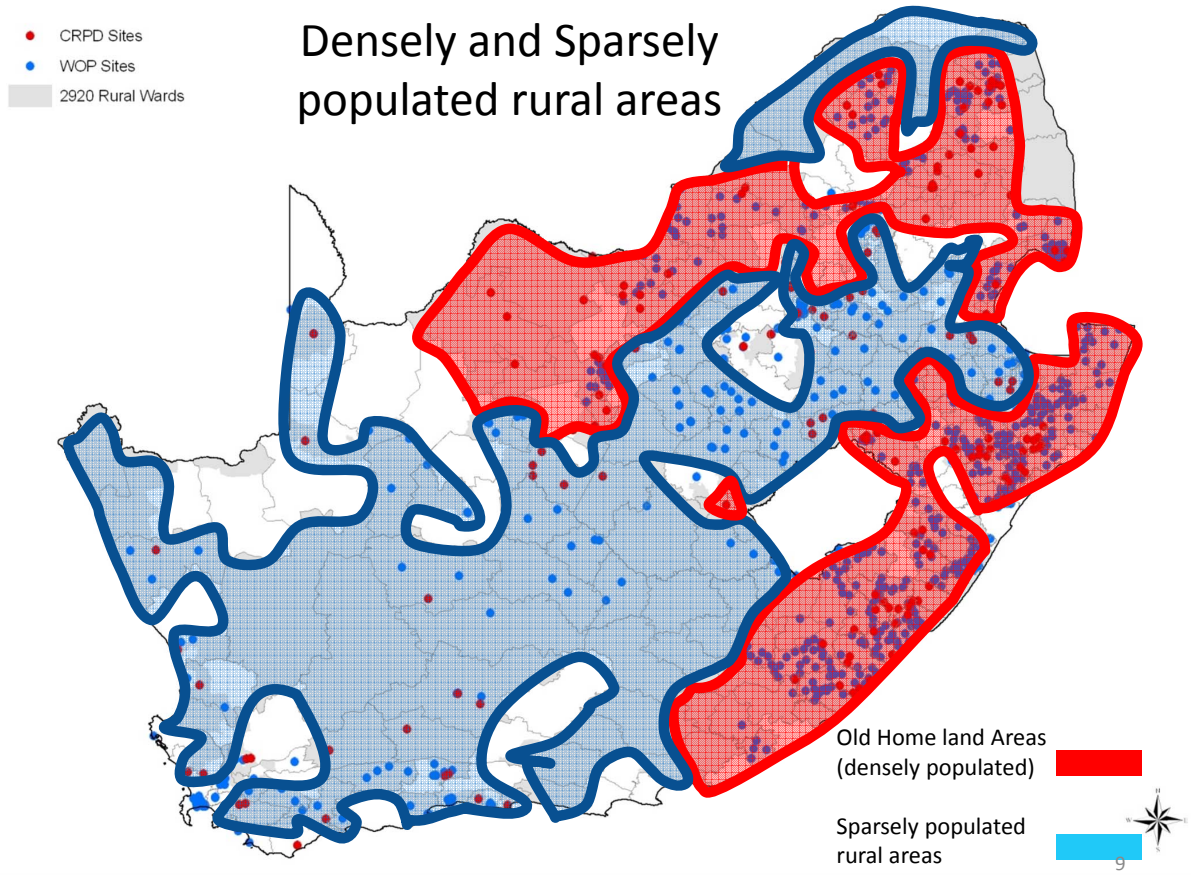
Figure 4: South African Biofuels geographic prescriptions for Rural Development



Source: Extracted from Tsakani Ngomane "Rural Development in South Africa: The role of Agriculture"

PhytoEnergy, a license holder, has embarked on the South African Food and Fuel Agri Ramping-up Initiative" (SAFFARI) in partnership with the Department of Agriculture, Forestries and Fisheries (DAFF) for energy-crop production as a means to increase the productivity of 50 000 hectors of under-utilised land (Department of Agriculture, 2012, p. 10). A formal Emerging Farmer Mentorship Programme was established in on 23rd April 2012 as a mechanism to increase emerging farmers' capabilities, knowledge of canola, build skills through mentorship and skills transfer (Phytoenergy, 2012).

Kepe & Tessaro (2014) and Nasterlack et al. (2014) study into the land use in the Eastern Cape, found land ownership, use and control holds social meaning and signifies identity and power (Kepe & Tessaro, 2014, p. 272). This recognition of social capital which is aligned to Lin's (2012) construct of intangible infrastructure. Kepe & Tessaro (2014) found the mistrust of third-party involvement in increasinng the productivity of "under-utelised land". The failure to recognise the social capital could impede feedstock security.

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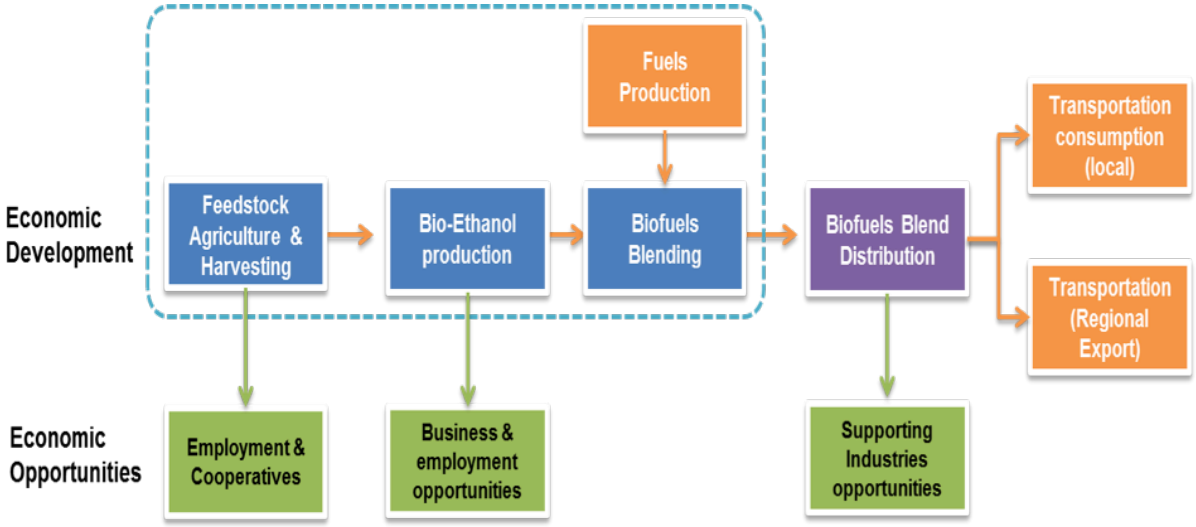
2.7. Conclusion

In this chapter the economic and social development theories and constructs were developed and pertinent deductions made from these theoretical models and debates to develop the concise core strategies and technology decisions available to resource-dependent countries. Policies are mechanism used to align macro and microeconomic structures (Morris et al., 2012; Torres-Fuchslocher, 2010). The policy options adopted hold the possibility to stimulate growth and development can be achieved through the use of specific instruments. The analysis of the biofuels value chain, in relation to the economic and social policy options and instruments, as defined by the literature presented are summarised below.

Figure 4: SA Biofuels Economic Development and Opportunities Potential



Source: Adapted From Pradhan & Mbohwa, (2014).

The itemization of the biofuels value chain is used as a guide to determine the economic and participations opportunity that exists, refer to Figure Four. Entrepreneurial opportunities in related and supported services and increased employment opportunities would increase the labour force participation rate. The participation in the market enables human capital accumulation and increases the potential for gaining access to other employment opportunities in the future. The value chain assumes that opportunities are geographically concentrated due to the provincial distribution of the petroleum firms' dispersion and the energy crop production that would be sourced from emerging farmers.

The South African geographic under-development is prevalent in previous homelands or 'Bantustans'. The geographic concentration of under-development therefore requires a municipal and provincial focus on economic development. The theories and models

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reviewed would thus be applied to the under-developed rural areas to be able to discuss rural economic development robustly.

The economic development theories and instruments can be summarised into four quadrants, as indicated in Figure Five below. As discussed, focussed economic development on the mineral and commodity resources with low value-add, exhibit low economic export diversification. The focus on existing comparative advantage poses specific challenges such as the does not facilitate the development of new opportunities, and therefore reduces the achievement of the full growth potential given broader-range of factor endowments, previously discussed. The over-reliance on mineral wealth would open the nation to commodity and currency fluctuation, increase the presence of the Dutch Disease and lead to the decline of primary sectors such as the agriculture sector (Lin, 2012a, 2012b; Morris, Kaplinsky, & Kaplan, 2011; Morris et al., 2012; Naudé et al., 2010; Torres-Fuchslocher, 2010; Vollrath, 2009a). Developing nations have the option to diversify the local economy through resource-based manufacturing, such as agro-processing (Lin, 2012a, 2012b ; Saad-Filho, 2013), as discussed previously.

An alternative policy would be the increased value-add activities such as offered in industrialisation, the bottom right-hand quadrant. The literature presented shows unanimous support for the focussed development of tradable goods and, by proxy, the manufacturing sector development. Countries have the option to develop the sector through low, medium or high technology sophisticated sectors; each would create varying degrees of employment opportunities that are targeted at the labour segments of the country. Low technology sophistication manufacturing development was found to offer increased low to medium skills-based employment opportunities, while high technology sophistication manufacturing development limits opportunities to a highly skilled labour force. South Africa's manufacturing sector exhibit a proclivity towards highly skilled manufacturing sector development.

The development of low technologically sophisticated biofuels manufacturing would therefore hold the potential to increase employment opportunities of the mid-skilled labour market. It also increases the value-add through the beneficiation of the energy crops into a substitute for petrol and diesel segments of the liquid fuels market. This is aligned to the NDP position of economic development. The forced backward productive linkages exhibit the potential to pull the energy crops productivity, through the increased demand, resulting in the increased demand of agro-processing (resource-based manufacturing), as indicated in the bottom left-hand quadrant. The consequence would direct the shift economy's

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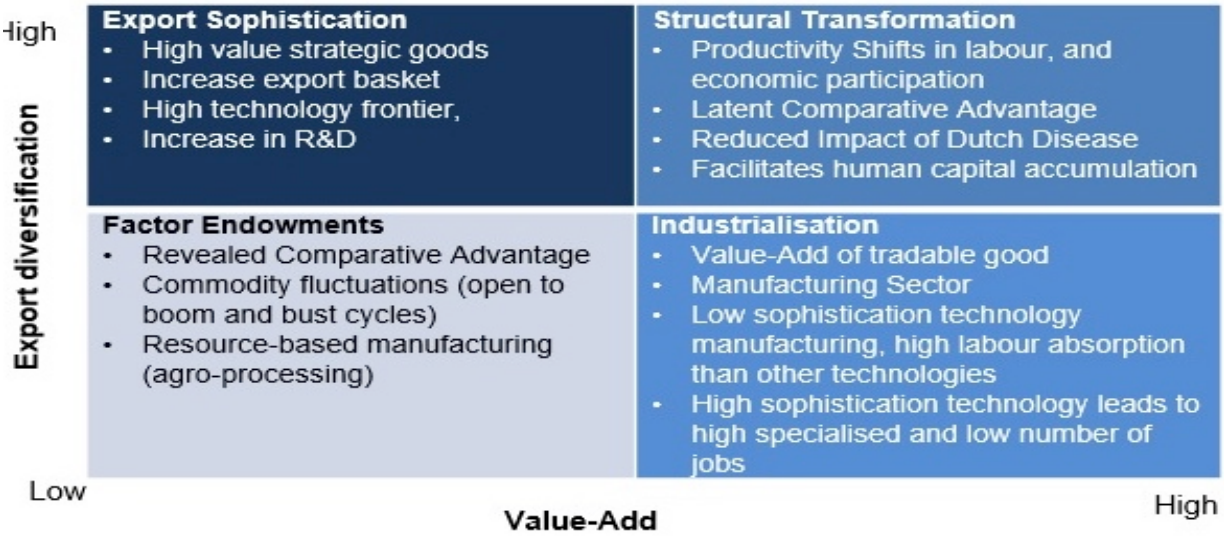
productivity through the increased labour participation rate and increase in income. Moreover, it would reduce the impact of the Dutch Disease through the increased use of comparative advantage following development strategy.

Export sophistication was defined by the literature, indicated in the top right-hand quadrant, as the continuous process of exploiting the revealed and implied comparative advantage. The global biofuels technology maturity indicates the potential for diversification. While the draft policy doesn't explicitly state the use of second-generation technology, the cost implication in comparison to the current fuel prices may have reduced the need for the inclusion thereof. The potential to diversify into different markets exists, despite the ring fencing of biofuels for the fuel-pool. The literature highlights the importance of demand-side policies in creating demand, however it does not explicitly highlight the role of industry-specific or overarching developmental policies. Neither does biofuels literature highlight the inherent potential for diversification into product markets and value chains that contain the same capabilities and technology processes.

Figure 5: Summary of Economic Development Strategic Options



The social models and theories reviewed the existence of three dominant models, and the newly introduced and debated inclusive economic development. The literature stresses the importance in alignment of macro, microeconomic and individual levels to achieve structural transformation as discussed under economic development literature. The four dominant theories are summarised in Figure Six below. The redistributive and developmental social policies can be integrated to develop a hybrid social policy. The discussion will commence at this hybrid strategy, to avoid duplication.

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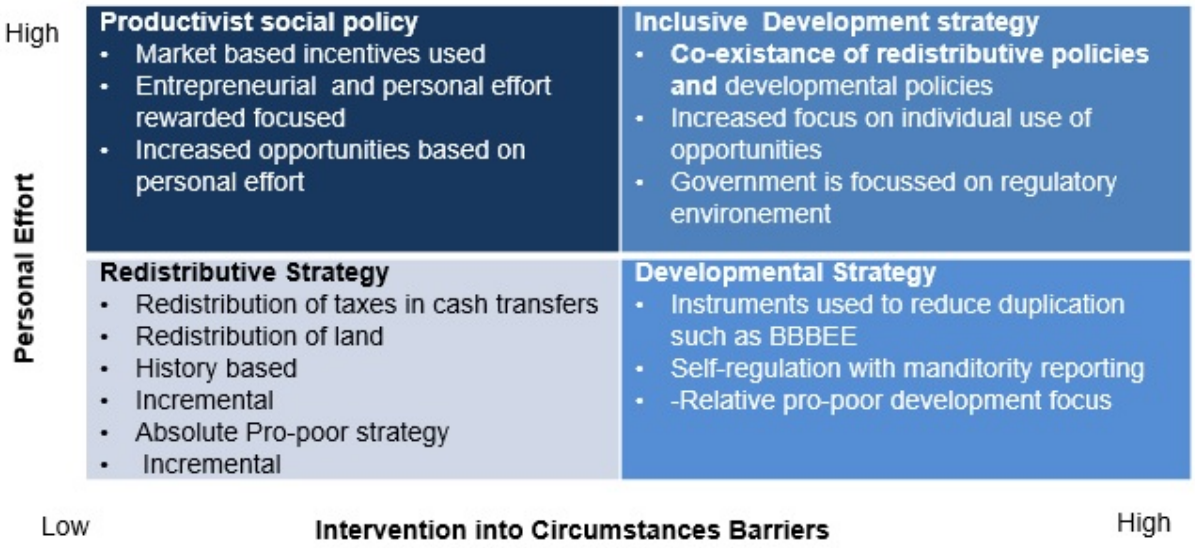
Figure 6: Summary of Social Strategy Options



This hybrid policy exhibits similar features to the newly debated inclusive development strategy. As previously discussed, inclusive development is not sector specific. The application to South African biofuels industry development empirically exhibits characteristics of the hybrid policy, inclusive development strategy, especially through the use of land redistribution in the agriculture sector and BBBEE instruments across all sectors with the specific aim of removing barriers of circumstance to facilitate entry into the market economy. The reduction of poverty was achieved through the use of absolute pro-poor development in the agriculture sector, as illustrated in the bottom left-hand side quadrant of Figure Six. While developmental strategies are relatively pro-poor with a focus on income inequality, the distinguishing difference between redistributive and developmental strategies is however the level of governmental intervention. Within the agriculture sector, the South African land redistribution policy was implemented through direct intervention by the government into the existing market structure, to provide recipients with the means of production in the form of land and capital.

The developmental social inclusion strategy is facilitated through the use of BBBEE legislation, which is applicable across sectors governed by sector scorecards. The governmental intervention therefore shifts towards indirect enablement. Prescription is aligned to business objectives, market structures and existing practices reducing the need for direct intervention.

It is therefore deduced that the inclusive strategy for development would balance the instruments and focus. The literature highlights the core feature as needing to include the

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marginalised in the process of strategy development (Deng et al., 2013; Kozuka, 2014;. Lin & Chan, 2013; Roemer, 2014). This is aligned to the agriculture-led pro-poor growth strategy (Andersson Djurfeldt, 2013), which predetermines the inclusion of smallholders into the market economy while providing the required support to faciitate commericalisation, consequently resulting in reduction of income inequality within the sector between emerging farmers and commerical farmers.

Personal effort is the fundamental criterion in achieving access to employment opportunities and access to the market economy (Kozuka, 2014; Lin & Chan, 2013; Roemer, 2014), as previously discussed. This fundamental condition is required to remove bad inequality and for productive poverty reduction. This condition is illustrated on the vertical access of Figure Six. The importance of personal effect to gain capabilities as defined by Hausmann et al. (2011), and Lin (2012b) becomes individuals' means of operating within the productivity open market. Knowledge, skills and experience accumulation become the means of human capital upgrade to compete within this market, while within the redistributive strategy, lower personal effort is required.

The inclusive development theory however does not incorporate the localised economic development into the debate. It is assumed that social inclusive policies are subordinated into the mainstream economic development strategies. The reduction of social policies to a secondary policy has the potential to perpetuate the imbalance between economic and social objectives. In order to bridge the theoretical gap, the construct of inclusive economic development was developed to demonstrate the importance of both, while incorporating a rural economic development focus.

The balance of both economic and social policies, strategies and related instruments informed the study. The construct of inclusive economic development would be explored within the biofuels industry to examine both the economic and social latent potential for localised economic development.

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3. CHAPTER THREE: RESEARCH PROPOSITIONS

3.1. Introduction

The biofuels industry is identified as a potential source of employment and economic development (Department of Energy, 2014). The primary aim is to increase opportunities for economic participation of the rural poor (Burger, 2014) through backwardly linking a modern globally competitive sector (petroleum production) to the agriculture sector. The previous chapter reviewed the core arguments relating to economic development.

In this chapter, the themes and constructs presented previously were used to develop the propositions. The first proposition examined the relationship between the biofuels industrial strategy and related social and economic transformation policies. The second proposition was aimed at gaining insights into how the interdependent actors' capability to collaborate effectively and support the new industry development. And finally, the third proposition focussed on gaining insight into the potential diversification opportunities into high value strategic products.

3.2. Proposition One: The development of the Biofuels development will result in inclusive economic development

The biofuels industrial strategy and biofuels position paper both explicitly state that the biofuels industry is a potential major source of employment and economic development. The biofuels industry was positioned as an economic development strategy to bridge the existing dual economic structure. This proposition was aimed at gaining insight into the socio-economic impact of the prescribed biofuels industry to stimulate local economic development and participation opportunities. The proposition examined whether the industrial development would result in an inclusive economic development strategy through the crowding-in of investment and local economic development activity that is beyond agricultural pro-poor growth.

The literature reviewed offered limited constructs and theories on inclusive economic development, hence this proposition was based on the economic constructs discussed in Chapter Two by Lin (2012), Naudé et al., (2010) and Saad-Falio (2013), while the social economic opportunity constructs were studied using constructs specified by Deng et al. (2013); Roemer (2014), Chan et al. (2013) and Patel et al. (2012). Djurfeldt (2013), George et al. (2012), Lawson (2010), Ngomane (2012), Rudel, 2013), Benedict, Adeleke, & Kazuhiro, (2014), Dethier & Effenberger (2012), Kepe & Tessaro (2014) and Hull (2014) offer agrarian specific constructs. Kozuka (2014) builds on Roemer (2014) and Chan et al's (2013) constructs of removal of barriers of personal circumstance and personal effort in the

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definition of inclusive development, and therefore will form the basis of the inclusive economic development model. This investigation assumed that economic activity would ignite productive spillovers in services sectors, human capital and technological innovation, resulting in economic development and growth and an increase in the country's productivity (Nijaki, 2013 , p. 253).

3.3. Proposition Two: Infrastructural Capacity to Develop Biofuels Industrial Cluster

The biofuels industry's strategy execution is dependent on the existing capabilities and collaborative institutions and (tangible and intangible) infrastructure to bridge the gap in the country's dual economy structure. The prolonged development phase of the regulatory framework however poses questions on the government's ability to develop the industry. This proposition was supported by two questions to determine the existing infrastructure influence on concentration of FDI and the institutional arrangements to support the execution of the biofuels industry.

Resnick et al. (2012) argued that the implementation of the green economy into existing sectors is dependent on government's capabilities and preferences. The expansion of the liquid fuels sector, to include the liquid biofuels renewable energy segment, requires institutional changes. Boschma, Minondo, & Navarro (2013) explicitly highlight the need to explore the influence of institutions and the need for institutional change to enable the development of new industries. Furthermore, the South African Constitution Chapter Three prescribes the principles of intergovernmental relations across the tiers of government (South Africa, 1996, p.21).

The criteria and constructs provided by Almeida & Fernandes, (2013); Amendolagine, Boly, Coniglio, Prota, & Seric, (2013); Jumbe & Mkondiwa, 2013; Lin, 2011; Morris et al., 2012; Rodrik, 2010; Torres-Fuchslocher, 2010 and Lazzarini, (2015) were used to examine the means available to institutional arrangements of the liquid fuels sector.

The literature of Lin (2011) and Hausmann & Hidalgo (2011) was used to provide the construct of capabilities, while tangible and intangible institutions were used to study the institutional capabilities to execute the biofuels industry. The suggestions of Lin (2011), Rodrik (2004, 2010) and Torres-Fuchslocher (2010) were used as the public-private collaboration framework recommendations for government. Favretto, Stringer, & Dougill's (2015) used a mixed method multi-phased approach to investigate the institutional

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coherences of Mali's Biofuels Strategy. This was used in the analysis of the outcomes of the constructs highlighted.

