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Study of the socio-economic impact of the closure of GUYSUCO sugar estates on sugar workers in Guyana

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Cover photo: Sugar Cane Field | Max Pixel

Abbreviations

CARE	Cooperative for Assistance and Relief Everywhere
CDB	Caribbean Development Bank
CSA	Commonwealth Sugar Agreement
CSR	Corporate Social Responsibility
DFID	Department for International Development
DWCP	Decent Work Country Programme
DWTST	Decent Work Technical Support Team
EAC	European Agricultural Council
EEC	European Economic Community
ERP	Economic Recovery Program
EU	European Union
GAWU	Guyana Agricultural and General Workers' Union
GDP	Gross Domestic Product
GPL	Guyana Power and Light Company Inc
GSDS	Green State Development Strategy: Vision 2040
GUYSUCO	Guyana Sugar Corporation
ILO	International Labour Organization
IMF	International Monetary Fund

IRS	Increasing Returns to Scale
ITMOs	Internationally Transferred Mitigation Outcomes
LCDS	Low Carbon Development Strategy
NAACIE	National Association of Agricultural, Commercial and Industrial Employees
NDCs	Nationally Determined Contributions
NICIL	National Industrial and Commercial Investments Limited
NRF	Natural Resource Fund
ODA	Official Development Assistance
PPP/C	People's Progressive Party/Civic
R&D	Research and Development
SDGs	Sustainable Development Goals
SOEs	State-Owned Entities
SSMP	Skeldon Sugar Modernization Plan
UNDP	United Nations Development Programme
WHO	World Health Organization
WBG	World Bank Group

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Harvesting sugar cane. | DPI, Guyana

Executive summary

From the nearly 400 sugar estates that existed in British Guiana in the 19th century, to the nationalization of the sugar industry and the 11 remaining estates between 1975 and 1976, sugar has been an integral part of Guyana's economy. However this commodity, largely produced for an export market, has often struggled to garner sufficient demand and maintain competitiveness in global markets. The decline in exports from USD123 million in 2011 to USD49 million in 2017 and USD27.7 million in 2019 and the movement of sugar production relative to GDP from 14.7 per cent in 1996 to 2.8 per cent in 2014 reflect the challenges faced by the state-owned sugar industry, managed by the Guyana Sugar Corporation (GUYSUCO). A key contributory factor to such declines was the loss of preferential prices for sugar in the European Union (EU) market in 2006, although recent policy-induced measures in response to declines in the industry have entailed reductions to production. Yet, over the years, efforts continued to be made to bolster and boost the sugar industry through measures including the state provision of tax reductions and levies during downturns, and the modernization and restructuring of the industry. Following what was deemed to be the unsustainability of maintaining consistently declining estates operating at a loss, the Government of Guyana closed the Wales, East Demerara, Rose Hall and Skeldon estates between 2016 and 2017 – estates which were not only characterized by the production of sugar but which also served as a hub for community life, and income generation and earning activities.

This study serves as a response to these closures as it uses the "sustainable livelihoods" framework to examine the impact on workers and their livelihoods, taking into consideration safety and support instruments provided by the state after the closures. Focus group interviews were notably done with 41 workers who were laid off from the closed estates. Amidst the possibility that the current Government will re-open the closed sugar estates, this study also examines the potential for greater competitiveness and productivity in the sugar industry and stresses the necessity of ensuring secure and sustainable livelihoods for workers.

Following focus group interviews, it was found that the livelihoods of sugar workers who were laid off were severely compromised; only one respondent, felt that she was better off compared to when she worked with GUYSUCO. Livelihoods notably depend on capabilities, assets and economic activities. On the capabilities front, concerns faced by workers included feelings that they were too advanced in age to be considered by new employers (especially in the context of wider unemployment in the country), children still at school, and the ability to use skills outside of GUYSUCO. As regards assets, the severance paid to a worker averaged across the four estates was G$838,177, while 17 per cent received no severance or were yet to receive at the time the interviews were conducted. Further, the loss of the majority of jobs by fathers – the main providers of incomes for the households – could have, at a minimum, disrupted the relationship between communities and strong family values. Finally, some of the insights on the economic activities of the laid-off workers include the fact that some workers were still unemployed at the time of being interviewed, while many of those who did find new jobs were employed on a part-time or seasonal basis. Concerning the sustainability of the livelihoods of laid-off workers, factors considered included, but were not limited to, the individual educational attainment of workers, home ownership and weekly income before and after termination. Further, discussion on the security of livelihoods covered issues including considerations of working outside of the sugar industry in sectors such as oil and gas. As regards livelihood security, considerations covered included whether respondents were willing to consider working in the oil and gas sector, and whether they had access to retraining opportunities.

This report provides guidance to support the profitability of the sugar industry and the sustainability and security of the livelihoods of sugar workers. This is integral to the pursuit of cellulosic ethanol production through which the sugar industry could be further revitalized and through which support could be given to green industrial policy and commitments under the