3.4. Proposition Three: Biofuels Value Chain Diversification Potential

Jarreau and Poncet, (2012), Naudé et al. (2011) and Singh (2011) emphasised the importance of aligning microeconomic structures and diversification to stimulate the growth of resource-dependent countries to break the resource-depended enclaves caused by the Dutch disease. South Africa's biofuels strategy's narrow prescription on first generation technology holds the potential to diminish the full potential of structural transformation.

This proposition investigated the potential the biofuels industry has to diversify the existing value chain. The constructs of industry proximity and relatedness offered by Boschma et al. (2013), Hausmann & Hidalgo (2011) and Neffke & Henning (2011, 2014) was used as the basis of analysis. This was further supported by the literature of (Barth, 2013; McMillan et al., 2014) to understand the productivity changes through social adjustment.

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4. RESEARCH METHOD

4.1. Research Design

The method used to design the study was selected to gain insight into preceding and current experiences of the Draft Biofuels Position Paper of the Regulatory Framework development; and the potential to contribute towards the structural transformation. The study requires a research method that can facilitate the depth and breadth of the developmental process, while enabling the capturing of effects on industry role-players. The qualitative method facilitates the gaining of insights in both factors and debates that contributed towards the outcome of the draft position paper, the institutional structures that facilitated the process and encapsulate industry stakeholders' experiences in the development of the draft policy and expectations of the industry evolution.

Existing studies into inclusive growth focus on the broader social and economic estimations through the use of secondary panel data such as economic growth performance and income distribution (Anand, Mishra, & Peiris (2013), de Mello, & Dutz (2012). Lawson (2010) and Ncube, Shimeles, & Verdier-Chouchane (2012) use panel data to investigate inclusive economic growth. The quantitative approach with regression instruments examine aggregated economic models to empirical testable form (Hidalgo et al., 2009; Jarreau & Poncet, 2012; Weiss, 2010). Acemoglu (2012), Arezki & van der Ploeg (2010), Cabrales & Hauk (2010), Chang (2011), and Furman & Stern (2011) used secondary data to test the effect of institutions on economic development. Furthermore, Anand, Mishra, & Peiris (2013), de Mello, & Dutz (2012), George, Mcgahan, & Prabhu (2012), Lawson (2010) and Ncube, Shimeles, & Verdier-Chouchane (2012) use panel data to investigate inclusive economic growth and development. South Africa is however a data scarce country that doesn't offer longitudinal data, making it difficult to duplicate these studies.

Existing studies on pro-poor growth (Andersson Djurfeldt, 2013b; Lustig, Lopez-calva, & Ortiz-juarez, 2013; Nicita, Olarreaga, & Porto, 2014) and the agriculture sector (Hull, 2014; Lombard & Ferreira, 2014; Mandelli, Barbieri, Mattarolo, & Colombo, 2014; Mohr & Raman, 2013; Raman & Mohr, 2014) used the qualitative methodology. Ritchie & Spencer (2002) state that the qualitative design aids in the investigation of social and public policy. The qualitative approach aimed at investigating the consequence of decision-making in policy development and the institutional arrangements that increase the legitimacy of the policy adopted. Furthermore, (Creswell, 2003) highlights that the method is particularly useful in distilling the multiple meanings, such as bureaucracy which has numerous meanings that are contextually based. The diverse stakeholders in the biofuels value chain and key

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decision-makers require in-depth exploration into the complexity of multiple institutional and stakeholder interest groups.

4.2. Sample Universe

4.2.1. Phase One: Historical Documentation

The universe was historical documentation of all public policy, strategies and related historical documentation issued by the South African government.

4.2.2. Phase Two: Primary Data

Liquid biofuels is categorised as a renewable energy product. The green renewable economy is categorised according to its technology, feedstock source and application (IRENA, 2014). The International Renewable Energy Agency (IRENA; 2014).

4.3. Sample Population

The population of the study was transportation energy products, regardless of the energy source, emissions, use and damage to natural resources. In phase one, all historical documents containing transportation fuels words was applicable. In phase two, the population was all stakeholders that use, produce are affected by transportation fuels.

4.4. Unit of Analysis

4.4.1. Phase One: Historical Documentation

The unit of analysis for the secondary document analysis were the themes contained in the content, therefore document level.

4.4.2. Phase Two: Semi-Structured Interviews

The aggregated stakeholder's perspective was the unit of analysis.

4.5. Sampling method and Size

Mixed methodology permitted the use of purposeful sampling (Hesse-Biber, 2010, p. 465). A non-probability heterogeneous purposeful sampling technique was used in this study. The benefit of this sampling method is that it enabled focussed data collection related to the South African biofuels strategy. The sample sizes were determined by the research phase.

4.5.1. Phase One: Historical Documentation

A purposeful sample will be used to collect data over the last five years. Eighty-nine documents containing the keyword biofuels were collected since 2010 from the Parliamentary Monitoring Group portal. The distribution is summarised in the table below.

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The sample consisted of thirty-seven documents representing 41.57% representation of the five-year population. The call for comments and policy documents, highlighted in Table 4 below, are counted separately, but is one document, namely the publishing of the draft position paper .

Table 3: Phase One Sample

Document Types	Five Year Population	Sample	Sample Representation
Committee Meetings	62	20	32,26%
Hansards	16	8	50,00%
Media Briefings	12		0,00%
Question & Reply	12		0,00%
Tabled Committee Reports	11	7	63,64%
Calls for Comments*	1	1	100%
Policy Documents*	1	1	100%
Daily Schedules	5		100%
Total	**89**	**37**	**41,57%**

* denotes the Draft Biofuels Position paper

4.5.2. Phase Two: Primary Data

The qualitative method permits the use of purposeful quota sampling (Hesse-Biber, 2010, Cooper et. al., 2014). The diverse stakeholders that are influenced by the development of the biofuels sector require a focused sample on key informants (Creswell, 2003). Accessibility and representativeness of influential stakeholders was a key constraint (Corbetta, 2003). Management of this risk will be achieved through the use of multiple affected stakeholder groups across the biofuels value-chain, as discovered during phase two, therefore ensuring heterogeneity and sufficiency in representation.

The sample was developed based on the stakeholders highlighted as explicitly stated in the draft position paper (Department of Energy, 2014, p. 13), energy crops selected (p. 19), industry associations, and public and public-support institutions as indicated within the draft position paper. A desktop Internet search was conducted to include national and international Non-governmental Organisations (NGO) to ensure that their perspective was captured, as potentially affected interest groups. The inclusion of NGO perspectives was consistent to another study Favretto, et al. (2015) into the Malian biofuels policy and institutional coherence. Moreover, the development of the sample across the proposed biofuels value chain enabled heterogeneity of key informants.

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Research participation requests sent via email and/or telephonic calls were made to gain access to key informants; refer to **Appendix 5: Consent Form**. The final sample for the semi-structured interviews is indicated in **Table 6: Semi-Structured Interview Sample Development.** The researcher however failed to secure an agriculture sector informant. Informants were separated at a national level and held functional accountability for biofuels participation. Informants experience exceeds ten years in the petrochemical sector or the renewable energy industry.

Table 4: Semi-Structured Interview Sample Development

Organised Institutions	Draft Policy	Sample selection	Final Sample
Non-governmental organisations	0	2	1
Private Firms	8	8	2
Organised Private Associations	4	4	2
Public and Support Institutions	**8**	**8**	**3**
Total	**20**	**22**	**8**

4.6. Measurement Instrument

Multiple level measurement instruments were used to gain insight into the meso and micro socio-economic factors that impact the biofuels sector development. A two-phased approach was used, namely: systematic content analysis to gain insights into progression of critical debates related to the biofuels value chain development, and key informant semi-structured one-on-one (face-to-face) interviews.

The primary and secondary data will be obtained using a qualitative method, as it enables the collection of data in a sequential manner (Corbetta, 2003). Furthermore, it ensures that all relevant topics are covered and facilitates the interviewer to prompt for deeper understanding on themes that may emerge during the process (Creswell, 2003).

4.6.1. Phase One: Historical Documentation Instrument

The keyword search functionality for biofuels was conducted on the South African Parliamentary Monitoring Group website that focussed on specific Department of Energy, Economic Development and Trade and Industry subcommittee minutes and presentation, verbatim debates (Hansards) and tabled committee reports.

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4.6.2. Phase Two: Semi-Structured Interviews Measurement Instrument

The key informant semi-structured interview technique was used to solicit primary data. The semi-structured interview guide was used to guide the discussion to enable the key informants to freely express their perspectives in a conversational manner (Corbetta, 2003). The use of the semi-structured interview instrument to gain insight into stakeholder's experiences and perceptions of current events is consistent with explorative studies conducted by (Favretto et al., 2015; Hull, 2014; Nasterlack, von Blottnitz, & Wynberg, 2014).

4.7. Data Gathering Process

4.7.1. Stage One: Historical Documentation Analysis

The secondary data was obtainable from the South African Parliamentary Monitoring Group website (PMG, 2015). Premium subcommittee documentation permission was obtained (PMG, 2015). Permission was obtained by the post ethical clearance of this proposed research.

The historical *premium* subcommittee documents enable the development of central themes and subthemes. The explicit benefits of this instrument are numerous. Saunders, Lewis, & Thornhill (2012) highlight that it permits insights into existing and current debates that impact business decisions, while simultaneously reducing risks and cost. Moreover, Prior (2008) highlights that the instrument enables focus on the content within the document and is unobtrusive.

4.7.2. Semi-Structured Interview Analysis

Access to key informants was based on their availability and influence in the biofuels cluster. Interview sessions were limited to one-hour sessions to limit impact on participants' work. Eight semi-structured interviews were conducted, indicated in **Table 4: Semi-Structured Interview Sample Development,** column stating Final Sample.

Video conferencing technology, namely Skype, was utilised to overcome diverse geographic dispersion between that of the respondent and the researcher. Five interviews were conducted via this method. The benefits that were derived from this interviewing instrument are cited by Cooper & Schindler, (2014, p. 164), namely to reduce the travel time between research participants and cause minimal disruption. Challenges experienced include technology reliability, respondents' amenability to the use of technology and financial costs incurred. Three interviews were conducted as face-to-face semi-structured interviews in English.

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4.8. Data Analysis

4.8.1. Stage One: Historical Documentation Analysis

Secondary data obtained was exported to Atlas to conduct content analysis. This is consistent with the method used by Oltra (2011) and Bravo, Naim & Potter (2012). Content analysis is a "systematics, explicit and reproductive design for the identification and evaluation and interpretation" of historical documents (Fink, 2005 cited in Bravo et al., 2012). This analysis method was however discarded due to the complexity in learning the technology. The concepts embedded in the biofuels industrial development policy, as well as the hypothesis constructs derived from the literature reviewed, were used to analyse the data collected. The qualitative content analysis was applied to the latent meaning and contextual-dependent meaning was used as defined by Margrit Schnreier (Cited in Flicker, 2014, p. 8).

4.8.2. Stage Two: Semi-Structured Interviews Analysis

The primary data generated from interviews were transcribed to ensure accurate depiction of the interview sessions (Saunders, et al, 2012). Thematic units are the topics contained within and across the text (Cooper et. al, 2014, p. 385). The constructs representing high-level abstractions were inferred from the text and context. The qualitative content analysis is a systematics process that is driven and directed by the propositions, while simultaneously reducing the amount of data collected into themes (Flick, 2014).

The transcribed data was mapped for the development of the thematic framework and was guided by the constructs within the biofuels position paper and the hypothesis, which is consistent with the framework prescribed by Saunders et al., (2012, p. 187) and Olsen, (2012). The central benefit of the analysis approach is that it allows indexing and charting facilities within the analytical tool, which enables the emergence of patterns from text-based data that will be derived from the documentation and transcribed interviews; core qualitative data analysis requirements of transforming data into meaningful outputs (Hesse-Biber, 2010; Maddox, 2014; Steinke, 2004).

The semi-structured interview guide, Appendix 6: Interview Guide, was mapped to the proposition investigated; refer to the table below: Table 5 Semi-Structured Interview Mapping to Proposition. The closed-ended statements that resulted from Questions nine, twelve and thirteen were removed from the interview guide after the first round of interviews. The flexibility of the data analysis method enables both concepts and code-driven categories (Flick, 2014, p. 4). Additional benefit is that the analysis instrument guards against the

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selective perception of the content, as well as providing for rigorous application of the reliability and validity criteria.

Table 5: Semi-Structured Interview Mapping to Proposition

Proposition	Interview Questions
Proposition One: Inclusive Biofuels Value Chain Development	Q6, Q7, Q8, Q10
Proposition Two: Institutional Capabilities to deliver	Q2, Q3, Q4
Proposition Three: Potential for Niche Market Development	Q5, Q9

The results are presented in thematic networks supported by subordinate-themes that capture the drivers of the central salient themes under the propositions investigated, indicated in Chapter Three (Attride-Stirling, 2001, p. 387). The thematic network was presented in tabular format to viably illustrate the relationship between the proposition, themes and subordinated themes.

4.8.3. Triangulation of results

The use of a consistent measurement and analysis instrument enabled the triangulation of results. Cooper et. al. (2014) highlight the mixed method approach through the combining of qualitative and quantitative finds, which is perceived to increase the quality of the research. In this study, exploration of the debates preceding the publishing of the draft position paper of the biofuels regulatory framework was done. The primary data collected through semi-structured interviews was used to gain deeper understanding of the debates and insight into the experience of key informants. New emerging themes highlighted within the semi-structured interviews were discussed in Chapter Six, as they encapsulate the narrative that was excluded in tabled reports, presentations and verbatim debates in the Handards.

4.9. Reliability and Validity

The qualitative method may be perceived to impact the credibility of the findings and deductions made due to the subjectivity of participants and documentation analysis, therefore impacting the external validity. The content and construct validity will be ensured through the use of the documentation analysis technique in relationship to the criteria provided by the South African government's biofuels strategy. This would therefore ensure that external validity is achieved, thus permitting generalisation of the findings to the affected populations (Saunders & Lewis, 2012). The internal validity will be affected primarily by the history and sample selection that is used to examine the relationships (Cooper et al., 2014, p. 203).

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4.10. Assumptions

The development of the biofuels industry requires backward linkages to a segment of the agriculture sector; namely grains and land crops, as prescribed in the positions paper. The land redistribution amendment act of 2014 has reopened the land claims process. This reopening land claim process would increase the existing base of emerging farmers. The process, under which the land allocations will occur, is however excluded from the study. The outcome is a land claims process and the increase number of new emerging farmers entering the market is a factor under consideration.

Institutional arrangements and overarching regulatory frameworks are supporting by specific policies are used to strengthen the delivery of the principals embedded into all policies. An example hereof is the BBBEE policy, which is reinforced by Employment Equity Act and the Skills Development Acts, which are priority elements of the BBBEE scorecards. Sector Specific scorecards facilitate the sector progress on the BBBEE legislation. Firm level incentives are available for skills development in the form of rebates. These institutional arrangements and co-ordination within and across sectors, through the use incentives to achieve social and economic inclusive objectives is therefore deemed to be possible in the development of a new industry.

The stereotypical definition of rural poor is used to exaggerate the impact under-development. The stereotype is based on characteristics the systematic exclusion of rural marginalised groups such as women, youth and persons living with disabilities (physical and mental). While patrimonial social system that may exists in rural areas are excluded from this study, the effects impact marginalised groups.

The subordination of social policies into the market economy is deemed to be unsustainable, in resource-dependent middle-income countries. A balance between social and economic development policies is required to achieve the goal of reducing inequality and poverty, and inclusive growth.

4.11. Limitations

There are several limitations of the study. South African biofuels industry policy and regulations are still within draft documents therefore limiting the study to a theoretical exploration. There are further contextual and method specific limitations discussed below.

Contextual limitations

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- The research study focussed on the economic and social inclusion policies and execution within the biofuels position paper. While environmental factors such as El Nino, Le Nino, international commitments under the UNEPP and political institutions influence the development of the industry, it is beyond the scope of the study.
- Existing socio-economic policies and supporting institutional arrangements are presumed to continue over the period during which this study was conducted, February until October 2015.
- The draft biofuels positions paper on the regulatory framework is focussed on commercial-scale investment. Existing small-scale biofuels producers were therefore excluded from the sample and data analysis.

Method Related Limitations:

- ***Data Collection instruments*** used to gather the data were limited by language, and confidentiality. The interviews and content analysis were conducted using English, despite South Africa having eleven spoken official languages. The use of one language, however, would have inherently impacted the key informants' ability to express themselves fully, as English was not their first or second language.
- ***Confidentiality:*** while respondents gave permission to record the interviews, the effect of the recordings may have influenced the informants' responses. The representation of stakeholders per segment of the sample posed a threat to maintaining confidentiality. The small sample size and segmentation according to institutional categories posed a challenge in maintaining confidentiality. Institutional categories were therefore collapsed, particularly in categories with low representation to ensure confidentiality as far as possible. Furthermore, names and institution names were removed from the transcribed data.
- ***Time Period*:** the biofuels sector development remains topical and receives on-going media coverage. The impact of media coverage therefore impacted the respondents' focus during the interview process.
- ***Researcher Bias:*** Reflectivity in the method enables the prioritisation and rephrasing of questions. The researcher's rephrasing of interview questions may have impacted the data collection (Saunders et al., 2012).

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5. CHAPTER FIVE: RESULTS

4.12. Introduction

In this chapter the results of each proposition will be examined. A two-phased approach was used to gain insight into the debates surrounding the development of the biofuels value chain. Secondary documentation content thematic analysis was conducted to gain insight into the debates relating to the biofuels industry development. Eight semi-structured interviews were conducted in phase two with key informants involved in industry development. The sample and data analysis method is discussed under each phase.

4.13. Phase One Results

Eighty-nine documents containing the keyword biofuels were collected since 2010 from the Parliamentary Monitoring Group portal. The distribution is summarised in the table below. The sample consisted of thirty-seven documents representing 41.57% representation of the five-year population. The call for comments and policy documents, however, are counted as one document, namely the publishing of the draft position paper for comments.

The draft position paper was used as the framework for thematic analysis and mapped according to the three research propositions. The position paper is an outcome of the policy development complexity with numerous stakeholder groups, purposely focussed on providing a regulatory environment for the biofuels industry development. The depth of the debates was therefore not fully encapsulated, particularly the social development policies excluding BBBEE. The multi-layered accountability and stakeholder participation structure was provided; however, the institutional structure to execute the institutional capacity to deliver was not robustly discussed.

4.13.1. Proposition One: Inclusive Biofuels Industrial cluster Development

The proposition query resulted in the establishment of two central themes: industrial policy and social policies. The emerged support instruments for each theme are highlighted in the table below. The results are presented under the respective theme headings below.

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Table 6: Proposition One: Secondary Data Thematic results

Theme	Subthemes
1. **Resources Management**	**1.1.** Water Scarcity and Food Security 1.2. Land use complexities
2. **Industrial Policy**	2.1. Horizontal Industrial Plan 2.2. Vertical Industrial Incentives 2.3. Industry Competitiveness
3. **Social Policies and Opportunities**	3.1. Agrarian Reform 3.2. Land Redistribution 3.3. Employment Opportunities
4. **Technology Choice**	4.1. Social Objectives Trade-off 4.2. By-products Impacts

4.14. Scarce Resource Management

South Africa, particularly the previous homelands, offers a comparative advantage for under-utilised land and potential labour pool. National scarce resources such as arable land and water undermine these comparative advantages. Furthermore, the use of land is central to the food vs. fuel debate. The first generation technology choice adopted by the BIS (2007) were "*heavily dependent on agriculture, major concerns were also expressed about possible food and water shortages, and the DoE was asked how it would ensure that farmers still prioritised production for food security."* Consequently, the department (DAFF) has actively managed the conflicting priorities of *enabling emerging farmers into the market driven economy* via the biofuels sector and alignment to the National Growth Plan outcome seven.

The use of under-utilised land remains contentious amongst stakeholders; "(C) *concerned about the implications of promoting biofuels instead of agriculture" (https://pmg.org.za/committee-meeting/17303/); "In KwaZulu-Natal (KZN) if the land was to be used to grow biofuels there would be no land to graze cattle" https://pmg.org.za/committee-meeting/13697/).* Questions were also posed relating to "*the mining rights were currently being distributed all over, and this would have a negative impact on fertile land" (*https://pmg.org.za/committee-meeting/16166/*). "He asked why the Fund was optimistic about biofuels as these projects threatened food security, as arable land was scarce in South Africa." In summary, the use of land for food, grazing and potential mineral rights indicate "trends that would hinder it".*

The land use complexity and on-going food vs fuels debate are impacting the biofuels producers' ability to ensure feedstock security and the development of a sustainable biofuels sector*. "Mr Green emphasised that in order to have a sustainable biofuel, there must be stable feedstock …" "Use of algae was being researched as a viable energy source, but that*

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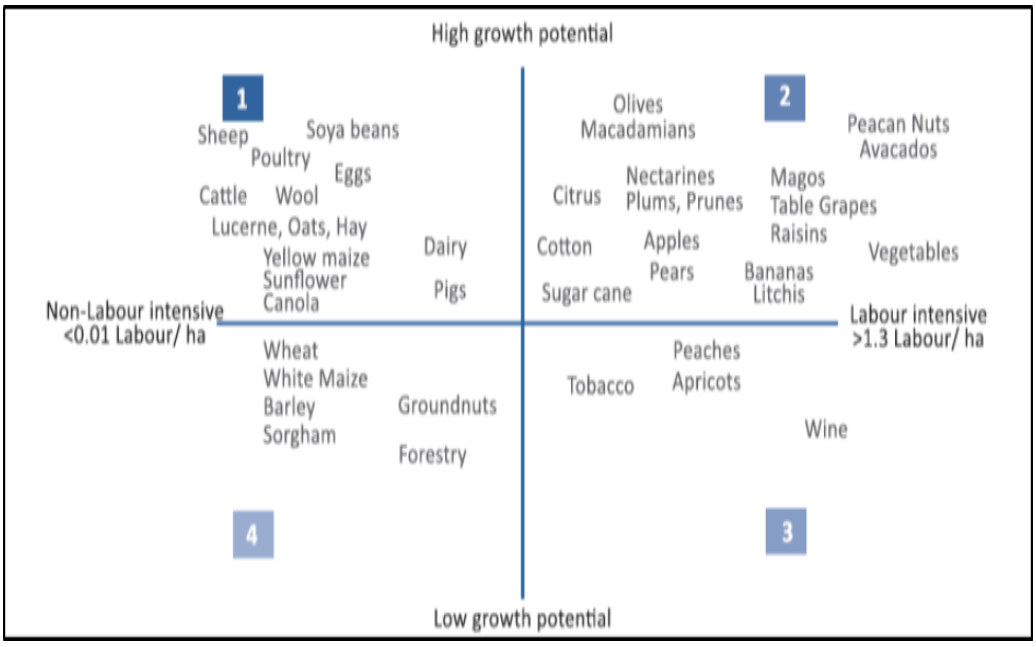
question still remained open" (https://pmg.org.za/committee-meeting/14740/). This is supported by *"[the] need to use technology appears to be critical in the development of the sector to mitigated. We therefore need to maintain a balance so that we apply real technologies that support local growth, employment and reinforce local economic progress and involvement of communities in the development of these programmes*" (https://pmg.org.za/hansard/18159/).

4.15. Industrial Policy

The stated primary objective of the biofuels market, "bridging the first and second economy", would therefore be inhibited as long as there is *"underdevelopment in key sectors of the economy." "[A]griculture could contribute to industrial development if good trade policies were in place. Industrialisation would deal with key challenges of agriculture in South Africa, such as market development, price stabilisation, investment attraction, and trade promotion".*

Agricultural sector actors and government social partners actively partook in the debates relating to the industrial development plans. Comments on the 2010 to 2013 IPAP *"signal(ed) the seriousness of the government about a comprehensive industrialisation and employment strategy,"* yet fails to deal with *"land crops and grain*", key inputs into the production of biofuels. Industry actors believe that "*… a number of crops were seen to benefit industrialisation, such as sugar cane, sugar beet, maize, sweet sorghum, cotton, canola, soya beans, and hemp"*

Figure 7: Department of Trade and Industry Presentation 12 August 2015



*Source: Extracted from document **150812DTI.ppt***

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For details provided in the DTI agriculture growth priorities sectors, refer to the figure above. This indicates that the priority commercially identified biofuels' feedstock are soya beans, canola and grain products, while sorghum is identified as low priority with greater labour intensity than sugar cane. These however raise concerns of the employment opportunities envisaged through the development of the biofuels sector.

The IPAP vertical industrial development on segments of the agriculture sector "*horticulture, aquaculture, organic products and niche crops*" has the potential to stagnate the development of the biofuels sector through not ensuring feedstock security required for production.

4.16. Biofuels Incentives

The value chain development required for the inter-sector linkages presumes there would be consistent application of incentives across the value chain. This is however in stark contrast to the vertical incentives that are available; namely "*full exemption of bioethanol from fuel tax, a rebate for biodiesel manufacturers of 50% and accelerated depreciation allowances over three years*." The application on vertical incentives in a horizontal value-chain sector has *"not proven to be sufficient to lure investment and a more supportive regulatory framework needed to be developed" (https://pmg.org.za/committee-meeting/15342/).* This however is inconsistent with the DTI, as the *"DTI strongly believes that transformation also fosters long-term value chain partnerships" (https://pmg.org.za/hansard/18431/).*

The industry *"required incentives to be cost competitive",* they also accounted for benefits such as balance of payments saving and fairly stable economic growth *(https://pmg.org.za/committee-meeting/15342/).* The potential investor's perspective was that the *"high capital costs involved and risk analysis is central to acquiring investment".* The "*crude oil price collapse"* increases the cost of subsidies offered to develop the sector.

The linking of commodity families appears to have opened the sector to cyclical fluctuation and industry competitiveness, ""*put a spanner in the works" and National Treasury was involved in an exercise to understand, based on the slow recovery of the global oil price, whether or not a compulsory upliftment for ethanol and biodiesel could be supported at the existing and estimated prices for petrol and diesel*" (*https://pmg.org.za/committee-meeting/21230/).* The ten-year delay since BIS and the cyclical nature of both commodity families is indicated by, "*the biofuels strategy was approved at a time when food and fuel prices were increasing, and while higher fuel prices were good for biofuel competitiveness,*

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the higher food prices influenced the implementation of the strategy" (https://pmg.org.za/committee-meeting/11440/).

Over the sample period reviewed, there were consistent requests from maize producers to be included in the feedstock selection when surplus was produced and when market prices were low; *"Currently farmers were producing maize at a R1 000 loss per ton, and biofuel investment in this sector had not happened because government had so far failed to come to the table. There was a need to enhance the biofuel strategy"* .However *"alternatives are being investigated so that justice can be done to the individuals who act in the agricultural production sector so that their businesses remain viable. However, the other end of the equation should also be to ensure that we retain and maintain the capability of South Africans who depend on maize as a staple diet, to be able to have access to it, without it being highly priced. https://pmg.org.za/hansard/18431/).* Moreover, *"Farmers would not be stopped from switching a crop, as long as they still maintained and respected the set criteria outlined in the licensing agreements (https://pmg.org.za/committee-meeting/16166/).*

4.16.1.1. Technology Choice

While there is indication that research and development was being explored in the use of second and third generation technology, "*Specific capabilities being advanced include the development of second generation biofuels like algal biofuels, at the Nelson Mandela Metropolitan University" (https://pmg.org.za/hansard/18159/).* There has been no update on the progress and this has remained an outstanding item on *"research findings or status quo of second generation biofuels as well as an argument or counter-argument on the inclusion or continued exclusion"* (http://pmg.org.za/files/130813biofuels.ppt). While the deliverables were not found in the data by the prescribed deadline (31 March 2013), it was highlighted that the benefits of technology use in "*The new bioeconomy strategy is expected to provide an economic engine for the new knowledge-based economy, which in turn will provide a basis for future growth in the economy. Such science-based biosolutions can for instance be used to … produce biofuels; produce biomining products, improve and adapt crops; reduce production costs, reduce environmental impacts; improve quality of products, etc.*" (https://pmg.org.za/hansard/18341/).

The inclusion of second-generation technology however poses a risk to achieving the full potential of the explicit "*primary requirement [that] was to create a link between the first and second economies, which entailed creating jobs in under-developed areas*" (https://pmg.org.za/committee-meeting/15342/). Moreover, it would reduce the availability of *"value chain by-products like electricity and other possible added value products".*

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(https://pmg.org.za/committee-meeting/13697/), consequently reducing the positive contribution towards the trade balance.

4.17. Social Policies

The social developmental policy appears to promote increased rural economic development in South Africa. These findings indicated above are consistently demonstrated by the objectives of the policy by all stakeholders. It is pertinent that biofuels sector development is therefore impacted by outcomes of the rural development policy and agrarian reform policies. These policies are developmental and redistributive (land restitution and redistribution) and social development policies, respectively.

The rural developmental policy is coherent with the National Growth Plan outcome seven of "*vibrant, equitable, sustainable rural communities contributing towards food security for all*". However, it indicates that while rural development for food security and employment opportunities objectives appear to be iin direct conflict with the feedstock security required to develop the industry. This appears to contribute towards the on-going debate of the food vs fuel dispute. This will be discussed further under proposition three.

Furthermore, rural development is coherent to the Department for Economic Development's stance on industrial development and linking high labour-supplying areas: *"We make the point of spatial disparities, particularly the over-concentration of our industrial economy in a few regions…. One of our industrial policy objectives is to ensure balanced development*" (https://pmg.org.za/hansard/18431/).

The land restitution policy appears to be negatively affecting the development of the agriculture sector and the sector's productivity. In 2010, the land restitution policy of "*willing buyer and willing seller was a thorny one and it would take some time to be resolved"* (https://pmg.org.za/committee-meeting/11285/). In 2015, the process and policy was criticised as "*The land restitution policy was 'airy-fairy' and it did nothing to settle the farming community or grow farms*" (https://pmg.org.za/committee-meeting/21301).

The agrarian reform is explicitly discussed through the presentation of the biofuels industrial strategy objective. This is also consistent with the expressed biofuels strategy secondary objective to *"integrate historically disadvantaged farmers, especially in the former homelands, into the mainstream agricultural and energy economies"* (https://pmg.org.za/committee-meeting/16166/; & https://pmg.org.za/hansard/18585/).

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It is also implied by numerous stakeholders through euphemism, as indicated by the Minister of Energy's response to a question posed on the biofuels sector: *"The biofuels industry strategy is premised on, amongst others, the creation of a substantial number of new jobs through broadening agricultural development by bringing marginal and underutilised farming land into production for biofuel feedstock. It is also premised on the deepening of agricultural development by unlocking animal feed value chains which are currently import intensive, but which would benefit substantially from the by-products of biofuel production" (https://pmg.org.za/hansard/18431/).*

While the construct of "emerging farmers" is indicative of the "*broadening agricultural development*", the inclusion of *"emerging farmers"* is consistently discussed in all biofuels debates and presentations. There is a concerted effort to ensure the development "*started with agro-processing focusing on traditional land"* and "*prioritising the growth of small-scale farmers"* (https://pmg.org.za/committee-meeting/15342/) through inter-departmental collaboration of DoE and DAFF. While there was explicit evidence provided that DAFF is accountable for financial assistance of emerging farmers, no concrete evidence was found on what mechanism of funding will be used (http://pmg.org.za/files/130813biofuels.ppt). National Treasury however appears to be subsidising farmers for energy crops (https://pmg.org.za/committee-meeting/16166/).

Entry into the market-driven economy and biofuels value chain however requires "*support(ing) emerging farmers in negotiating contracts with biofuels manufacturers … and providing technical support to emerging farmers"* (https://pmg.org.za/committee-meeting/15342/) to ensure fair relationships in the value chain. It may therefore be deduced that a hybrid social policy is being employed, which incorporates both land redistribution and rural development to stimulate local economic development. This is clearly encapsulated by, *"Mr J Skosana (replied) that rural industrialisation was possible".*

"Ms Modise emphasised that job creation should be focussed in poor and rural areas. Former homelands were seen as the key areas for commercial development" (https://pmg.org.za/committee-meeting/15342/). All documentation reviewed discussed the labour absorptive capabilities in the agriculture sector due to the development of the biofuels sector. The employment opportunities estimations are however varied.

There is consistency in the estimations provided by the DoE (2013), however other stakeholders such as Department of Trade & Industry (2013) (55,000 new jobs) and Department of Water and Environmental Affairs (2012) (53 416 long-term jobs), of which 141

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jobs were estimated to be within the manufacturing of biofuels. While the time variations are relevant in the estimations, the reported differences are considerable. The assumptions thereof are also not available from documentation to further interrogate this discrepancy. Some insight is however provided on the historical difference: "*Current estimates were based more on international success rates and projections" (https://pmg.org.za/committee-meeting/15342/*). It nevertheless doesn't explain the variance between departments.

The sector contribution towards the energy and greenhouse gasses (GHG) emissions reductions or savings is consistently presented throughout all documents reviewed. The estimated emissions savings is estimated to be 50% towards the 30% national commitment. Moreover, it is aimed at introducing "*the clean fuels programme to facilitate the necessary investment that refineries need to produce liquid fuels that are more environmentally friendly"* (https://pmg.org.za/hansard/18585/). It would therefore aiding in the increase of liquid fuels energy mix and fuel security.

4.17.1. Proposition Two: Capability to deliver

The results of this proposition indicate that the biofuels potential investors are cluster formation is required to transactional cost that increases the cost of production, which further increases the cost of price-based incentives. There is a signal that the inter-sectorial value chain development capabilities are learnt by doing, as indicated by the slow progress on establishing a regulatory environment, and multiple segmented stakeholder engagements. The thematic findings and subthemes are presented and discussed below.

Table 7: Proposition Two Thematic Results

Theme	Subthemes
1. Infrastructure	1.1. Liquid Fuels Infrastructure 1.2. Clustering 1.3. Transactional Cost
2. Institutional Arrangements	2.1. Intergovernmental consultation framework 2.2. Public Private partnerships framework 2.3. Outstanding Items and Delivery constraints 2.4. Rural local government capacity building

4.17.1.1. Liquid fuels Infrastructure

"*(R)efinery ethanol blending occurs at the six refineries in South Africa so as to minimise the investment in the industry. Depot blending was limited to two large depots for each of the seven oil companies. Following the indicated preferences of the oil companies, it was assumed that two companies (Sasol Secunda & Natref) would blend at the refinery and the remainder would blend at depots" (https://pmg.org.za/committee-meeting/15342/*).

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The evidence explicitly indicates that the two licensed bio-refiners are geographically clustering in close proximity to existing petrochemical firms that have the blending capacity in order to reduce transactional cost; refer to Figure 8: Geographic Distribution of Liquid Fuels Infrastructure and Potential Biofuels Production Sites, below. The cluster formation is evident, despite the outstanding "*Industrial Cluster Framework"* (https://pmg.org.za/committee-meeting/17303/).

Blending and transportation cost uncertainties however still remain despite the *"initial figure for blending costs and upgrading costs. However, it was necessary to investigate costs for a specific refinery and this had taken additional resources. Transportation costs were also unclear until routes and fixed depots were finalised"* (https://pmg.org.za/committee-meeting/15342/).

This is however in light that the *"utilization of refineries in the region was among the lowest in the world, at 80%*" (https://pmg.org.za/committee-meeting/17479/). Reasons cited in documents reviewed indicated the aging infrastructure that required reinvestment into the sector, while there are calls for improved import and inland distribution infrastructure (http://pmg.org.za/files/140902doe1.pdf). The final decision would however be taken in 2017 (https://pmg.org.za/committee-meeting/17479/).

The impact of the more capital-intensive segments clustering is thought to result in the increased transactional cost of feedstock producers (farmers), as captured by, *"NAFCOC said that transport costs were too high. Sometimes these costs were caused by unnecessary traveling because some produce was not processed where it was grown" (https://pmg.org.za/committee-meeting/11285/).* This is consistent to findings of a "*2008 Trade and Industry Policy Strategies study [which] found that all foodstuffs that were consumed in South Africa were transported … the distances from consumers, the value chain was much longer and the accompanying costs much higher. This contributed directly to the rising cost of food. Small businesses, particularly black farmers, were completely excluded from the value chain… Since early 2007, rural prices have tended to grow faster than urban prices."* One of the recommendations made by the study was that alternative value chains should be created that are shorter, more cost effective and much more inclusive (https://pmg.org.za/committee-meeting/21301/).

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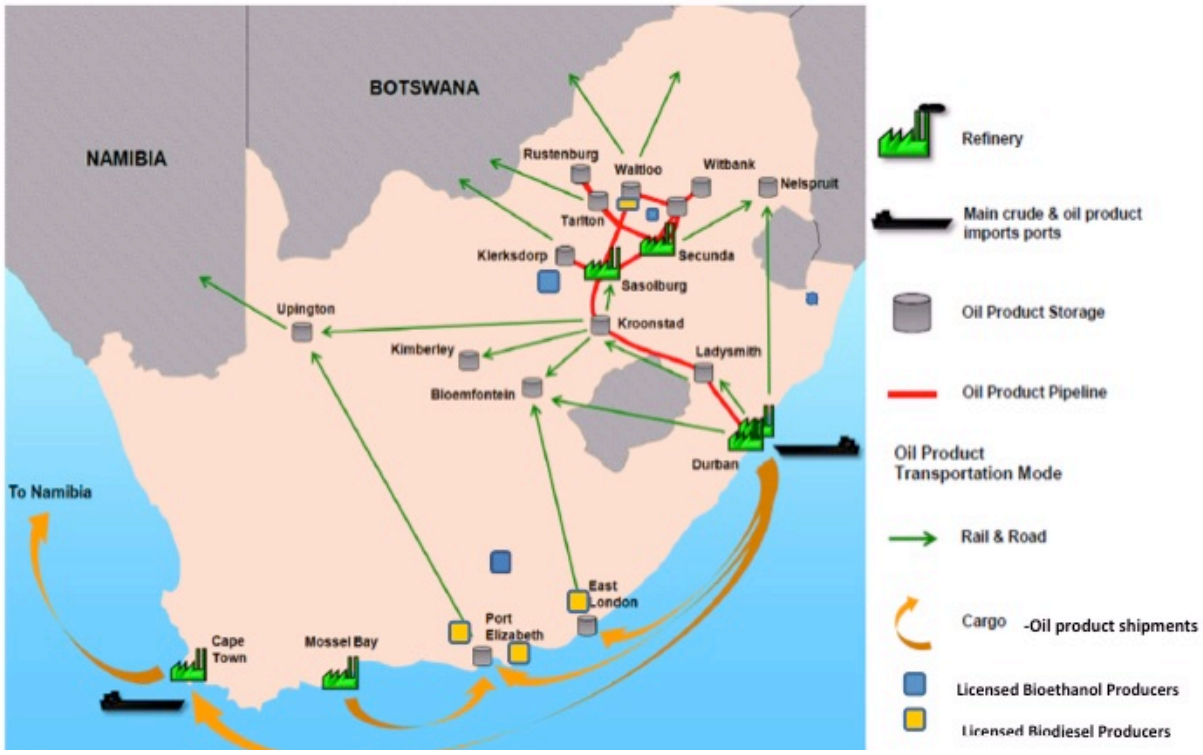
Figure 8: Geographic Distribution of Liquid Fuels Infrastructure and Potential Biofuels Production Sites



4.17.1.2. Institutional Capacity

The horizontal industrial development approach, as depicted in the value chain model, requires institutional governmental department consultation and alignment. A staggered Private-Public consultation framework was developed, while internal consultative structures were developed prior to industry specific engagement. "*A Cabinet mandated Inter-departmental Biofuels Task Team (BTT) established in 2005*" to aid in the increased governmental co-ordination required across the value chain, while the Biofuels Implementation Committee's (BIC) "*inaugural meeting was held on 30 August 2013*", chaired by the DoE (https://pmg.org.za/hansard/18431/). The multi-layered public private consultative framework therefore exists to aid the development of the sector.

The results indicate that most departments are actively involved in the BTT, based on their respective mandates, while no consolidated list was available beyond the biofuels industrial programme lead (DoE) and supporting departments (DAFF & NT). The sample analysis indicated that eleven national government departments are involved in accordance to specific mandates as indicated below:

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Table 8: Intergovernmental Departmental Mandates in Biofuels Value Chain

Government department	Sector Value Chain Involvement	Mandate
Science and Technology	Manufacturing	Support and R&D in technology (2nd & 3rd generation technology)
Trade and Industry	Manufacturing	SIPS 8
Agriculture, Forestry and Fisheries	Agriculture	Support emerging farmers in negotiating contracts with biofuels manufacturers as well as financial assistance
Environmental Affairs	All	Issuing of water licences
Higher Education and Training		Aid in developing skills pool to support development
Economic Development		Spatial balance industrial development
Energy	Lead	Regulates liquid fuels industry
Rural Development and Land Reform	Agriculture	Land Redistribution and rural development
Water Affairs	All	Water licensing
Cooperative Governance and Traditional Affairs	Agriculture	*Facilitate and promote the development of cooperatives and small enterprises and traditional land use*
National Treasury	All	Structuring the Incentive schemes including cost-benefit analysis

Source: extracted from sample

Despite the departmental-specific mandates along the value chain, the BTT was inefficient in achieving outcomes in timeframes. This was highlighted in the time delay between the "*Biofuels Industrial Strategy of the Republic of South Africa [that] was approved by Cabinet on 05-Dec-07"* (http://pmg.org.za/files/130813biofuels.ppt) and the Draft Position Paper on the Biofuels Regulatory Framework which has remained an outstanding item reported in the Portfolio Committee on Energy on the Budget Vote report (https://pmg.org.za/tabled-committee-report/2361/), and was only *"published in January 2014 by the DoE for public comments"* (https://pmg.org.za/tabled-committee-report/2034/). Frustration on the progress of the biofuels sector and, by implication, the BTT execution of providing regulatory certainty was explicitly expressed, as indicated by "*discussing the strategy about six years ago, but there did not seem to have been much improvement or implementation of the strategy since then"* (https://pmg.org.za/committee-meeting/16166/).

The multiple consultation framework, which includes BTT and BIC, posed delivery challenges as *"[S]ome of the targets could not be achieved as they are dependent on external parties such as the Task Team on Biofuels, which comprised of different departments and new issues are continuously being added"* (http://pmg.org.za/files/130813biofuels.ppt). The Biofuels Pricing Framework delays were attributed to exclusion of sugar cane as a reference crop, resulting in incentive scheme

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rework. Other outstanding items include the "*General Fuel Levy instead of an Equalisation Fund levy to collect the money*" (http://pmg.org.za/files/130813biofuels.ppt). There was no additional information available on this item in the data reviewed. The Minister of Energy had however indicated that "*Various meetings with relevant stakeholders are being held in order to expedite the resolution of all outstanding matters*" https://pmg.org.za/hansard/18431/).

There was limited indication of local government involvement in the execution of the sector development. It was however noted that "*local governments often had land and funds, but lacked the capacity to determine what projects should be embarked on. The IDC was targeting poorer municipalities in order to assist in their development projects*" (https://pmg.org.za/committee-meeting/12018/). The focussed development of capabilities of poorer municipalities is coherent with the social (rural) development policy, discussed previously.

4.17.2. Proposition Three: Market and Niche Market Development

There was no explicit link found between the biofuels sector and niche market development opportunities, particularly high value strategic products such as chemicals.

4.17.3. Summary of Phase One Propositions Results

Phase one results indicate the complexity of the development of the biofuels value chain development and the ability to execute an inclusive economic development strategy, while there is clear evidence provided on the determined effort on rural development of economic participation opportunities through the use of social policies. The land restitution and redistribution social policy effectiveness is hindering the development of broader agrarian participation opportunities. Moreover, there is clear indication that employment opportunities will be created, despite the differences in departmental reports.

There is no clear ability demonstrated from the reviewed documents that hard and soft institutional capabilities exist to execute the biofuels value chain. While consultation structures are present, the process of learning to collaborate effectively across inter-governmental departments appear slow, resulting in frustrating stakeholders present in parliamentary discussions. While mandatory blending was legislated, questions on the biofuels specific pricing framework are still outstanding. Moreover, the existing aging liquid fuels infrastructure to be used at two refineries and depots poses a risk for the sustainability of the biofuels sector. Additional investment is required, however this decision will only done after 2017, adding to the risk challenges faced by potential biofuels foreign direct investment.

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Strenuous effort had gone into the attraction of FDI through incentives schemes, despite not holding a comparative advantage in key inputs into the sector. Subsequently, the evidence indicates the on-going debate on food security and effective use of natural resources. The technology choice trade-offs needs to be examined to determine the optimal balance for achieving the unambiguous social and economic objectives.

4.18. Phase Two Results

Eight semi-structured interviews were conducted with key stakeholders along the biofuels value chain. The representation of these stakeholders, segmented according to their type of institution, is represented in **Table 4: Semi-Structured Interview Sample Development**; refer to the last column marked final sample. Data was collected from one NGO representative, three public and supporting public institutional representatives, two industry association institutions and two private potential investors.

The pre-defined interview guide was used to collect the data. The interview guide, refer to Appendix 6: Interview Guide, was based on the constructs reviewed in the literature and draft biofuels position paper on the regulations. The interview guide and related data collected was mapped according to the propositions, discussed in Chapter Three; refer to **Table 5: Semi-Structure Interview Mapping to Proposition**.

4.18.1. Proposition One: Development of Biofuels Inclusive Value Chain

The purpose of the interview questions under this proposition was to gain insight from key informants' perspectives on the proposed bundle of incentives that have not achieved the desired foreign direct investments, while exploring the support that emerging and historically disadvantaged South African farmers would receive to produce energy crops. The secondary intent was to determine the South African citizens' benefits derived from this sector's development and how it would aid in the reduction of unemployment.

Respondents indicated that a diverse range of benefits are derived from the development of this sector, namely: eight highlighted the impact on the trade balance, five discussed the contribution towards GHG emission reduction, six stated local economic development opportunities derived from attraction of rural investment, three highlighted demand-driven entrepreneurial activity and eight stated the reduction of unemployment. However the development of the sector requires incentives to attract investment into the liquid fuels segment. The themes and subthemes are summarised in the table below.

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Table 9: Phase Two Proposition One: Thematic Results

Theme	Subthemes
1. Incentives and Benefits	1.1. Pricing framework and Investment Risk 1.2. Fiscal Linkages 1.3. Greenhouse Gasses debate 1.4. Second Generation Technology
2. Value Chain productive Linkages	2.1. Policy 2.2. Feedstock security 2.3. Land redistribution & tenure 2.4. BBBEE 2.5. Inter- and Intra-sectorial partnerships 2.6. Local Energy crop security and regional trade agreements
3. Local Economic Development	3.1. Clustering 3.2. Employment Opportunities 3.3. SMME's demand driven business 3.4. Rural Development

4.18.1.1. Incentives

There are numerous debates relating to the incentives offered to the industry. Private and two public institution respondents held a consistent view that the sector needs to be incentivised to remain profitable, while one respondent indicated that *"They can get a start-up [fee] but they should not be supported to become stable".* Instead "*incentives in terms of soft loans – that is loans that are not carrying too high an interest rate but they should not be paid for a product that they need to produce in a sustainable way in time to come".*

Six respondents indicated that promulgation of the regulatory framework, particularly the pricing framework and incentives, are however stifling the desired investment. One respondent highlighted that *"we feel a lot still needs to be done and we are not willing to risk funding where policy has not been sufficiently developed and also the regulatory environment has not been fully developed*". This sentiment was shared by all private institutions, as one respondent indicated, "*There's no way any investors would put money into that without having any idea whether there's return on investment*", while one respondent indicated that "*we pretty much are ready to go, it's just that without the final regulations our funders will not release the cash"*. The delays resulted in a decline in potential investors, from eight to two; one in each liquid fuel market segment. One respondent defines this occurrence as an "*economic mistake".*

Energy crop suppliers are also affected by the outstanding supply-side policy framework, particularly the crop-pricing instrument. One public institution informant stated, *"There are programmes that will be done by the Department of Agriculture and then the fact that you create a market for their product at a particular price that they indirectly get support from the*

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price". The potential of participating and obtaining access to the energy market appeared to exist; however, delays in the regulations appear to be dampening interest. A potential investor indicated that, "*Everybody's very sceptical at the state of biofuels so we'd rather actually commence construction so farmers see an opportunity, get excited and are more willing to engage. At this stage no one's really too interested in it".*

Two respondents shared that the risk of mandatory blending and monopoly of the market could result in biofuels producers' rent-seeking behaviour, *"[I]f you have a monopoly plus obligation, that's the worst possible combination from a consumer's point of view, because they will for sure sell at whatever the price they want".* Another respondent indicated the potential liquid fuels sector rent-seeking behaviour, *"We want to sell biofuels to you" and they'll say, 'Fantastic! We'll buy it from you at R1 a litre, take it or leave it'".* It is therefore pertinent to legislate the biofuels regulatory framework to eliminate these practices.

Three respondents indicated that the capital-intensive storage and blending infrastructure investment required is pending the supply of biofuels production. One respondent highlighted that *"they (petrochemical companies) will only commence infrastructure implementation once biofuel manufacturing facilities commence construction. Which is the rational thing to do. There's no need to spend cash when there's no supply".* The petroleum firms are requiring incentives as, *"Additional costs, besides the purchase of the biofuels, exist in handling it and there would be the subsidisation of that. There are two components. The uptake costs and the production costs and both of those need some form of subsidisation to be cost neutral*".

The abovementioned indicates that both the petroleum and biofuel sectors require incentives, indicating that the incentive scheme would impact the fiscus. Two informants indicated the cost of incentives, indicating that *"when the oil price was $120 per barrel, subsidies amounted to R90 million, whereas at $50 a barrel the cost will be R200 million".* A public institution informant indicated that *"It was good in that, in hindsight as well it's also good that it was not affected then, because got the shock of their lives later on to learn that this thing now when the price is going so far (down)…it's good in terms that it highlights the realities because this is feeding into a commodity that has got a lot of volatility in it."* These views were consistently expressed in a newspaper article stating the following: *"[T]here is a fiscal risk posed by the subsidy under the circumstances of a declining crude oil price," said deputy director-general of energy policy and planning Ompi Aphane (*Roelf*, August 11 2015).*

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One respondent wrote an open letter to the DoE, Appendix 7, in response to said deputy director-general of energy's statements, indicating that *"Government takes a more holistic view on this issue…. you must also consider that this expenditure will in return lead to multi-billon investments from the future biofuel industry creating at minimum 15,000 – 20,000 new sustainable jobs, a massive swing in the balance of payments as well as significant additional corporate and employee taxes collected over many years into the future".* Four other respondents shared the fiscal linkages to the economy beyond the allocation of incentives.

The same respondent stated, "*they have to use international pricing… and, for example, at the moment internationally a metric tonne of biodiesel costs say €800, calculate that in rands, this is R12 000, assuming the tonne regulate diesel, BFP, basic fuel price without all these additional calculated costs, costs R6 000. You have to subsidise it with additional R6 000 at the moment to come to this price, which is profitable for the biofuel industry. Now, and this is an interesting aspect, that biodiesel price and the bio-ethanol price internationally is not directly related to the crude oil price because it is a commodity*".

There were diverse perspectives on the total contribution the biofuels sector would contribute towards GHG emission reductions. It appears the perspectives were informed based on the constituency they represent as well as the position in the value chain. The industry-association representative indicated that further study is required to fully comprehend the GHG benefits, as the gasses will be emitted during the biofuel production process. This is coherent with an NGO respondent, who indication that added transportation via trucks from farmers to bio-refiners and then to petroleum refiners would increase overall emissions. One respondent identified "*a study carried out in Australia and it showed that if you blend a certain percentage of ethanol into fuel it reduces your PMR, your particulate matter 2.5 PMR particulates anyway you used them out of that pollutant by a very very big proportion and if you look at the health cost of that pollutant, you'd look at overall… you'd have a healthier population just from cleaner air".*

Four informants implied that first generation technology choice contributes towards the food and fuel, and land use debate. While mitigating plans are being developed, as previously mentioned, three respondents indicated there are other technologies that are more efficient in GHG emissions reduction and production yield, namely commoditising the waste stream via either algae or biogas. One respondent indicated that if you put "*algae in there and feed the algae you can grow bio-mass 200 times faster than you can grow bio-mass on any piece of land*". Another respondent indicated, *"Well there's enough space to do it because*

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Stellenbosch University has completely advanced in the production of the enzymes (technology) … And the deep frustration of German companies, Swiss companies wanting to invest in this country to create jobs and it's not happening.

However one respondent indicated there *"are new generation technologies called 'cellulosic ethanol' but it hasn't been proven and commercialised. I don't think anyone's really interested in that technology, at least not for the next four or five years… South African investors, especially the large corporate banks, tend to be very conservative in investments and justifiably so. So if there were in the world at least three or four second or third generation technologies that have been established and are well-proven and running for at least four or five years and are economically viable, definitely we'd look at it but at this stage it isn't the case…If you look at the likes of the big US and the EU, their incentives are substantially higher and frankly their banks have a lot less risk averse".* The discourse between the potential technological benefits and investment in "South African bankability" risk management is at odds. It was therefore assumed that financial institutions have a preference for the latecomer-advantage financing model. Foreign direct investment could potentially bridge this financial model gap.

4.18.1.2. Value chain Productive Linkages

Two respondents indicated that the motivation for the sector development is crucial in understanding the productivity of the biofuels sector. One respondent indicated that "*foreign exchange and especially job creation, because that is the fundamental motivation for biofuels in this country… The United States of America as a fuel-ethanol producer and the motivation …. is independence.".* Conversely another respondent indication "*the USA is not efficient ... energy balance of the ethanol is barely worth the effort. So it's – I mean there it's completely, it's more industrialisation, industrial policy and agricultural policy more than an energy policy*. It may therefore be deduced that the motivation to create predominately agriculture jobs could result in similar experience as in the United States of America.

Biofuels production capabilities are influenced by feedstock security. One respondent indicated implications of not having feedstock security, "*In Zimbabwe they also had grand plans and they have also like a massive processing ethanol producing plant and I mean they're running at like 10 to 20% capacity, because they can't source the feedstock".* Another respondent reinforced this perspective by indicating, "*Again from a bankability point of view feedstock or (feedstock) security is paramount to any financier".* The firm's level of productivity is therefore a key driver to ensure that shareholders obtain their returns, which is aligned to the volume based incentive system.

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One public institution informant indicated the challenge in obtaining energy crop production from emerging farmers and cooperatives. He stated, *"Now you see what the problem is right? But the message is being communicated and set-up and it is clear that this is a job that agriculture must fulfil and then the state-manufacturers must also come in and assist. The state through development of agriculture as well as its companies, where applicable, would play a roll. There is a – it's called CAPS which is a programme that is bringing this into the mainstream*". A private institution participant indicated *"There is something called an agricultural feedstock protocol, which I've not been able to lay my hands on… that offers some incentive to the farmers. What I did establish is that the national Department of Agricultural does not issue subsidies, it's done through the provincial department".*

Four respondents stated feedstock procurement would be sourced "*predominantly, from black farmers, but from commercial farmers as well to fill that gap and, as an absolute worst case, if there's insufficient local supply we'd have to import".* Another respondent indicated a regional trade partner's expectations of sector participation, *"I know there are a lot of producers in the region within Zimbabwe who are banking big time on the South African obligation".*

While the draft regulations highlight the SADC framework, they however don't indicate sourcing of feedstock from regional trade partners. "*Once you start developing the regulations and laws that are contained and… so all these things have to start being checked against the existing international agreements, other laws and so on and so forth. So a lot of it falls away. So what, you know, the end result would be, it can be quite different from what the Position Paper states."* The implication is that integrating regional trade agreements could reduce the estimated agriculture employment opportunities. A respondent contributed towards this argument by stating that "*the people next door to us where there's much more rainfall and much better ground for food will ask us to do it there*", highlighting that South Africa's neighbour's agriculture-related natural endowments are stronger than SA.

Four respondents indicated that emerging farmers are supported, either through government or sector development programmes. Three private institution respondents indicated that firms are partnering with local farmers to ensure that there is sufficient feedstock supply. The evidence suggests the development of distinctive feedstock security strategies designed by potential investors to achieve feedstock security and develop a knowledge and skills base of emerging farmers to achieve feedstock security and yield quality. One potential investor indicated the following, with regard to using existing programmes: *"Grain South Africa has*

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been instrumental in my mind turning emerging farmers into full on self-sufficient commercial farmers." On the other hand, the other potential investor is partnering with additional stakeholders such as DAFF, emerging and commercial (white) farmers and investment institutions to share knowledge about their crop selection, "*And in the Eastern Cape and the Free State it is possible to grow canola in the winter season without any irrigation and in the summer season to grow maize in the same field".* The difference in approach could be attributed to the availability of the selected feedstock and market development.

An alternative model was offered by a public institution respondent, stating *"And I would group, say, 100 of these small farmers into 1 big farm, big estate, they would own everything but would employ this guy who knows a lot about farming and they make him the manager of their crops and he works for them and he applies his knowledge and teaches the other people how to farm. If you farm on a bigger scale it's much easier to make a profit than on small scale. You remove all the barriers between the small farms and make a big farm and have a collective ownership of that farm – like a trust. The ones who want to benefit just from sitting in the trust, they just sit in the trust and they get some benefit from their dividends. The others who want to sit in the trust but also want to work on the farm, they get a salary for working on the farm and for sitting in the trust. Those who want to sit in the trust and work on the farm and do a management job as well on the farm that would have workers that report to them so they accept more responsibility they get higher salary from the farm and from sitting in the trust value. So that's the way you could get that sort of thing – the people who benefit from the land that they got they do not benefit from that without really having an in-depth knowledge of farming. And of course they've got to pay this guy who is managing everything for them because they don't have that knowledge, but in the meantime, they are getting this knowledge. Knowledge transfer will take place from him to them and to their children because owners are now growing up there. And if you now make it an attractive place to be, the children won't leave for the city, they will stay there."* His hindsight highlighted the importance of discerning between land reform participants and communal land trust members who need to share the productive gains, based on personal effort in relation to gaining access to the means of production, namely land.

One private informant summed up the importance of partnerships across the value chain, stating: *"One piece of information that came out at our conference was that these biofuel producers would have to have a 40% black empowerment shareholding…. What we were hoping was that the farmer would be given a shareholding in the distillery as that would be the logical way to do it. I've said earlier that an intelligent manufacturer would secure his raw material. The best way of doing that is to give a small share to your raw material supplier".*

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The inter-sectorial partnerships was identified as a risk, stating "*There's also a need to split the risk so that it's not vertically integrated with maybe different people looking at different aspects along the value chain".* It was observed that one respondent explicitly stated the impact of the BBBEE ownership priority element. Two private institution respondents implied the use of supplier development elements.

Four respondents indicated that commercial farmers' use of crop rotation agricultural practices would be used: *"So you don't have any competition with food, with food cropping activities".* One respondent shared the European experience of energy crop production when grain commodity prices are low: "*The food industry in Europe was crying bloody murder, you know, when the biofuel time gets more introduced there. But the farmers will love it".* Similar rent-seeking behaviour appears to be present in the South African market as indicated by two respondents, "*in sugar and sugar prices are going [whistling], you know, down the drain and all the sugar producers are desperately looking for alternatives uses for their feedstock".* Two other respondents indicated "*If the sugar industry made a strong statement about biofuels being tend to new factory and cultivate new cane or additional cane then there's a different story".*

Productive linkages between the biofuels sector development to the agriculture-related social policies (agrarian reform and restitution social policies) was highlighted by three private institution informants, implying the potential as a market-based incentive to increase restituted and under-utilised land productivity. One respondent sums this up: *"We've been successfully transferring land but that land is not productive. I think the biofuels industry is an ideal tool, an ideal market, for restituted land."* One public stakeholder cautioned the use of communal land without guarantees, *"All those community dynamics also come into it. Where I think they need strong community institutional arrangements as well as involvement of the traditional leadership to make it a success".* One public institution respondent indicated that increasing the agriculture economic activities however did not build the social capital of the economy; *"It's almost like you are telling the children to be busy with an activity that's not going to… teach them anything, you're just keeping them busy and that's unfortunately a weak solution to our job problem that we have in SA."*

One respondent mentioned the negative social implication of the biofuels value chain, stating *"It's not all hunky dory, you know, when – so you have to really look at the whole like evaluating when you're looking at benefits of these projects and even if the upstream – the story might be – might look nice, but you have to look at what's happened downstream as well".* And *"I mean this project is also known for having displaced some communities for*

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having polluted some waterways for not paying… its employees...". One private institution informant stated: *"Farmers can be very opportunistic. I can just see one farmer selling to his black neighbour farmer and that guy getting a premium just because he happens to be black. Strange things happen. We want guys to produce and sell not just become traders".*

This sentiment was share by a public institution informant who stated the economic impact of narrowly focussing on one value chain, "*I'm saying it's like the milk situation, because it was once reported like that some years ago that there was this complaint – but we are saying that we don't want that kind of a thing. We don't want – there has to be a need to also look at the value chain with understanding that it doesn't mean that when you put the – when you implement the legislation and the policies that it's going to solve all the problems of the value chain at once. You'll find sometimes that one value chain is negatively affected and then one must revise … that is why you've got regular reviews of policies. It's to be able sometimes to deal with such matters without creating an unstable environment in terms of policy and legislation…We need to intervene somehow but at the same time the intervention must not be so much as to overly regulate the sector".* The value chain regulatory framework design therefore appeared to exhibit the need to incorporate the socio-economic scenarios on the proposed and existing industry behaviours, to reduce rent-seeking behaviours and attain fair and equitable gains along the value chain stakeholders.

4.18.1.3. Local Economic Development

All respondents indicated that employment opportunities would be created. The potential investors indicated that the majority of the jobs would be created in the agriculture sector, while one potential investor indicated 400 biofuels manufacturing jobs would created.

There appears to be discourse on the estimated agricultural jobs that would be created with the sector's development. There appears to be two dominant methods applied: "*According to international available data you need 0.1 worker per hectare, and the whole biofuel industry to fulfil these 400 000 tons need 1 million hectare to be planted so you can calculate how many additional workers needed. That's 100 000".* It appears the key assumption is that agriculture jobs will increase, however the level of mechanisation and feedstock yield rates are not indicated.

The other is based "*on the UN to develop a programme for SA and they looked at agro-processing and the number of jobs created. So back in 2003 I think it was, it was 18 jobs for every million turnover of an agro-processing enterprise because of the backward linkages in agriculture."* The estimation method is clearly linked to firm level productivity, as depicted by

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the informant. It also doesn't explicitly indicate whether biofuels production is included in the estimation. The other key informants indicated his disbelief at the estimated figure*, "I cannot believe those people. I think they're merely an (estimation) I cannot see how it can provide so much work".*

The increased employment opportunities through infrastructure development and biofuels investment in rural areas would be further entrenched through clustering. The transactional cost of transportation to energy crop producers appeared to increase the probability of development around the biofuels production investment. Factors that contribute to this behaviour are transactional costs and existing price zoning. One informant indicated the biofuels plant investment decision is based on price zoning, product demand and proximity to refinery blending capacity, "*the pricing structure and an inland bioproducer like Bothaville would be well positioned logistically to supply the reef, Johannesburg, which accounts for as much as 70% of fuel used in South Africa. It's a big user. Cradock would be seriously disadvantaged because in terms of the zoning… it would be in a lower price zone than Bothaville and it's disadvantaged by the distance. So the works price, if it's related to the zone, plus they still got to deliver it."*

Two private institution informants indicated that farmers are responsible for feedstock transportation costs, which was summed up by one informant who stated, "*Physically, the farmers will truck it in. They'll either truck it in themselves or they'll hire a transport company to transport the grain to them. So it will be straightforward truck to site or it will be truck to the nearest silo and then from there we'd have to arrange our own transport".* Moreover*, "the thing is, our pricing will be based on x-gate pricing so it's up to the farmer to be efficient in his transport produce. It's easier for us to set the price at factory gate price. So if you're fortunate enough to be in the Bothaville area then great, you can supply through us and your transport costs are low, but if you're based in KZN it wouldn't be economically viable to have road transport to biofuels depots in the Free State. So if you set deferring prices it does cause (arbitrage) issues you try to avoid".* The avoidance of higher transactional cost would therefore increase the local employment and secondary demand.

The reduction of potential investors reduces the local economic development and employment opportunities. While all respondents indicated investment in rural areas would result in employment opportunities, this is best illustrated by a respondent who indicated*, "If one had to suddenly spend close on 2 ½ billion rand building a factory you will get knock-on effects in the local economy. You could call it the Sasolburg effect… Whether it's accommodation or restaurants supporting industries [you get] all of these great jobs. So it's a*

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capital injection in the rural economy". Another respondent builds more depth to this perspective by stating; *"You also obviously have housing and that relates to building of houses, so there'd be jobs for building. Those people will need electricity and water so you automatically have rural development to suppor*t…. *That's what I understand what rural development is; a whole periphery of supportive industries, but they are not big industries".* The investment would therefore aid in rural communities' increased accessed to social and economic infrastructure, while increasing local capital formation.

In summary, there are numerous factors and debates to take into consideration when examining the latent potential of the sector. Key informants indicated most of the desired social and economic benefits that could be achieved, such as rural development through capital-intensive investment and productive linkages into the local rural economy. A whole systems approach is required to manage the nuances between existing and potential value chains. The institutional capacity and arrangements would therefore be paramount to ensure delivery of the proposed biofuels value chain to attain the espoused benefits, while mitigating the negative effects.

4.19. Proposition Two: Institutional capabilities to execute

The intent of this proposition was to gain key informants' insights into the institutional arrangements that contribute to the execution of the biofuels sector development. Subsequently, the hurdles and supporting frameworks to the delivery of the biofuels value chain insights were investigated.

The evidence revealed three consistent institutional capacity matters that impact the development of the biofuels value chain, namely institutional engagement structures impact on relationships and supporting policies. These themes and subthemes are provided in the table below.

Table 10: Phase Two: Proposition Two Results

Theme	Subthemes
1. Barriers	1.1. Competency 1.2. Bureaucracy 1.3. Leadership
2. Institutional Arrangements	2.1. Representation 2.2. Private Public Consultation Framework 2.3. Relationships Management
3. Supporting Policies	3.1. Bills 3.2. Existing frameworks

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4.19.1.1. Barriers to Industry Development

One informant encapsulates the disconnect between the policy development and implementation as; *"Someone wisely said that if South Africa had to participate in the Olympic race for policies we'd win a gold medal. If they had to look at events and implementation we wouldn't even qualify".*

There was general consensus on the barriers to implementing the biofuels strategy. Two informants indicated that technical competency was a barrier; one responded encapsulates the capability barrier by stating, "*There is a lack of expertise – government. There is laziness. There is definitely a conflict between different departments".* One informant indicated, "*Right now the cabinet is reshuffled, that's like our biggest nightmare. If cabinet is reshuffled yet again we get a new minister of energy. Biofuels will be stuck around for at least another two or three years. It's going to be the same thing. The new minister would want to explore and examine XYZ and that just means time"*.

The changes in leadership appear to impact the allocation of resources and priorities. Four respondents implied and explicitly stated that leadership commitment was needed, as denoted by one respondent: *"We need the leadership before we have the institutional capabilities. We need to have the vision. So we've got to get somebody who actually cares for the country in the leadership position. Somebody who cares for his people and actually understands what it takes to be a political leader. A political leader of the country is the person who removes the obstacles in front of these farmers so that they can do their work in order to make the economic conditions in the country better for workers and for all the people of the country. They remove the obstacles; they make it possible for all the people and all the processes in the country to work. That's what the biggest leader does".*

4.19.1.2. Institutional Arrangements

This theme comprises of arguments that the multiple stakeholder engagement structures, stakeholder representation and the minimal impact provincial government have in petitioning national government for the development of the sector. The institutional structure that is aimed at ensuring alignment across the value chain is explicitly mentioned in the Biofuels Position paper. The key informants provided invaluable insight into the structural arrangements of the consultative structure and how it operates, recent developments and their experiences with the engagement forums.

Collaboration along the desired biofuels value chain required governmental departments to align resources. As one public institution informant stated: "*maybe we should come when*

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everything has been [finished] up because [they] (Department of Energy) are actually the recipient of this whole thing and the main benefits should go to the agricultural sector. But from the point of view that this gets into the fuel pool which is the energy for transportation in the country, that's where then (they) come in. There has also been a need to have an inter-departmental task team because you need to look at the various segments of the value chain, which then requires a multi-stakeholder. And by the way we do have a BTT but there was also a biofuels implementation committee".

Four informants inferred that the private public consultative framework, namely the Biofuels Task Team and Biofuels Implementation Committee, were inefficient and ineffective. Bureaucracy was most often cited as a barrier to the sector's development. The Biofuels Task Team was established in 2003; however there appears to be no consistent understanding of the representation within this committee. A public institution key informant indicated the intergovernmental representation at the Biofuels Task Team (BTT) by stating, *"I'll say that the departments that are current – mainly, in the economic, infrastructure, you know, development cluster involved. We've got the Department of Energy, we've got the Department of Trade and Industry, we've got the Department of Water and Sanitation, Department of Agriculture, Forestry and Fisheries. We've got the road development there, we've got the Presidency there, you've got the Economic Development department, you've got business – small business development being there. We've got the Department of Public Enterprises; we've got Department of Science and Technology. We've got Department of Environmental Affairs and then some other department …they're also, they are engaged".*

Other respondents stated, "*I don't know what they discuss at the biofuel task team and I don't know the members there, but I only know that there is no representative of the industry participant at the biofuel task team*." Another indicated some understanding of the multiple governmental departments involvement as, "*Things at national level is not just the department of energy. If it sounds like I'm accusing them of being slack, I am a little, but it's not just them. It's because there's a subsidy component that includes National Treasury. Because there's an economic development component it involves EDD, The Economic Development Department and because it involves taxes, it involves SARS. But there's actually a biofuels task team that has multiple departments involved in it. That's where I think it's actually been stalling because when you've got more than five people in a room, trying to get them to agree on something very difficult. Each department has at least three representatives, each one has to contribute to the discussion. I use the word contribute very loosely, and that is, I suspect, is what's resulted in this program being very drawn out… I think a lot of new people are coming in and then they've got new ideas and then again they*

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haven't walked as far, they don't realise these new ideas have actually hashed them. Either buried or supported ten years ago, it shouldn't be happening".

An industry association informant indicated the expansion of the consultative framework prior to the development of the Biofuels Position Paper; stating "*Okay the BTT is strictly government and I tried in earlier years to say let me participate. Help. 'Don't because we know better' and then it was about the first quarter of last year, Department of Energy thought that the – remember they'd already published the position paper – they thought that the introduction of biofuels would be imminent and then they at long last decided to involve industry. So the biofuel (task team was) to do that, they contacted many people and said please, If you want to participate in the biofuels implementation committee. So the pick consists of: Department of Energy, representatives and industry representatives and then group that whole committee devolved into 8 sub-committees, because at our very first meeting we said look, 'what needs to be addressed?' So the first one was the feedstock committee. Another one was the pricing committee. Another one was called a production committee. Another one was logistics. Another one was taxes. Another one was legal. And then I was elected chairperson of the tax committee-fuel taxes and given responsibility also for handling legal. So then these sub-committees would meet and try and address their individual problems and there were minutes' issues, etc. Do you know who SAPIA is? SAPIA withdrew from BIC and then took legal opinion as to whether they could participate or not and I heard that they could, but whether any meetings have taken place or not since, I don't know, because I finished my tax sub-committee work and issued the final report".* Three other participants indicated SAPIA's withdrawal of the BIC.

Industry associations and potential investors (four informants) articulated their frustration with the slow pace of the delays in finalising the regulatory framework. This is encapsulated by one respondent indicating, "*the regulation would be published mid-2014, the end 2014, the beginning 2015, the mid-2015 and now we have nearly October, and as you probably know in two days the law comes into effect without any planning regulation in place".* A public institution key informant indicated *"the process also department now they are in the committee levels now leading to cabinet. …. So it's that kind of a situation which is very uncomfortable".* The experience is supported by another informant's statement: "*There's just too many people trying to express an opinion and requiring that their needs be met and wanting their requirements brought into the regulation."*

Four private sector informants indicated bureaucracy as a hurdle for the sector's development. One private institution informant provides insight into structural consultation

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dynamics by stating that, *"There are some more things, but the first one is bureaucracy. The government formed a biofuels task team for BTT which consisted of a number of government departments, I don't even know how many, like... twelve. In this country government departments work independently of one another. Just to go back, I said twelve. I've seen a slide that lists eight of them by name but I know there are others who sit on the BTT who were not on that list that's why I'm guessing at twelve. So these departments work independently of one another and each one then has a little say. They express and opinion. So when one, the leading department is obviously the department of energy, when they make a proposal you have a number of comments and 'why' and 'if' and 'but' and then the proposals get rejected and then they have to be reworked. Now this happens all the way up, first of all initially between departments and then as it goes up there's an economic and development committee that sit at parliament and then it goes higher to I think an energy committee. Maybe it gets out there in the wrong order and eventually it gets to cabinet and there is also cabinet sub-committee".*

One respondent provides additional insight into the constituents represented in the BIC by stating, *"Oil companies, the prospective biofuel manufacturers, TRANSNET is involved as a logistic company...associations of these different companies, you know… associations for even the biofuels companies".* Emerging farmers and associations do not appear to be partaking in the process. When a public informant was explicitly asked on their participation, *he indicated that "…we've tried to get those...engaging them. But sometimes there are challenges in terms of engaging people. Sometimes it becomes too early maybe in the process. Sometimes you'll find that because the process stop/starts it becomes difficult."* However he also highlighted, *"But I do get people contacting me, people sending me email, I respond to them, engage with them. There are many things – you must also remember there are also meetings taking place on a bi-lateral basis. Where people will come and ask but where are we and all that – then we engage that. Some they say: I want to get involved in this business, how do I go about it? See, these are the challenges that you are facing. This is where we are, this is what we can do, this is what is in place – if they need to then we say go do your homework…here are the relevant documents".*

The government's internal focus on engagement and alignment prior to industry inclusion into the industry development process appeared to diminish the trust in the process. One informant questioned the intent of the BIC by stating: *"…and the BIC, this was nothing else than an excuse from government doing something. That was the petrol industry, the agribusiness industry, the biofuel industry participating but it was not an open honest*

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discussion, it was more or less meeting the government excuses for delays in the regulation".

Two participants implied that there was an inequitable representation and lobbying power in BIC. This was indicated by participants stating, "…*around 20 to 30 representatives of the petro-chemical industry were present, attending"* and *"Oh wait, we might be excluded from this (bundle) of opportunities. So they really got heavily involved and they lobbied and they've got a very very strong lobby, especially being based in Kwazulu-Natal. There are politics around Kwazulu-Natal that would support it. The sugar industry, in my mind, they disrupted the process. They are obviously welcome to participate, I think the issue I've got with the sugar industry is that their aim is to swing the export sugar and convert the export sugar to ethanol in South Africa".* Another informant indicated the effect of the lobbying efforts stating, *"Hang on, we should have a separate standard for sugar… [T]here was a lot of discussion with the department of energy and I believe an accommodation have been made whereby sugar would be permitted as a feedstock".*

A recent development appears to be the establishment of working subcommittees to address the practical challenges identified in the BIC. One respondent indicated the practice by stating, *"Remember anybody who was in the big BIC committee could attend any sub-committee, so I could have gone to the production or the pricing meetings and I did go to a couple. At this point I don't know whether they completed their work on pricing and logistics… What's happened is that those minutes were of internal meetings and are not published, so the work might have been completed and used by the Department of Energy to proceed to the next step. In other words, the work public committee would have said 'There's no major stumbling blocks, it can be done' a few 'buts'. Department of Energy would have said 'Okay, it's up to you guys to sort out the buts'… and then they proceed with the position paper and taking through to regulatory framework".*

The slow progress of the consultative structures appeared to have resulted in the provincial government petitioning the national government, indicated by one potential investor statement: *"The Free State provincial government, all they can do is lobby because something like incentive and liquid fuels price-setting comes from national. So it's not that easy for provincial to lobby oil IPAP to national. From Free State provincial, the Free State economic development they have very poor biofuels because the bioethanol project of Waterbul is dead. That's a R2.5 Billion investment so they want it to happen and it would support the agricultural constituency. To the degree that they can, they have been lobbying energy and trying to get them to move ahead. I guess they've done the best they can but it's*

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still out of their hands frankly". Provincial government is viewed at a weak-petitioning mechanism that evolved to *"a multifunctional approach, we tried to lobby from various angles, politically, provincially to do something".*

4.19.1.3. Supporting Policies

Three respondents specified the supporting policies that support the development of the biofuels sector. Existing policies that enable economic development and industrial policies were "*The New growth plan and IPAP".* One association informant indicated, "…*you've got this CO2 tax that's coming. You've got this gas emissions act or pollutions act. There's lots of legislation which tightens up on pollution where biofuels will assist in South Africa meeting that legislation. The very general thing is that if you look at all the legislation, the biofuels will assist in meeting many".* The pending carbon emission tax poses additional uncertainties to the petroleum industry, particularly Sasol. This was indicated by a public institution informant who stated; "*We in SA have been told that we pollute – that we contribute to a lot of the CO2 that is being produced in the world and it's been said that Sasolburg and Secunda is the point of the planet where we produce the purest CO2".*

There was no explicit mention of social specific polices such as BBBEE. Some respondents mentioned the social policy instruments when probed on them. It can be presumed that this requirement is inherently dealt with in the licensing requirements.

The biofuels industry value chain development requires configuration to national industrial and economic development policy commitments. One public institution respondent provided insight into the alignment process and structural arrangements: *"We don't have the framework approved yet …it's now going to cabinet but the committees – the clusters that, prior to cabinet, that need to deliberate on that… Outcomes 6, and … outcome 4 …So, you've got this challenge so, what do you do then? You engage with the industry, you engage with the leaders from out of the (producers)…to look at now the actual implementation. That is why I am saying to you that we are no longer featuring the oil companies that much is actually not true because now we are engaging them differently".* This may allude to the awareness in the representation challenges discussed previously.

4.20. Proposition Three: Biofuels Market Diversification

The purpose of the interview questions was to gain insight into stakeholders' perceptions of the inherent potential of the biofuels industry to attain further economic opportunities to contribute towards reducing the unemployment rate. The findings are captured in the below table.

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Table 11: Phase Two: Proposition Three Thematic Results

Theme	Primary Data Results
1. Existing Markets Diversification	1.1. Industrial Chemicals 1.2. Cooking oil 1.3. Airline industry 1.4. Mining sector 1.5. Agricultural waste to bioenergy
2. Product line Diversification	2.1. Biojet 2.2. Biogas 2.3. BioPlastics 2.4. Bioenergy feedstock
3. Technology	3.1. Second- Generation Technology 3.2. Co-production

One industry association informant indicated that the biofuels sector could aid in the increased electricity production and access of the poor to energy, stating*; "It's like anything, the more tools you have in the tool box, the more sustainable it is and the more diverse those tools are the better it is. So certainly, but I don't think the rural problems are going to be solved by any one method; it's going to have to be a whole diverse mix of methods. So yes, I think it's important to have clean capacity tools. Ethanol-gel is one of them; gas is another one, PNG. Biogas is more for electricity production than domestic use. But yes, I think (diversifying) all energy promotions".*

Another private institution informants mentioned product specific opportunities within the niche fuel segments, which extend within the existing value chain. He stated; "*And dependent of what kind of biofuel you produce you can diversify your production in different areas. You can produce, for example, biojet fuels, you can produce hydrogenated diesel for 100% usage, for example in the mines so that they have no sulphur or diesel available and can run the engines underground with the same specification as with diesel. You can do it with bio-ethanol, you can produce high-grade petrol for the aircraft industry, but there are different or quite a lot of possibilities from a chemical and physical perspective you can do with these 'crude product' biodiesel or bio-ethanol. So you can also cover the demand of the aircraft industry to blend or to use pure biofuels for their purposes, but it depends on the size of the plants, it depends on policy, it depends on how to structure a subsidising system best and, what has always been taken into account is that the moment you calculate the worst case scenario because crude oil prices will not drop further, so any development in the future regarding the biofuel business will it make it more profitable for government than it is at the moment".* Incentives and policy framework appear to influence the diversification potential.

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Firm level vertical diversification would however impact existing value chains. One key informant cautioned biofuels producing firms' vertical diversification efforts. He stated; "*One of the requirements for getting the subsidy is that 100% of your production must go into fuel… One of the criteria is that previously disadvantaged persons on underutilised land shall produce the ethanol from a new capacity. Those are the three things, which means that our current members cannot participate".* The proposed incentive structure would therefore exclude incentive recipients from diversifying into the industrial market. The industry association informant stated that the existing industrial market contributes "*R2 billion of foreign exchange products".*

He however conceded that the potential for vertical diversification would be dependent on cost competitiveness and the biofuels production (ethanol) stream. *"It would if it's economic. What would happen is, typically let's say Mabele Fuels at Bothaville, which is in the middle of the maize growing area, or the Sorghum plants. They would simply expand their distillery because the feedstock is in the same area. What would happen then is they logically just expand. And by the way, the petrol specifications can take up to E10, we are only looking at penetration of E2 at the moment. So there's plenty of room for such co-phases of the biofuel permit".*

The use of second-generation cellulose biofuels technology could offer existing and potential farmers and industrial ethanol producers the opportunity to diversify into the agriculture waste-to-energy market stream. One informant provided insight into the potential by stating: "*There's most definitely, but timewise it's a long way off in South Africa. In North America there are three or four plants on second generation and typically we will wait many years to check if they are successful, and any board would take the easy decision of going with first generation material. The strategy does not really cater for second generation because the strategy says 'jobs' and 'farmers'. What's been looked at is what's called stover… It's what's left over when you've taken the mielie out of the mielie plant. And the same with sugar cane, they only take the stalk, the leaves of the cellulose, so there's a lot of cellulose, which is going to be cheaper than farmers growing cellulose…. So first part of second generation would be waste product. Stover from maize industry and stalks and leaves from sugar cane. And sawdust from the sawmills and from the paper industry, when you make paper there's a lot of fine milky stuff".*

Second generation cellulose biofuels technology appeared to offer energy crop producers additional revenue generation opportunities. One respondent stated: "*You're going to buy sorghum at about R3 000 a ton whereas you could buy stover at only the logistics cost,*

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R100 a ton to move it from the field, okay there's some labour to pick it up, say R500 a ton. One would need to look at the logistics there and it might be possible then to make biofuels without subsidy, it might be economic. But then why call it biofuel? It could go into the industrial market…. in other words, if you took the cellulose you could probably get a higher price in the industrial market that you could get in the fuel market. Therefore you would try and enter the industrial market. But that would cause a price war because our producers can fall back on domestic pricing to be equal to their export price."

Based on respondents' inputs, there appears to be three existing value chains that would be impacted by biofuels value chain diversification. The ethanol production stream appeared to impact more existing value chains than biodiesel, namely consummate alcohol and industrial ethanol markets, while biodiesel would impact only the cooking oil market. Local consumers could benefit from the diversification of biofuels producers to existing industrial ethanol markets, which holds the potential to reduce the local prices of industrial ethanol, as stated by one informant: *"What I'm saying is domestic markets normally command a higher price than the export market. The paint industry that you talked about, half our current producers are supplying it and say the paint must be at a certain price, but their surplus they are exporting at a lower price. So if cellulose tries to attack the paint, producers can drop their price until it's equal to the export price".*

One private institution participant shared his industry experience whereby a local chemical firm exhibited interest in expanding their operations to develop high value products derived from bioethanol. He detailed: *"I think that will eventually be the case. I know for a fact that in Brazil there's BP technology that's using ethanol to produce ethylene which will in turn make high density polyethylene and low density polyethylene. In fact when I was at IDC someone from Safripol approached us with the technology, but even then with the high oil prices the economics didn't make sense because roughly half your ethanol will be used to make a ton of plastic, and if you look at the overall financials it didn't make a lot of sense. Especially now with the low oil price you've suddenly got very cheap feedstock from crude as well as gas because crude has a knock-on effect on actual gas in terms of price. It would be tough for ethanol to be cost competitive but in the very far future – 100 years down the line maybe, once the fossil fuels start getting very expensive, I do see ethanol becoming a bio-based feedstock for chemical and plastic manufacture."*

4.21. Triangulation of results

The analysis instrument enabled consolidation and increased reliability of the results, while also increasing the validity of the results. The outcome of the triangulation is indicated under

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each proposition. The frequency of semi-structured interviews is presented to highlight the dominance of the sub-themes identified. The diverse stakeholders and groups over the five-year period did not enable the frequency of calibration.

4.22. Proposition One: Triangulated results: inclusive economic development will result from biofuels industry development

The central themes for this analysis were outlined in the secondary data content analysis, while primary results provided depth to the findings demonstrated in phase one. While value chain productive linkages and local economic development were not explicitly highlighted within the secondary data results, it was aligned to the social inclusion polices' evidence that was found. These findings were incorporated into the theme of social inclusion policies.

Table 12: Proposition One: Triangulated Thematic Results

Theme		Subthemes
1. Incentives and Benefits	1.1. Horizontal industrial plan 1.2. Vertical Industrial Incentives 1.3. Industry Competitiveness	1.4. Pricing Framework and Investment Risk 1.5. Fiscal Linkages 1.6. Greenhouse Gasses debate 1.7. Second Generation Technology
2. Value Chain productive Linkages	2.1.1. Social Objectives Trade-off 2.2. By-Products impacts	2.3. Policy 2.4. Feedstock security 2.5. Land redistribution & tenure 2.6. BBBEE 2.7. Inter- and Intra-sectorial partnerships 2.8. Local Energy crop security and regional trade agreements
3. Local Economic Development	3.1. Agrarian Reform 3.2. Land Redistribution 3.3. Employment Opportunities	3.4. Clustering 3.5. Employment Opportunities 3.6. SMME's demand driven business 3.7. Rural Development

4.23. Proposition two: Institutional capacity to execute biofuels strategy

The results from both phases consistently revealed the institutional arrangements to support the implementation of the biofuels industry. The infrastructure constraints identified in phase one were not highlighted within the second data, however linkages to the pricing framework were identified. The transactional cost was elevated to be included in the pricing framework discussion under proposition one. It will therefore not be duplicated.

Table 13: Proposition Two: Triangulated Thematic Results

Theme	Secondary Data Results	Primary Data Results
4. Barriers	4.1. Liquid Fuels Infrastructure 4.2. Clustering 4.3. Transactional Cost	4.4. Competency 4.5. Bureaucracy 4.6. Leadership
5. Institutiona	5.1. Intergovernmental consultation	5.5. Representation

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l Arrangements	framework 5.2. Public Private partnerships framework 5.3. Outstanding Items and Delivery constraints 5.4. Rural local government capacity building	5.6. Private Public Consultation Framework 5.7. Relationships Management

4.24. Proposition three: Biofuels industry diversification potential

No evidence of diversification opportunities was found in phase one. The key informants' stated diversification opportunities are enabled by product and skills relatedness and are indicated below.

Table 14: Proposition Three: Triangulated Thematic Results

Theme	Secondary Data Results	Primary Data Results
6. Existing Markets Diversification	None cited	6.1. Industrial Chemicals 6.2. Cooking oil 6.3. Airline industry 6.4. Mining sector 6.5. Agricultural waste to bioenergy
7. Product line Diversification	None cited	7.1. Biojet 7.2. Biogas 7.3. BioPlastics 7.4. Bioenergy feedstock
8. Technology	None Cited	8.1. Second- Generation Technology 8.2. Co-production

4.25. Chapter Conclusion

The results indicated in both phase one and phase two indicate that the biofuels industry development requires an integrative systematic approach in understanding the dynamics of the regulatory framework development and supporting instruments. The protracted regulatory uncertainty had deterred potential investors, resulting in unintended consequences such as monopoly development in the bioethanol and biodiesel segments, subsequently reducing the social and economic benefits potential derived from the sector.

The prescription of first generation technology in the manufacturing process appears to be the source of the on-going food vs. fuel debate. The management of the scarce resources, such as land and water, could be reduced through the co-production of first- and second-generation technology. The impact of second-generation technology remains an outstanding item, therefore reducing the ability to gain insight into the potential to reduce the food vs energy debate. Informants had provided provisional insight into the latent potential of second- and third-generation technology.

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Furthermore, the linking of crude oil and grains and land-crops had clearly led to the review of the pricing framework, attributed to the low crude oil prices. The final outcome of the review is still pending, to the frustration to the two remaining commercial-scale investors and energy crop producers. An alternative perspective was offered by a prospective investor, which relies on the treatment of biofuels as an independent commodity based on international pricing.

Evidence suggests that the social development policy would be used through the introduction of emerging farmers into the energy market. It is deemed to be aiding in correcting the market failures that resulted from the land reform and redistribution social policies. The stimulation of rural agricultural activity would contribute towards economic participation opportunities, despite the varying models used to estimate the job opportunities. The manufacturing sector would however create limited full-time employment.

The capital investment into rural areas of the country would result in the attraction of small, micro and medium enterprises in secondary and peripheral industries that hold the ability to stimulate commercialising of rural development. The spillover effects thereof were indicated to include the increased access to social services infrastructure and job opportunities directly attributed to the investment, as well as indirect job opportunities in supporting industries such as construction, road logistics and public works stimulated by increased economic activity.

The delay in developing public-private partnerships to overcome sector-specific challenges appears to contribute to the lengthened delays in finalising the regulatory environment and addressing liquid fuels-specific infrastructure constraints. The inclusion of the private sector appeared to have mixed reactions, attributed to the delay itself and the over-representation of one stakeholder group. There was no explicit evidence of under-representing groups such as emerging farmer stakeholder groups, beyond organised agriculture presented by GrainSA.

A small number of participants were able to participate in the biofuels market diversification potential, therefore reducing the sample to four informants. The diversification into product line application through producer surplus could increase access to energy substitutes such as bioethanol gel, while diversification into existing markets could increase competition in market share, while simultaneously contributing towards reducing the trade balance deficit.

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5. CHAPTER SIX: DISCUSSION

5.1. Introduction

In this chapter the results of Chapter Five are compared to the reviewed literature in Chapter Two. The discussion of results is structured according to the propositions and sub-questions presented in Chapter Three. The top thematic results are discussed, and new insights emerged that adequately provide evidence that the biofuels industry development would result in inclusive economic development and market diversification.

5.2. Review of Research Objectives

The objective of the study was to understand the latent potential the South African biofuels sector may hold in localised economic development and participation opportunities. The purpose of this chapter is to discuss the triangulated findings of the propositions and questions stated in Chapter Three. The overarching research question was driven by the potential of the biofuels industrial cluster's ability to develop inclusive economic development.

The literate reviewed suggested limited research conducted on the biofuels' social and technology boundaries, and the changes in the fossil fuels' liquid fuels institutional capabilities evolution process required to incorporate biofuels, as well as the potential for biofuels producers to diversify into other high value strategic markets and products, through the use of technology.

This study found that a relationship between the biofuels industry prescription of first-generation technology is geared towards rural development through low technology sophisticated capital investment that increases the economic participation of the rural poor. The food vs. fuel debates continuation is attributed to the technology choice prescriptions of the biofuels industrial strategy. These prescriptions are however cost competitive in comparison to the maturity of the second and third-generation technology. Furthermore, the maturity of the technology enables higher socio-economic gains in comparison to the scientific-based requirements of specialised skills, limiting employment opportunities to the small pool of scarce and critical roles within the scientist community

The inter-sectorial linkages strengthen localised economic development, resulting in the absorption of the rural structurally unemployed into the agriculture and manufacturing sectors. The development of labour-intensive SMEs was embodied in the development of emerging farmers and cooperatives, and removed the personal circumstance barrier to enter the liquid fuels sector. Moreover, the productive linkages are reinforced through social economic transformation policies such as agrarian reform and BBBEE. The increase in

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average income of the rural poor, and increased demand for social infrastructure and services, therefore exhibited inclusive economic development potential.

The evidence indicated that the constraints in obtaining the social and economic benefits are however attributed to the draft policy regulatory framework that links commodity families and institutional capabilities to collaborate with all stakeholders consistently. Public-private partnerships were found to exhibit disproportionate stakeholder representation, while intergovernmental capabilities to manage the PPP and regulatory framework process was inefficient, which resulted in delays in finalising the legislative framework. Consequently, potential investors exited the proposed industry resulting in only two possible investors.

The asset-specificity of the existing liquid fuels infrastructure crowds-out the assimilation of biofuels products. Additional investment at refinery level is required to meet mandatory blending requirements, which is mitigated through incremental inclusion at depot level. Fossil fuel producers are excluded from the cost recovery mechanism incurred for investment. Energy crop and biofuels producers' transactional costs are recovered through the pricing mechanism. The inability to obtain agriculture sector representation in the sample, and limited biofuels producers, resulted in inconclusive evidence on the use of agglomeration and clustering to further reduce transactional cost.

Producer surplus and the use of second-generation technology potential to diversify into related high value markets and product lines was investigated to aid in strengthening localised economic development and increased employment opportunities. The evidence demonstrates that diversification opportunities exist for energy crops and biofuels producers. Biofuels producers' use of first- and second-generation technology co-production would enable them to operate in the biofuels industry and enter existing related markets, such as the industrial chemicals and cooking oil markets, while product-specific uses can be used to enter industries such as the airline and mining industries.

Biofuels producers' co-production would create a market for the energy crop producers and related agricultural waste. Consequently, energy crop producers would be able reduce their transactional costs. Moreover, farmers would be able to enter the biomass energy market.

5.3. Results Discussion

5.4. Proposition One Discussion

The development of the Biofuels value chain development will result in inclusive economic development

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A systematic content analysis of triangulated results is indicated in **Table 12: Triangulations of Thematic Results**. There is a range of social and economic policies and instruments demonstrated in the evidence. Discussed below are the core themes that emerged during the analysis of this proposition.

5.4.1. Economic Development

5.4.1.1.1. Biofuels Industrial Policy

The primary objective of the biofuels industry development is "*bridging the first and second economy*", namely the agriculture and manufacturing sectors. This implies productive linkages between the sectors, based on the agriculture energy crops used in the production of biofuels. This is aligned to Saad-Falio's (2013) proposition that manufacturing pulls other sectors of the economy. The agro-processing focus through the use of low sophisticated first-generation technology would therefore increase the demand for grain and land-based crops identified to mitigate the food security concerns. The focus on two sectors that exhibit the potential to absorb the rural unemployed through tradable goods is consistent to the recommendations of Lin & Rosenblatt (2012), Saad-Filho (2013) and Saadi (2012) to increase the productive structure of the country.

The secondary stated objective is to "*integrate historically disadvantage farming into mainstream agriculture and energy economies"*. The two target markets explicitly epitomise the dichotomy of the production for fuel or food security debates. The first-generation technology chosen to support inter-sectorial linkages appears to be consistent to respondents' statements that the biofuels industrial strategy is an agriculture-led industrialisation strategy, similar to the USA. This is consistent to Lin's (2011) use of technology choice as being a proxy for industry policy, it is therefore deduced that biofuels industry development is based on the agriculture-led industrialisation.

The technology prescriptions appear to be the root cause of the on-going debates relating to the use of scarce resources such as land and water. Consequently, the conflicting priorities as demonstrated by the food security concerns in comparison to the promotion of producing energy crops. It is also explicitly stated that under-utilised land will be used to produce the prescribed energy crops. The criteria, however, for determining under-utilised land are not explicitly stated. There appears to be conflicting priorities regarding what is deemed to be under-utilised land. Local communities' social values and subsistence use of the land needs to be formally incorporated into the biofuels feedstock security discussion. Furthermore, the impact of mining sector-designated land needs to be incorporated into the debate. This is

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consistent to Kepe et al. (2014) and Nasterlack et al., (2014) findings that indicated land ownership, use and control holds social meaning and signifies identity and power (Kepe & Tessaro, 2014, p. 272).

Land, water and labour are core factor endowments required for the sector. The biofuels regulatory framework is targeting investment towards the factor endowments, in previous homelands, through geographic prescription. The concentration of four of the eight biofuels licence applicants in the Eastern Cape indicates that the province holds a comparative advantage in biofuels production (Brent, 2014; Energy, 2014). Pradhan & Mbohwa (2014) recommend that feedstock selection should reflect different climate, soil types and water demand. This is coherent to the recommendations by Lin (2011) and Torres-Fuchslocher (2010). The reviewed literature does not provide guidance on regions or provincial comparative advantage-following strategies. It is however deduced that the development of regional agro-processing regions would contribute towards the increase in national total factor productivity. Furthermore, the increased use of labour-intensive capital advantage strategies therefore holds the possibility of reducing the structural unemployment created by comparative advantage-defying strategies.

5.4.1.1.2. Incentives

A basket of incentives is available for the promotion of new commercial-scale biofuels investment. The findings suggest that finalisation of the regulatory framework is required to ensure reasonable pricing of produce along the value chain. The incentives available to stimulate investment are consistent to global practices (Costantini et al., 2015). The evidence indicated that the existences of mandatory blending regulations are demand-side policies to generate the demand and linkages between the biofuels producers and petroleum sector. The absence of the price-based instrument could lead to arbitrage, as articulated by informants.

The extraction of rents from petroleum firms would result in gains to the established small-scale producers and industrial chemicals market players. While the literature indicates that small-scale producers are typically used for own consumption and local markets. The product relatedness of industrial chemicals to bioethanol would allow easier market swopping. It is therefore deduced that the possibility thereof would be predominately within the bioethanol market.

The pricing framework is based on the Hirschman's inter-sectorial linkages (1981, cited in Morris, Kaplinsky, & Kaplan, 2012), which consequently resulted in the linking of two

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commodity families, namely soft commodities and energy commodities (Morris, Kaplinsky, & Kaplan, 2011, p. 8). Grains and land crops are not defined as commodities by Morris et al. (2011), while IPAP was indicated by social partners statements to *"signal the seriousness of the government about a comprehensive industrialisation and employment strategy…. a number of crops that were seen to benefit industrialisation, such as sugar cane, sugar beet, maize, sweet sorghum, cotton, canola, soya beans, and hemp".* The integration into the industrial application as discussed however warrants the classification as a soft commodity (Morris et al., 2011).

This deduction is presented in **Table 12: Triangulation of Thematic Results**. Consequently it appears to have increased the volatility of the subsidies required by National Treasury. The concerns on the fiscus were explicitly highlighted by, "*National Treasury was involved in an exercise to understand, based on the slow recovery of the global oil price, whether or not a compulsory upliftment for ethanol and biodiesel could be supported at the existing and estimated prices for petrol and diesel*" (https://pmg.org.za/committee-meeting/21230/). While Bell, Silalertruksa, Gheewala, & Kamens, 2011) suggest that the increased subsitution of fossil-fuel energy would positively impact the trade balance, the evidence however suggest that the fiscus would be impacted negatively. The reduction and increased fluctuation in the national budget would impede the resources available to deploy in other activities.

The evidence indicated vertical incentives available to biofuels producers and redistributed land recipients. There is no conclusive evidence that biofuels crop producers will be incentivised beyond the draft pricing framework. The manufacturing-specific directed incentives are aligned to the IPAP. This is consistent to the deductions made by relating vertical resource-based industrial policies by Lazzarini, (2015) and Neffke & Henning (2014). The practice of incentivising one sector within a horizontal value chain, however, does not aid a holistic enabling environment by excluding upstream and downstream shareholders. It is also inconsistent to the OECD recommendation of offering incentives along the value chain, as indicated in Figure 3, named biofuels value chain and incentives.

The exclusion of the downstream oil firms from the subsidies available is inhibiting the investment in blending infrastructure. It is possible that this may have resulted in the incremental approach to blending infrastructure. This point is discussed in more depth under proposition two, under the heading liquid fuels infrastructure. As the lead commodity sector, the infrastructure specificity does not enable backward linkages as required by biofuels firms. This is aligned to Morris et al. (2012).

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The prolonged delays appear to have resulted in the decline in potential investment into the industry. Investment institutions are withholding funding required to commission the manufacturing facilities, consequently stifling required infrastructure investment into blending facilities to accommodate the new renewable product. The delays in capital formation are inhibiting much needed economic participation opportunities. The negative impact for potential investment in this sector is the decline in value of the initially anticipated investment by local investors. Factors such as the Rand depreciation and low interest rates may have informed the exit of six potential investors. Existing firms, however, and foreign national investors may have these factors work in their favour, increasing the value of the investment secured. All firms incurred sunk costs during the nine years since the promulgation of the Biofuels Strategy (Department of Minerals and Energy, 2007). This deduction is consistent with Voegele's (2013) conclusion.

The inability to deploy the funding secured into physical productive assets is negatively inhibiting the development of rural areas. The finalisation of the regulatory framework is required to stimulate local economic development and the demand for energy crops. Moreover, pricing framework certainty is required to ensure that value is created for biofuels industry shareholders. Additional delays in the regulatory framework could result in the remaining investors' deciding to focus on export of biofuels products to recover sunk costs, and to use the factors of production to obtain global biofuels market share. The biofuels production investment, without an established fiscal linkage, particularly of foreign investment, holds the potential that all financial benefits obtained would not necessarily return to the South Africa. The inter-sectorial linkage with the agriculture sector would still be developed, however the producers would not be restricted from competing with food production farmers. Furthermore, feedstock would not necessarily be sourced from emerging farmers, thus diminishing the potential to remove barriers for emerging farmers and cooperatives to enter the energy market. Employment opportunities would be created, however limited trade balance contributions would be made.

While the draft regulatory framework highlights is geared at incentivising investment into the industry, the economic impact on fuel cost drivers of industries such as road logistics firms (Viljoen, 2013) and on consumers was absent from the data and findings. The exclusion of consumers from the sample appears to impact the emergence of this theme. The increase in cost of fuel by approximately 6,5c per litre would increase the transportation cost on already cash-strapped consumers, impacting food prices and contributing towards food inflation, negatively affecting the economic affordability of food. This deduction is consistent with Brent (2014), Mohr et al (2013;) and Pradhan et al (2014a).

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It was however indicated that indirect benefits derived from the industry's development included the reduction of greenhouse gases and carbon emissions. These are related to the broader environmental and quality of living benefits. The increased demand for road logistics to transport the production inputs and biofuels to depots is however discounted from the argument of increased benefits. It was nevertheless highlighted that the reduction in carbon emissions would reduce respiratory health-related illnesses.

5.5. Social Inclusion Policies

5.5.1.1. Agrarian Reform and Land Redistribution

The discussion of the subtheme consisted of the triangulated results indicated in **Table 12: Triangulation of Thematic Results.** Agrarian reform was achieved through land redistribution to increase the agriculture activity. The decline in the agriculture productivity is attributed to the presence of the Dutch disease; namely the higher wages available in the mining sector.

The focus on emerging farmers is driven by "*broadening agricultural development*", highlighting that the underlying motivation of the biofuels industry development appears to be focussed on improving the productivity and employment opportunities in the low capital-intensive emerging farmers segment of the agriculture sector.

Evidence demonstrates the impact that the land redistribution process and policy has had on the agriculture sector's productivity decline. This results are consistent to the recent South African biofuels case study conducted by Nasterlack, von Blottnitz, & Wynberg (2014). The land redistribution policy exhibits similar traits as the pro-poor agriculture growth strategy (Andersson Djurfeldt, 2013a). The redistribution policy holds the potential to increase a broad-class of agriculture entrepreneurs. This could be achieved through the use of cooperatives, as achieved in Brazil (Stattman & Mol, 2014b). The redistributed land recipients have the choice to use the reallocated land productively through personal effort. An informant indicated that the biofuels industry can aid in increasing the productivity of land reform, stating, *"We've been successfully transferring land but that land is not productive. I think the biofuels industry is an ideal tool, an ideal market for restituted land".* The creation of the market and removal of barriers to gain access to the market though personal effort is aligned to the criteria of (Roemer, 2014) (more) for economic development.

Existing historically disadvantaged commercial farmers have both the means and the access to the agricultural markets. They have received the benefits of the agriculture sectors

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BBBEE (AgriBBEE) programmes. "*Grain South Africa has been instrumental in my mind in turning emerging farmers into full-on self-sufficient commercial farmers" a*nd state development programmes such as "*…CASP, which is a programme that is bringing this into the mainstream".* The draft regulatory policy is vague on how historically disadvantaged (HDI) commercial farmers will be dealt with when operating in the food production market. It is therefore presumed that developed HDI commercial food market producers will be using crop rotation to gain access to the energy market, to mitigate the risk of food security. This would increase the market size of 'new' emerging farmers, consequently increasing the demand of energy crops, as required by local biofuels producers.

The communication to the *new* land reform recipients needs to be done, providing the incumbents with the options for which market they would like to participate in. it would be the responsibility of the department of land reform and department of agricultures' area of accountability.

Furthermore, the inter-sectorial partnering with emerging farmers is mutually beneficial. Firstly, the evidence indicated that feedstock security is a concern. This is consistent to findings by Jumbe & Mkondiwa (2013) and Pradhan & Mbohwa (2014). In the semi-structured interviews there was potential for engagement with emerging farmers when the legislation was finalised, eluding to the aid in the development of co-operatives, a potential vehicle to development and for increasing emerging energy crop producers' market access: "*…predominantly black farmers, but from commercial farmers as well to fill that gap and, as an absolute worst case, if there's insufficient local supply, we'd have to import"*, therefore ensuring feedstock security. This is consistent to the practice in the biofuels market in Brazil (Brent, 2014; Stattman & Mol, 2014a)

Secondly, biofuels producers would gain BBBEE priority element points in enterprise and supplier development, while emerging farmers and cooperatives thereby gain market access. The Inter-sectorial linkages facilitated through the BBBEE instrument would create informal knowledge and capability sharing platforms. Crop-specific knowledge can be gained from programme development, as demonstrated by PhytoEnergy's Emerging Development Progamme.

Finally, the formalised inter-sectorial partnership facilitated through the BBBEE priority ownership element. Up to 40% equity shareholding in biofuels production firms is possible, therefore ensuring the producers attain feedstock security. The formalised relationship would also enable real-time communication of feedstock yields and volumes. It would therefore

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facilitate an increase in accurate information and allow improved co-ordination between the sectors and partners. The depth of the relationships would subsequently be increased beyond the reciprocal producer and consumer relationship, increasing the sustainability of the relationships.

Consequently, the increase in energy crop demand, technology and knowledge improvements attributed to the inter- and intra-sectorial development initiatives from the biofuels producers and DAFF, would lead to the ability for emerging farmers to upscale their production and use the equity shareholding as collateral for securing commercial bank funding. This is contrary to the BBBEE findings, which indicate that a narrow few will benefit (Juggernath et al., 2011; Patel & Graham, 2012); however, it is consistent to the desired outcome of increasing productive linkages (The Presidency, 2014; Oecd Economic Surveys South Africa, 2015, p. 74) that remove personal circumstance barriers which result in *good* inequality (Deng et al., 2013; Roemer, 2014). It is therefore argued that individuals use the market-based incentives to pursue personal economic benefits.

Communal land was identified under the category of underutilised land. One respondent indicated a model for equitable sharing of production gains. The proposed model for assurance of fair gain is premised on personal effort through the provision of monthly earnings, and transactional payment through dividends to shareholders based on use of the asset, namely the land. It therefore is aligned to Deng et al's (2013) hybrid model. Good inequality would thus emerge between land redistribution recipients. This is consistent to the literature reviewed (Deng et al., 2013; K. Lin & Chan, 2013; Roemer, 2014).

> *"And I would group, say, 100 of these small farmers into 1 big farm, big estate, they would own everything but would employ this guy that knows a lot about farming and they make him the manager of their crops and he works for them and he applies his knowledge and teaches the other people how to farm. If you farm on a bigger scale it's much easier to make a profit than on a small scale. You remove all the barriers between the small farms and make a big farm and have a collective ownership of that farm – like a trust. The ones who want to benefit just from sitting in the trust, they just sit in the trust and they get some benefit from their dividends. The others who want to sit in the trust but also want to work on the farm, they get a salary for working on the farm and for sitting in the trust. Those who want to sit in the trust and work on the farm and do a management job as well on the farm that would have workers who report to them so they accept more*

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responsibility, they get a higher salary from the farm and from sitting in the trust value. So that's the way you could get that sort of thing – the people who benefit from the land that they got, they do not benefit from that without really having in-depth knowledge of farming. And of course they've got to pay this guy who is managing everything for them because they don't have that knowledge, but in the meantime they are getting this knowledge. Knowledge transfer will take place from him to them and to their children because owners are now growing up there. And if you now make it an attractive place to be, the children won't leave for the city, they will stay there."

5.5.1.2. Rural Economic Development

The rural developmental agenda is coherent with the National Growth Path outcome seven of "*vibrant, equitable, sustainable rural communities contributing towards food security for all*". It however conflicts with the desire to develop the biofuels industry, which is based on the evidence that exhibits the inherent conflict in priorities.

The capital investment into rural areas of the country would result in attraction of small, micro and medium enterprises in secondary and peripheral industries that hold the ability to stimulate commercialising of rural development. *"You also obviously have housing and that relates to building of houses, so there'd be jobs for building. Those people will need electricity and water so you automatically have rural development to suppor*t…. *That's what I understand what rural development is; a whole periphery of supportive industries, but they are not big industries"*

The investment into rural areas would increase the economic activity at provincial level. The municipality would therefore increase its revenue stream through fiscal linkage instruments such as property tax and consumption linkages through the use of infrastructure. The increase in revenue generated can be used to increase accessibility to social service infrastructure such as electricity, water and sanitation, and education. The cost of upgrading existing infrastructure would be reduced when co-ordinated with the biofuels production investment, which requires these infrastructures to operate. This is consistent to Lin's (2012b) statements that the focussed tangible infrastructure development and upgrade would be reduced in cost through economics of scale investment. It can therefore be deduced that spatial under-development and increased service delivery would be addressed. Consequently, there would be an increase in social stability through reduction in service delivery protests (Department of Labour, 2014).

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The attraction of foreign investment into rural areas will provide a localised dual economic structure. This deduction is consistent to the attributes provided by Vollrath's (2009) national dual economic structures. The targeted localised productive investment, however, would enable regional biofuels value chain specialisation to develop. This targeted development is aligned to Ricardian and Hecksher-Ohlin's (H-O) theories of specialisation (Morrow, 2010). The Ricardian and H-O theories however do not discuss the intra-country, provincial specialisation impact on internal trade. Nevertheless consistency is found for the regional specialisation recommendations of Boschma, Minondo, & Navarro, (2013), Naudé, Bosker, & Matthee (2010) and Singh (2011) to increase economic growth. It is therefore deduced that the provincial labour participation rate would increase, positively contributing towards the increase in national labour force participation rate (LFPR). The fiscal gains through tax would thus increase from the increase in the corporate and personal tax base.

5.5.1.3. Employment Opportunities

The results indicate that employment opportunities would be created, which is presupposed on the biofuels manufacturing investment. The data indicates that direct employment and indirect employment opportunities will be created. The estimation method varies according to stakeholders; therefore no clear estimation can be made. Direct employment would be created in the agriculture and manufacturing sectors, while indirect employment opportunities would be created in the logistics sector, attributed to the increase in demand for inputs into the production sector such as fertilizer, and by the transport of energy crops and finished products to the blending facilities. Moreover, there would be an increased demand for social infrastructure development such as electricity, water and sanitation and roads construction.

The accumulation of assets, via financial services institutions, would increase the demand in insurance products. Supporting services industries such as the agriculture insurance segment would create additional employment opportunities. This may be in the form of independent brokers associated with insurance houses. Alternatively, large insurance firms could employ marketers. This is consistent to Nijaki's (2013) statement that employment opportunities will be development due to economic development.

At municipal level, there would be an increased need for public works employment and opportunities. These employment opportunities are consistent to Chang et al's (2013) productivitst social development model that is managed by macroeconomic institutions such as labour market regulations and institutions. The employment opportunities of supporting

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industries are governed by sector-specific BBBEE codes, sectorial determination and national labour regulation requirements.

The draft regulatory framework explicitly prescribes the representation of the agriculture and manufacturing sectors. In the agriculture sector, this would be by biofuels producers, which appear to be aimed at an indirect means of regulating the agricultural labour patterns. The biofuels manufacturing sectors are to regulate the employment patterns in the agriculture sector, as indicated in the prescription that 70% are to be South African citizens attained by certification. This prescription appears to be an attempt to correct institutional failures in the agriculture sector created by the increase in the minimum wages of farm workers, which resulted in the employment of foreign nationals from neighbouring countries. This prescribed practice is coherent to the Brazilian social seal certification process.

The existing labour market dynamics inherently hold the potential to decline the labour absorption rate for emerging farmers as they scale-up their operations. The reduction in marginal productive gains from increased employment would result in increased mechanisation. This deduction is consistent to the findings of Nasterlack, von Blottnitz, & Wynberg (2014). The use of capital in farming activities is, however, dependent on the energy crop produced.

5.5.2. Conclusion

The multi-level and systematic co-ordination of rural development, inter-sectorial productive linkages, and increased direct and indirect employment opportunities, supported by the social and transformation BBBEE policy, can be concluded to conform to recommendations of removing barriers of personal circumstance and promotion of personal effort (Deng et al., 2013; Kozuka, 2014; Lin & Chan, 2013; Roemer, 2014). Furthermore, while biofuels manufacturing facilities in rural areas are the pivotal criteria to stimulate demand for locally produced energy crops, so too are the land redistribution policies to enable emerging farmers and cooperatives to gain the means to access the growing of energy crops.

The discussions above indicate that the evidence of inclusive development, as defined by Kozuka (2014), will occur. The pro-poor agriculture-led strategy would increase direct and indirect employment opportunities along the value chain. The focussed removal of energy market entry barriers and focus on productive gains attained through personal effort of under-represented groups would result in the increase in average income of those disadvantaged by circumstance such as living in rural areas. On the other hand, individuals and, by extension, communal trusts and cooperatives' members who decide not to enter

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either the agriculture or energy crop production opportunities would be disadvantaged from productive gains of personal effort.

The linking of economic development through rural development has the potential to expand access and quality of basic infrastructure and services-related infrastructure to the poor. The existence of both economic and inclusive development would therefore result in inclusive economic development. Inclusive economic growth would be the outcome of the implementation of the inclusive economic development.

5.6. Proposition Two: Discussion

The existing institutional arrangements would shift to incorporate the introduction of liquid biofuels.

The evidence revealed three consistent institutional capacity matters that impact the development of the biofuels value chain; namely institutional engagement structures, infrastructure specificity and pending supporting legislation. The triangulated results are available in **Table 12: Triangulated Thematic Results.**

> *"Someone wisely said that if South Africa had to participate in the Olympic race for policies we'd win a gold medal. If they had to look at event and implementation we wouldn't even qualify". (**Private institution informant)***

5.6.1. Institutional Arrangements

The legitimacy of the biofuels policy requires capabilities and hard infrastructure (Lin, 2011; Morris et al., 2012; Rodrik, 2004). Key informants have indicated behavioural capabilities and stakeholder consultation process-related concerns, which undermine the legitimacy of the draft regulatory framework. Bureaucracy was consistently found to a barrier to developing the industry; the evidence provided to support their bureaucratic experiences was related to the intergovernmental task team, and delays in finalising the policy framework.

The triangulated results indicate that there are fourteen departmental representatives serving in the intergovernmental task team. Respondents were uncertain about what is discussed within the structure. The secondary data evidence indicated the governmental role-players in providing different services and aligning sectorial-specific requirements before engaging with external stakeholders.

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> *"The process is with the department now and they are in the committee levels now leading to cabinet. …. So it's that kind of a situation which is very uncomfortable".* The experience is supported by another informant's statement: "*There's just too many people trying to express an opinion and requiring that their needs be met and wanting their requirements brought into the regulation." (**Public institution informant)***

The development of a horizontal co-ordinating structure is consistent to Morris et al. (2012) and Rodrik's (2004) recommendation for creating an enabling environment. The literature however does not guide the number of representatives involved within one stakeholder group. (Favretto, Stringer, & Dougill, 2015, p.39) established that there were five ministerial and central technical departments involved in the development and execution of the Malian biofuels policy. It therefore appears that the South African national government's co-ordination forum is disproportionate. It was deduced that the broad scope of the BTT is inhibiting the required focus and resource co-ordination required to develop the sector.

> *"There are some more things, but the first one is bureaucracy. The government formed a biofuels task team for BTT which consisted of a number of government departments, I don't even know how many, like... twelve. In this country government departments work independently of one another. Just to go back, I said twelve. I've seen a slide that lists eight of them by name but I know there are others who sit on the BTT who were not on that list, that's why I'm guessing at twelve. So these departments work independently of one another and each one then has a little say. They express and opinion. So when one, the leading department is obviously the Department of Energy, when they make a proposal you have a number of comments and 'why' and 'if' and 'but' and then the proposals get rejected and then they have to be reworked. Now this happens all the way up, first of all initially between departments and then, as it goes up, there's an economic and development committee that sits in parliament and then it goes higher to I think an energy committee. Maybe it gets out there in the wrong order and eventually it gets to cabinet and there is also a cabinet sub-committee."* **(Private Association Institution Informant)**

The evidence indicates that the Biofuels Implementation committee (BIC) was established in August 2013, as a Public-Private Partnership forum. The establishment of this engagement forum is consistent with (Jumbe & Mkondiwa, 2013; Lin, 2011; Morris et al., 2012; Rodrik,

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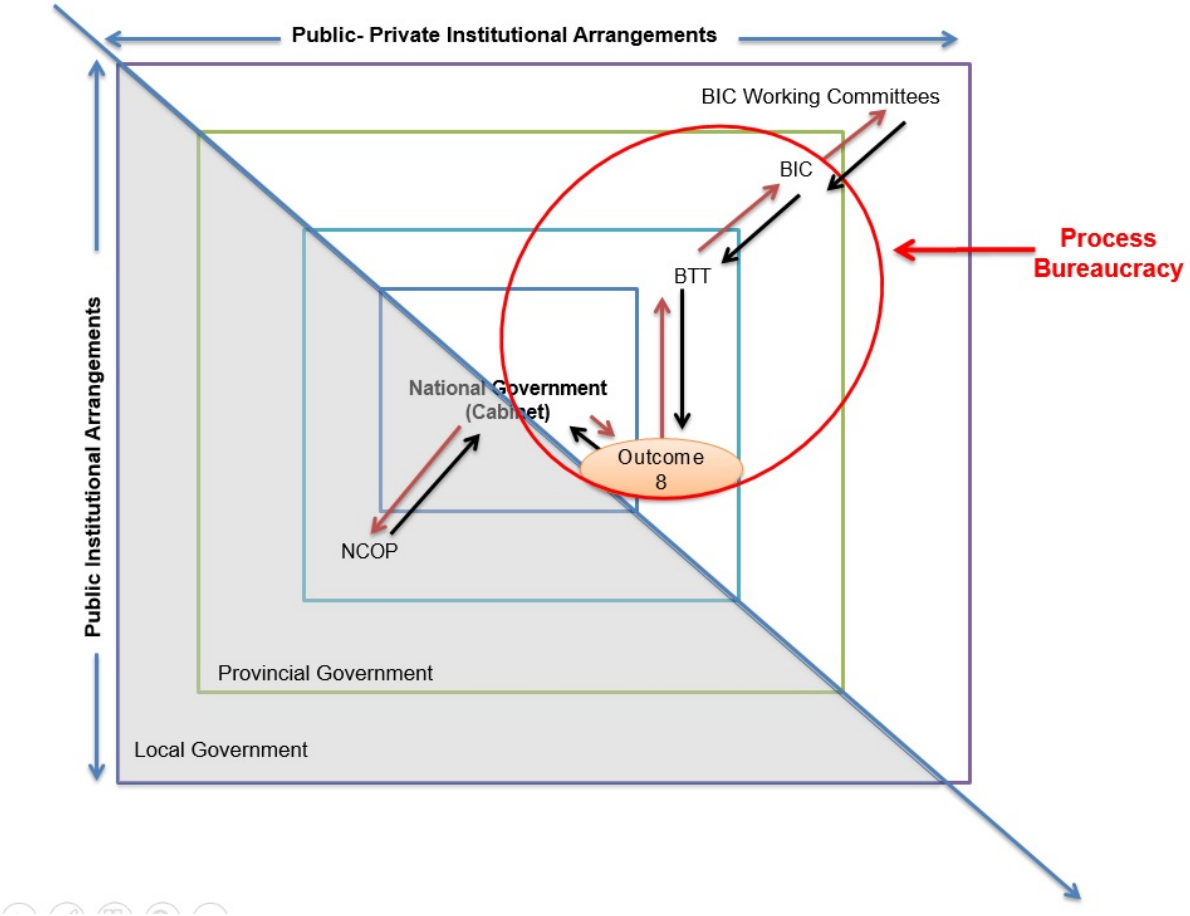
2010; Torres-Fuchslocher, 2010), all of whom agree on the importance on PPP in policy development and implementation. The evidence of the private sector's efficiency is demonstrated by the shift delivery of the draft regulatory policy, which was published for comment in February 2014. Functional targeted working committees were established to address the pragmatic concerns of all stakeholders. The biofuels development framework is indicated in the figure below.

The biofuels regulatory bill would be the final outcome of the consultation process depicted below, Figure 14. In developing the legislated act, further deliberation is required to with the public and next tier of government, namely consultation and approval with the National Council of Provinces before the President signs it into effect.

Figure 9: Biofuels Industry Development Institutional Arrangements



The institutional arrangement is aimed at supporting the national development of the biofuels sector. However, unlike Mali (Favretto et al., 2015), South Africa has not integrated non-governmental and international donor agencies into the consultation framework, despite the

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indirect alignment to international carbon emission and socio-economic developmental goals such as the Millennium development goals and COP.

Leadership is perceived as the core requirement to mitigate the institutional bureaucracy constraints. The evidence highlighted that resources were allocated through the development of the intergovernmental and PPP framework. This is consistent to the observation of (Favretto et al., 2015).

5.6.2. Infrastructure

The triangulated results indicated that concerns related to the aging liquid infrastructure were only highlighted within the secondary data findings. Respondents did not explicitly define infrastructure as a priority barrier. Applying a narrow definition of institutional capabilities results in the investigation of the leadership of the departments leading the biofuels sector regulatory framework. The Department of Energy (DoE) regulates liquid fuels infrastructure and marketing of the refining industry (biofuels and petroleum); refer to **Table 8: Intergovernmental departmental Mandate in Biofuels Value Chain.** This proposition assumes that the biofuels industry is a renewable energy product that is being introduced into the fossil fuels' liquid fuels industry. The evidence indicates that the source of the liquid fuels was disregarded, and that it is instead focussed on transportation fuel application. The incorporation of the product use therefore requires the constituency expansion to include the renewable liquid fuels (biofuels) industry, as stated by Boschma, Minondo, & Navarro (2013), in development of new industries. It is deduced that three constituency groups, namely fossil fuels and two segments of the renewable liquid fuels (new commercial-scale investment and sugar industry) producers and interests need to be aligned to ensure institutional coherence. It appears that alignment has not been fully achieved within the BIC, as stated below:

> This was indicated by participants stating, "*around 20 to 30 representatives of the petro-chemical industry were present, attending"* and, *"'Oh wait, we might be excluded from this (bundle) of opportunities.' So they really got heavily involved and they lobbied and they've got a very very strong lobby, especially being based in Kwazulu-Natal. There are politics around Kwazulu-Natal that would support them. The sugar industry, in my mind, they disrupted the process. They are obviously welcome to participate… I think the issue I've got with the sugar industry is that their aim is to swing the export sugar and convert the export sugar to ethanol in South Africa".* Another informant indicated the effect of the lobbying efforts, stating, *"Hang on, we should have a separate standard for*

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> *sugar… and there was a lot of discussion with the Department of Energy and I believe an accommodation has been made whereby sugar would be permitted as a feedstock".*

The representation and influence of established constituents (petroleum and sugar industry) within the DoE liquid fuels segment needs to be addressed to attain legitimacy from stakeholders. The literature reviewed, however, does not provide recommendations of how to manage the process to integrate relative divergent interests towards achieving a unified liquid fuels strategy which demonstrates that all interests are balanced.

The liquid fuels infrastructure asset-specificity requires additional investment from petrochemical companies; cost-recovery mechanism are however not to ensure "*cost neutral*" operations. Private institutions' respondents did not highlight infrastructure availability as a constraint:

> *"They (petrochemical companies) will only commence infrastructure implementation once biofuel manufacturing facilities commence construction. Which is the rational thing to do. There's no need to spend cash when there's no supply".* **(Private Institution Respondent)**

Furthermore, the potential locations of biofuels production facilities are in relatively close proximity to petroleum producers and blending facilities. The relative proximity to blending facilities reduces producers' transactional cost. In addition, petroleum producers are to bear the cost of infrastructure investment. However, emerging farmers would carry the transportation costs to the producers' silos, compensated in the pricing framework as discussed above. The uneven allocation of incentives, which are not aligned to the OECD (2013) recommendations as indicated in **Figure 3: Biofuels Value Chain and Incentives**, holds potential to create resentment on behalf of existing stakeholders, particularly the petroleum industry.

The evidence indicates that the DoE drives the industry development, with support from the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Trade and Industry (DTI), while the DAFF also supports the agriculture sector, particularly emerging farmers and land redistribution recipients with financial assistance and CASP. However, in the context of the derived conclusion of proposition one under the heading Industrial Policy (refer to 2.1 proposition one above), this indicates that the biofuels sector development is

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driven by a pro-poor agriculture-led development strategy. It is therefore deduced that the accountability of the strategy would be by the DAFF, supported by DoE.

The misalignment of lead accountability is however not reflected in the constituency of the Biofuels Implementation Committee (BIC). (Favretto et al., 2015) demonstrated that the Malian Ministry of Mines, Energy and Water was leading the Biofuels sector development as well, though the biofuels strategy was based on *Jatropha* farming. The difference in feedstock selection could be deduced to impact the accountability and national departments' representation. The literature, however, does not provide insight into the impact of an agriculture-led biofuels development strategy on the sector's development, when led by the DoE.

5.6.3. Supporting policies

The triangulated results indicated three broad categories of policies that support the development of the biofuels industry development, namely social, economic and environmental. The social policies are primarily the drivers towards achieving social inclusion through instruments such as rural development and land redistribution and agrarian reform, while economic development polices focussed on industrial development such as the Industrial Development Action Plan, using instruments such as incentives. Environmental policies include carbon emissions through the clean fuels policies; the triangulated results are present in **Table 13: Triangulated Results**

> "*You've got this CO2 tax that's coming. You've got this gas emissions act or pollutions act. There's lots of legislation, which tighten up on pollution, where biofuels will assist in South Africa meeting that legislation. The very general thing is that if you look at all the legislation, the biofuels will assist in meeting many.*" **(Private Association Institution Informant)**

Respondents indicated IPAP, the National Growth Plan and the Carbon Tax Bill as policies that support the biofuels industry development. These policies are the core economic and environmental frameworks that influenced the Biofuels Position Paper Regulatory Framework. The identified policies are consistent to (Brent, 2014, p. 11). He expands the policy range to include the National Development Plan (NDP) and South African Renewables Initiative (SARi). The NDP is aimed to address the triple threat to economic stability, namely poverty, inequality and unemployment, through accelerated industrial growth.

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The proposed Carbon Tax Bill is the demand-side policy that would increase the demand for cleaner fuels. However, the NDP identified this as a weak instrument to stimulate more effective use of fossil fuels (National Planning Commission, 2011, p. 174). (Ambec et al., 2013; Costantini et al., 2015; Costantini et al., 2012) state that under the Porter Hypothesis (PH), demand-side policies are required to change the consumption patterns of firms and consumers. The consequence mechanism links consumption cost, making it less cost-effective to continue with fossil-based consumption patterns. It also creates a demand for renewable products such as liquid biofuels to reduce the cost. The mandatory blending, discussed previously under the heading 2.1.2 Incentives indicated additional support mechanisms to stimulate the demand for liquid biofuels. The absence of a price-based instrument (Costantini et al., 2015), as articulated by informants, could lead to arbitrage; refer to heading 2.1.2, Incentives.

Since the Carbon Tax Bill is not yet statutory, the demand for biofuels would not be increased. However, consumers would be willing to switch to biofuels' blends when there is a cost advantage. It is however inconclusive to determine if biofuels will be cost competitive. The decline in global crude prices, coupled with added fuel tax as discussed under 2.1.2, would result in the increased cost of transportation fuels when biofuels become available. Resnick et al. (2012) argue against the use of taxation to transition towards the green economy and recommend the use of fertiliser incentives and agriculture technology to improve energy crop yields and cost of production. This is consistent to the developmental strategy proposed by the pro-poor agriculture-led growth strategy discussed previously.

5.6.4. Proposition Two conclusion

The evidence indicated that a broad and narrow institutional shift has occurred. The inclusion of the renewable liquid biofuels into the fossil fuels stream had resulted in inclusion of existing industrial chemical producers to enter the market as well. The policy development and narrow structural arrangements need be addressed to ensure legitimacy of the industry.

The mandatory blending demand-side policies were implemented on the 1st October 2015; however, without the supporting pricing and quantity supply-side policies, investment will not take place. This gap between polices could result in seeking of maximum gains from either the petroleum companies or biofuels producers. The outstanding demand-side policies include the Carbon Tax Bill, which is envisioned to aid in the transitioning towards the green economy. The consequence however would result in the fiscal linkages to consumption behaviour, resulting in increased inflation, as sector-specific cost drivers would be

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transferred to consumers. The investigation into reducing the local production cost of energy crops is needed, as an alternative to taxation.

The social and economic transformational macroeconomic policies appear to exhibit policy coherence, namely the NDP, NGP and IPAP. The sector-level polices however need to be strengthened to include benefits for the consumer, beyond reduction of respiratory health-related benefits derived from the reduction of carbon emissions and greenhouse gases.

5.7. Proposition Three: Findings discussion on Biofuels industry Market Diversification

The alignment of micro- and macroeconomic determinants would stimulate the diversification into the export of high value strategic products.

This proposition's emerging themes, as indicated in **Table 13: Triangulated Thematic Results,** suggest that role-players within the biofuels sector, namely energy crop producers and bio-refiners, could benefit from existing markets. While the results are based on the four key informants' contributions, they do highlight the latent potential of biofuels industry diversification.

Dani Rodick (2010) stated that one of the critical criteria for industrial policy intervention is the potential to spillover into other technologies and activities. The draft regulatory framework has ring-fenced the incentives given to biofuels producers, thus excluding new commercial investment from diversifying into other products. Potential investors would therefore be restricted from operating in these markets until the incentive period of twenty years lapses. While the incentives are restricted to first-generation technology, this does however not restrict producers from diversifying into second-generation technologies.

> *"They would simply expand their distillery because the feedstock is in the same area. What would happen then is that they logically just expand. And by the way, the petrol specifications can take up to E10, we are only looking at penetration of E2 at the moment. So there's plenty of room for such a co-phases of the biofuel permit."* **(Private Association Institution representative)**

5.7.1. Market Diversification

The firm-level diversification probability at a provincial level is consistent to the results found by Boschma et al.,(2013) and their econometric study into the emergence of new industries

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using the proximity approach on product level relatedness. The diversification through the use of technology would therefore entrench the industrial cluster formation, hence providing further local economic development and creation of employment opportunities.

Firm-level investment would increase the demand for agricultural waste. The probability exists, given the draft regulation-prescribed relationships and reduction of transactional cost; biorefiners would source second-generation agricultural waste from existing providers. The technology diversification would enable suppliers to sell all products. However, the probability also exists that energy crop suppliers would be able to sell their waste to biogas producers. This would increase revenue streams for producers, particularly emerging farmers. They would therefore operate in two distinct markets. This is consistent to the OECD (2013) recommendation that the agriculture breadth be expanded through participation in both the biogas and biofuels energy markets.

The biofuels final products' relatedness to existing markets, such as those highlighted by key informants, indicates the inherent opportunities, particularly since these markets have higher margins. It is assumed that the rent-seeking behaviour of existing markets can be applied to the established related markets. The tacit approval of the self-serving behaviour to secure an additional market could also be permissible for entry of biofuels producers in their markets. Moreover, the exclusion of second- and third-generation technology from the draft regulatory framework could strengthen the resolve to enter high value and high margin markets such as the industrial chemicals market. The consequence thereof would be increased competition in both the local and export markets.

The development of a commercial scale biofuels industry would therefore disrupt the existing markets, through increasing local competition. The literature reviewed, however, does not provide insight into government policy intervention on developing an industry that is closely related to existing markets. Government intervention into attraction of FDI and excluding existing comparable industries is against the explicit recommendation by Lin (2012) and Rodrik (2004) of removing existing firms' constraints from entering into commercial-scale development. Consequently, the increased competition would result in placing existing jobs at risk. This is consistent to the assertions of (Resnick et al., 2012) of transitioning towards green growth. While they do not explicitly highlight the impact of competing markets, the disruptive green technology would result in the same effect.

The skills relatedness of the biofuels production process to related industries would enable an increased demand for technical-related skills (Boschma et al., 2013; Neffke & Henning,

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2014). This would then enable the shift from low-skilled to semi-skilled and skilled employment opportunities. Local economic diversification opportunities would therefore encourage growth, while simultaneously facilitating human capital upgrading, which is aligned to Singh (2011), Jarreau & Poncet (2012) and Naudé et al. (2010). Consequently, the productivity shift from low to higher productivity would ensue, including an increase in the tax base and increased income on a personal level.

The existing markets have experienced additional competition that would result in equalisation of export and local product prices attributed to the increase in supply. This finding is consistent to those of (Huang & Chang, 2013, p. 3), which highlighted that increased competition holds the potential to reduce cost of products, providing benefits to the country's citizens.

The increased competition may result in the review of the biofuels regulatory framework, as stated below:

> *"I'm saying the milk situation because it was once reported some years ago that there was this complaint – but we are saying that we don't want that kind of a thing. We don't want – there has to be a need to also look at the value chain with understanding that it doesn't mean that when you…implement the legislation and the policies that it's going to solve all the problems of the value chain at once. You'll find sometimes that one value chain is negatively affected and then one must revise… That is why you've got regular reviews of policies: it's to be able sometimes to deal with such matters without creating an unstable environment in terms of policy and legislation… We need to intervene somehow, but at the same time the intervention must not be so much as to overly regulate the sector."* **(Public Institution Representative)**

5.7.2. Product Diversification

The unintended consequence of biofuels diversification would increase the biofuels industry competitiveness. The diversification holds the potential to reduce the incentives funded by the fuel levy, therefore reducing the impact on consumers and sectors impacted directly by fuel price fluctuations. The use of technology to stimulate firm-level productive gains and innovation is aligned to the recommendations by (Costantini et al., 2015). Weldemicael (2014) further expands the firm-level gains, highlighting that learning-by-doing also improves product quality. Moreover, it would enable South Africa to gain access to the global trade of biofuels.

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Developed nations' increased demand for biofuels products, such as in Europe and Asia, offer trade opportunities to developing nations (Jumbe et al., 2013). The existing trade relations and routes, in comparison to other Asian biofuels exporters such as Thailand, Singapore, Malaysia and Indonesia, places South African firms in a favourable position. The access to the global biofuels trade is however dependent on existing bilateral trade agreements. (Saad-Filho, 2013; Saadi, 2012) both agree with that trade relationships are uneven between developed and developing countries.

The diversification into export-related products would increase the foreign currency revenue, and increase the possibility of higher economic growth. This is consistent to the recommendations of (Barth, 2013; McMillan et al., 2014), which are based on the Presbirch-Singer hypothesis. The increased growth rate would be diminished though as the biofuels pricing-policy is based on two commodity families, as discussed previously. Moreover, it has the potential drawback of increasing global supply and reducing the demand. The literature reviewed however provided no guidance on how to balance high value product demand and the impact of an increased global biofuels market.

The increased capital accumulation either through co-production through the use of first- or second-generation technology would entrench the industry position and role in rural economic development. The spillover effect would therefore result in the re-balancing of the spatial imbalance of the industrial development, and increase economic participation opportunities.

5.7.3. Proposition Three: Conclusion

The biofuels position paper does not discuss co-production for the local and export market, and co-production of products. The possibility for diversification into higher value strategic goods in existing export markets, such as cooking oil and industrial chemicals, is dependent on *"financial bankability"*. While only a small number of respondents contributed towards this proposition, the evidence suggests that the opportunity exists, based on skills and product relatedness. These issues need to be incorporated into the current debate to address the promotion of productive economic development and growth that would benefit the unemployed and rural communities.

South Africa is able to gain foreign currency to decrease the trade balance, while simultaneously being able to increase the manufacturing and agro-processing productivity through the increased labour participation rate, and learning-by-doing firm-level productive

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gains. Furthermore, the increase in demand for energy crops would incentivise emerging and commercial farmers, within the confines of ensuring balance to the food security, to increase crop yields through the use of technology, consequently resulting in the incremental social adjustment as defined by (Barth, 2013; Lin, 2012b).

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6. CHAPTER SEVEN: RESEARCH CONCLUSION

In this research paper the proposed commercial-scale biofuels sector was investigated to determine the potential to provide inclusive economic development. The content analysis instrument was used to triangulate the five-year historical documents and semi-structured interviews with key informants.

The study was to focus on exploring the inclusive economic development model of the biofuels industry. The preliminary model was based on economic and social development constructs and concepts, covered within the literature reviewed (Chapter Two). The results in Chapter Five and the discussion that ensued in Chapter Six provide evidence of the industry's inherent potential aid in balanced socio-economic development.

6.1. Key Findings

The singular focus on economic growth is not sustainable. Resource-dependent economies such as South Africa require balanced social and economic development to address structural unemployment, inequality and persistent low economic growth. The alignment of macro- and micro-economic determinants are required through effective policy formulation that balances local communities, investors and broader marco-economic growth determinants and institutions.

The biofuels position paper and the research conducted found the biofuels industry to offer a rare opportunity to correct market failures through removing the barriers for emerging farmers to enter the energy market, and offer direct and indirect employment opportunities. Personal effort is a key component to gaining access to and growing with the biofuels sector.

The South African government is directing capital accumulation driven through commercial-scale investment into rural areas, to address the unbalanced spatial economic developmental, through the Biofuels Industrial Strategy (2007) and Draft Position Regulatory Framework (2014). First-generation agriculture-based technology was used to provide inter-sectorial linkages with the land and grains segment of the agriculture sector. The productive linkages create opportunities for existing and, more importantly, ***new*** recipients of the land redistribution policy to gain access to the energy crop market, and subsequent development to become commercial producers.

The pro-poor agriculture-led growth strategy would increase direct and indirect employment opportunities along the value chain. The focussed removal of energy market entry barriers and focus on productive gains attained through personal effort of under-represented groups

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would result in the increase in average income of those disadvantaged by circumstance such as living in a rural area. It is however predicated on the guided foreign direct investment into spatially under-developed areas, with under-utilised land.

The linking of economic development through rural development and the potential to expand access and quality of basic infrastructure and services-related infrastructure to the poor. The existence of both economic and inclusive development would therefore result in inclusive economic development. Inclusive economic growth would be the outcome of the implementation of this inclusive economic development.

Public and private sector institutional support for the development process, especially through existing mechanism such as CASP and emerging farmer developmental programmes offered through the agriculture sector BBBEE scorecards. Furthermore, it has the potential to create other opportunities (employment and entrepreneurial) that can absorb the structurally unemployed.

The broad application of institutional arrangements were perceived and experienced through lack of technical competency and bureaucracy embedded within the policy development process, placing the legitimacy of the final regulatory framework at risk. The outstanding stages of finalisation of the regulations would increase time delays, placing the feasibility of attracting and retaining existing potential investors at risk. Concerted effort therefore needs to done to mitigate these risks, as the explorative evidence indicates that there are inclusive development opportunities that can be derived from the inter-sectorial productive linkages that can increase the national and local labour utilisation and increase the tax base.

The narrow application of institutional arrangements found that the inclusion of the renewable liquid biofuels into the fossil fuels sector had resulted in inclusion of existing industrial chemical producers to enter the market as well, highlighting the existing liquid fuels institutional shifts to incorporate new industry players. The biofuels regulatory framework, which includes supply-side and demand-side instruments, is still pending, despite the mandatory blending implementation on the 1st October 2015. Alternative methods of incentivising the transition towards renewable liquid fuels needs to be investigated, as well as subsidisation of the factors of production to reduce the cost of feedstock, which is consistent to global trends (OECD, 2013).

The biofuels diversification into higher value strategic goods in existing export markets is dependent on *"financial bankability"*. The evidence suggests that the opportunity exists,

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based on skills and product relatedness. The gains from global trade would be dependent on the pricing framework that uses an alternative to the proposed instrument. Co-production through the use of first- and second-generation technology is not explicitly excluded from the draft policy framework; however, pending on the decline of the cost of second-generation technology, biofuels producers are not prohibited from entering markets that yield higher returns. Moreover, emerging farmers would be able to increase their returns through diversifying into providing agriculture waste to biofuels co-producers and/or selling their agriculture waste to the biomass energy market. The productive gains from learning-by-doing also hold interesting opportunities for human capital accumulation and act as a vehicle to shift the dual economic structure towards higher economic sophisticated products and structural transformation that includes a large portion of the seventy percent of the rural poor into the market economy.

6.2. Limits of the Research

The research was limited to existing biofuels' industry key stakeholders. The inclusion of the organised agriculture sector, public developmental agencies such as the Land Bank and Industrial Development Corporation could result in different themes. It is therefore recommended that further research be expanded to include these critical stakeholders into the required debate of the inclusive economic development.

6.3. Recommendations for Professionals

The use of the inclusive economic development model would aid in determining that the maximum social and economic benefits are derived from the investment made into local communities. Leveraging on existing strategies, such as the pro-poor agriculture growth strategy indicated in this explorative study, could remove barriers from entering the market-based economy for the rural and urban poor youth, women and people living with disabilities. It would require their personal effort to attain and maintain their access and, coupled with sector-specific development programmes, could result in win-win benefits for all parties involved. The firm and or investor would be rewarded for the contribution towards BBBEE priority elements, while participants would attain relevant skills and knowledge that compliments the firm's talent pool.

Additional recommendations that emerged during the discussion will be discussed briefly below.

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Table 15: Study Recommendations

Major Challenges	Proposed Way Forward
Regulatory Environment	▪ Make the consolidated feedback on the draft position paper available to stakeholders to increase transparency in the process. The further delays could damage the existing relationships. ▪ Consider including biofuels industry development within operations Phakisa to increase the visibility commitment to develop the sector ▪ In the development of a new industry, explicit communication should be made highlighting the regulatory framework that will be used, namely the development of a strategy towards legislation. Concerted effort is required to reduce the experience of process bureaucracy. Moreover, new sector-specific policies and regulations require a framework that increases broader participation of stakeholder groups' interest in public-private partnerships to increase transparency. ▪
Institutional Arrangements for Delivery	▪ Reorganise intergovernmental task team into strategic, tactical and implementation streams that is also aligned to the three tiers of government. ▪ Include provincial and local government in the consultation process, to increase transparency. It may also increase the approval process later when it gets to the NCOP, make information more reliable to key stakeholders.
Incentives	▪ The investigation into the feasibility of using funds collected from the proposed the Carbon Tax bill to fund the biofuels incentive payable to producers. It would reduce the cost to consumers, and achieve the objective of developing the renewable new industry.
Technical Competency	▪ Use the public private partnership to aid in the skills transfer as expressed by informants. It may increase the credibility of governmental documents, especially bills.
Stakeholder Representation	▪ Include and organise emerging farmers and cooperatives ▪ Provide them with decision to partake at either energy or food market. Highlighting benefits and drawbacks
Feedstock security	▪ Provide emerging farmers with the choice to partake in market. Create a provincial level database, that's available on the provincial Internet sites to increase communication. This needs to be included into governmental departments websites, especially the DAFF and DoE.
Under-utilised land	▪ Create a database that identified under-utilised land. Consult with affected communities on the current use, and the willingness to form cooperatives and contribute towards agri-business in either the food or energy markets. These are to be recorded, to enable focussed development.

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6.4. Recommendations for Further Research

The study found several potential future research areas within the socio-economic and institutional and economic diversification arenas. Potential research areas are discussed briefly below.

Firstly, South Africa's existing Bilateral Trade Agreements (BIT's) with the European Union has lapsed. In 2014, South Africa signed a duty-free 80 000 tonnes bioethanol agreement with the European Union (REN21, 2015, p. 94). Within the context of biofuels export, research into the impact on the terms-of trade given of the BITS expired. More interestingly would be the export agreement impact on the existing draft biofuels position paper, given the 'ring-fencing' of the new industry products. The investigation may enquire into the influence of the new commercial-scale biofuels and existing local bioethanol producers derived from sugar feedstock.

Secondly, a qualitative content analysis of the biofuels working committee meeting minutes should be conducted. It would provide insight into the perceived importance of social and economic justice into the sector development, in comparison to the firm-level and industry-level financial gain.

Thirdly, further study is required into the role of biofuels in agriculture-led growth industrialisation and the success thereof when driven by the department of agriculture. The cross-country comparison could investigate the success in developing countries when the Department of Agriculture leads the process of new industry development, in comparison to the Department of Energy. Common variables such as land redistribution and agrarian reform and structure of the liquid fuels sectors should be considered.

Fourthly, to investigate the extent of local consumer market gains obtained from increased competition across related product markets. A mixed method approach holds the potential to obtain insight into the change in local price and firms' perceptions of their ability to remain competitive.

And finally, the statistical analysis was a shortcoming in identifying the binding constraints within the South African economy. The release of the World Economic Forum's (WEF) Inclusive Growth and Development Report (September, 2015) offers new and exciting opportunities to determine the inclusive growth barriers, and disaggregate the matrixes to provincial level. Hypotheses and research questions can be used to test disaggregated statistical data, with the benefit of the matrices at a provincial or municipal level. These

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indices can be used to determine the relationship between rural foreign investment on capital accumulation and access to improved basic services and infrastructure, employment opportunities and entrepreneurship.

6.5. Conclusion

Inclusive economic development is a social and economic development model that aids in increasing economic participation opportunities in resource-dependent economies. Economic diversification opportunities are used for improving the living standards of individuals who are excluded from the market-based economy due to circumstance. The investment into low-sophisticated new industries can aid in increasing demand for factors of production and increasing economic activities within the country.

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8. APPENDICES

8.1. Appendix 1: Consistency Matrix

Title: Inclusive Economic Development: The case of the South African biofuels cluster

Research Questions	Literature Review	Data Collection Tool	Analysis
Proposition 1 Inclusive economic development	D. Acemoglu, 2012; Almeida & Fernandes, 2013; Tartakowsky, 2011 Pradhan & Mbohwa (2014) Lin , 2011 Torres-Fuchslocher, 2010 Saad-Filho, 2013 Lazzarini, (2015) and Neffke & Henning , 2014 Costantini et al., 2015 Deng et al., 2013 Lin & Chan, 2013 Roemer, 2014) Kozuka, 2014	Document Analysis Semi-Structured one-on-one Interview	Qualitative Content Analysis
Proposition 2: Institutional capacity to deliver	Favretto, Stringer, & Dougill, 2015 Boschma, Minondo, & Navarro, 2013, Naudé Hausmann & Hidalgo, 2011; McMillan et al., 2014; Rodrik, 2004, 2010 Weldemicael, E. (2014)	Document Analysis Semi-Structured one-on-one Interview	Qualitative Content Analysis

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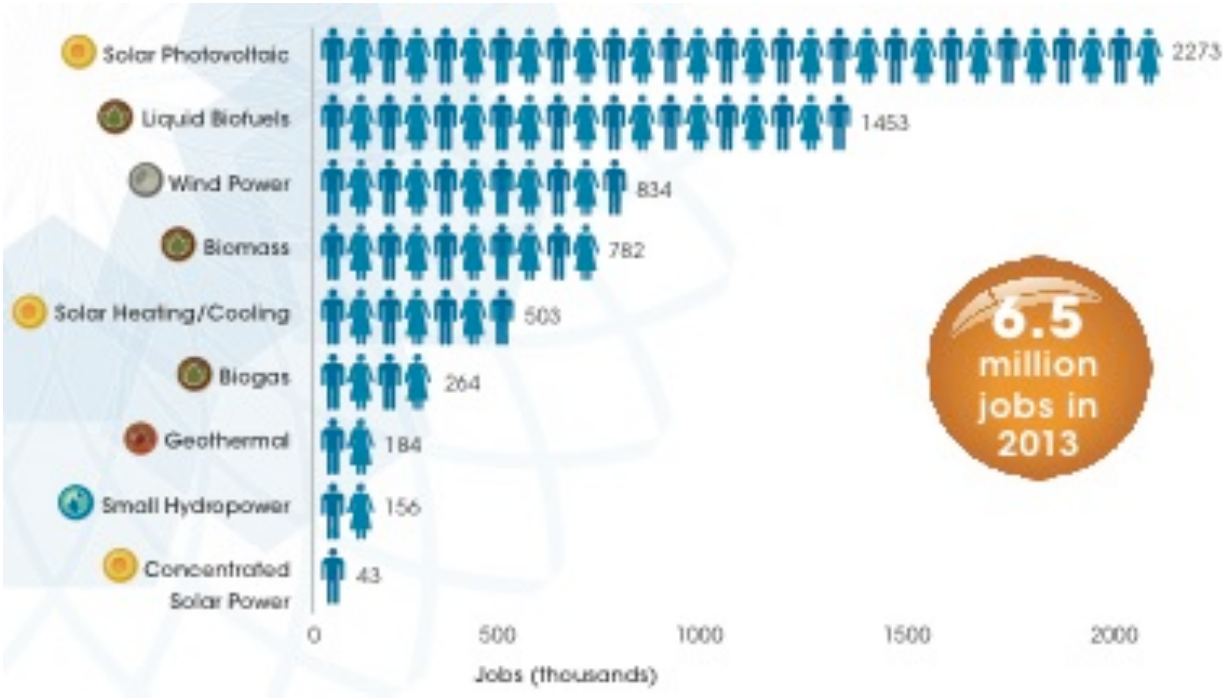
Proposition 3: Niche Market development	Hausmann & Hidalgo, 2011; McMillan et al., 2014; Rodrik, 2004, 2010 Acemoglu, 2012; Naudé et al., 2010 Torres-Fuchslocher, 2010 Saadi, 2012	Document Analysis Semi-Structured one-on-one Interview	Qualitative Content Analysis

9.2. Appendix 2: FIGURE 4: Global Renewable Energy Jobs Created In 2013



Source: IRENA Jobs annual Review 2014, p. 4

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9.3. Appendix 3: Consent Form

I am conducting research on the socio-economic impact of the prescribed biofuels industry, and am trying to find out more about the impact on various stakeholders. Our interview is expected to last about an hour, and will help us understand how the South African biofuels may contribute towards stimulate other green industry opportunities for local economic development and participation opportunities.

Your participation is voluntary and you can withdraw at any time without penalty. Of course, all data will be kept confidential. If you have any concerns, please contact my supervisor or I. Our details are provided below.

Researcher:

Nazeema Ismail| Tel: +27 72 593 9396 | email: Nazeema.Matthews@icloud.com

Supervisor:

Lee-Roy Chetty | Account Director| Brunswick South Africa Ltd.| 23 Fricker Road, Illovo Boulevard, Illovo, Johannesburg, South Africa | Tel +27 (11) 502 7432 Mobile +27 71 330 1073 | email LChetty@brunswick.co.za

Signatures

Participant	Date
Researcher	Date

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9.4. Appendix 4: Interview Guide

Question	Probes	Objective
Good day, thank you for agreeing to partake in this study. As the meeting invitation indicated, I am investigating the prescribed biofuels cluster as an inclusive development model. Our interview is expected to last about an hour, and will help us understand how the South African biofuels strategy may contribute towards stimulate other green industry opportunities for economic participation opportunities. All responses will be kept confidential. This means that your interview responses (notes and voice-recordings) will not be shared with anyone and any information we include in our report does not identify respondents' identity. The voice recording and notes area tools to ensure accurate capturing of our time together. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time. Are there any questions about what I have just explained? Are you willing to participate in this interview?		
1. Briefly describe your institution's role and level of involvement in the biofuels industry		Explicitly confirm institutional mandate and constituency represented.
2. Kindly highlight what you believe are the primary objectives of the biofuels strategy.		Confirm the expressed objectives of the BIS and that is aligned to current beliefs.
3. What has prevented the execution of the strategy?		Gain insight into sector development barriers.
4. What support policies and strategies impact BIS implementation?	In light of these polices and strategies mentioned, what challenges the execution of BIS? Are there plans to lessen the impact developed?	Gain insight into the broader policy barriers on Biofuels sector development.
5. Do you believe there is sufficient established local government capacity and capabilities to support the biofuels value chain development?	What role will provincial and municipalities play? Do you believe there is sufficient infrastructure to support the industry?	Gain insight into the Institutional capacity (skills availability, storage and transportation related infrastructure) to effectively support the industry
6. Why do you believe the current biofuels subsidy model is being reviewed?	What are the obstacles to the current model?	Gain insight to whether the incentive scheme will be aligned to global practices, as reviewed in literate.
7. Who will derive the most benefit from model changes? And why? (bio-refineries, investors, local communities, etc.)	What are the implication of the review on stakeholders and BIDP, particularly the development of the sector, i.e. Investors, consumers, the tax recovered?	

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Question	Probes	Objective
8. How will black emerging farmers, smallholders and cooperatives encouraged to enter the (biofuels feedstock provider) market?	What mechanisms are required to increase entrance into the supply of agriculture feedstock supply? How will farmers be informed of biofuels related opportunities?	Determine the mechanisms are there to aid the development of feedstock security
(Removed Question 9) What organisations will support emerging farmers to use agriculture related technology to increase their productivity?	What support do black smallholder,	Determine the trade-offs between increased supply and increased labour intensive
9. How do you believe the biofuels value chain and industry can be further localised?	Do you believe there are sufficient capabilities (labour skills, R & D investment) to further develop the industry? I.e. cosmetics firms, pharmaceutical bioethanol R&D, energy and chemical related products e.g. ethanol gels, substitute for paraffin and biogas If there is, what is the progress?	Gain insight into the relationship between value-chain diversification and localized manufacturing policy as determined by literature reviewed.
Removed Question 11) Is the developmental strategy for promoting other biofuels related products and sectors?		Gain insight into current thinking into niche market development for SME, investment and employment opportunities to contribute towards reducing unemployment rate.
Removed Question 12) In your view should there be support mechanisms and instruments (R & D investment, incentives and collaborative forums) to stimulate other biofuels related products and industries?		Determine whether further incentives are required to diversify the biofuels products.
10. What benefits could stakeholders gain from a broadened biofuels strategy?	E.g. FDI, deepening localized value chains, Employment, Small enterprise development, local use of ethanol surplus, Improvement of health and related products, reduction in food inflation and transportation cost?)	Gain insight into the social and economic benefits
Is there anything else you would like to add?		Provide key informant an opportunity to further discuss and or highlight issues that contribute to the industry development.

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9.5. Appendix 5: GIBS Ethics Clearance Letter

Gordon Institute of Business Science
University of Pretoria

Dear Nazeema Ismail

Protocol Number: **Temp2015-01502**

Title: **Inclusive economic development: the case of South African biofuels cluster**

Please be advised that your application for Ethical Clearance has been APPROVED.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,

Adele Bekker

9.6. Appendix 6: Parliamentary Monitoring Group Consent to Access Database

From: monitors <monitors@pmg.org.za>
Subject: RE: Premium Committee Access_Masters Student
Date: 08 September 2015 at 4:17:14 PM SAST
Cc: nazeema.matthews@icloud.com

Good day

Thank you for your interest in the PMG website.

I have activated your account and you now have access. Make sure you log in first if you want to access any of the premium content.

Let me know if you have any problems.

Regards,

Rashaad Alli
Monitor and Projects Manager
Parliamentary Monitoring Group
Website: www.pmg.org.za
Tel: (021) 465 8885
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9.7. Appendix 7: PhytoEnergy Open Letter

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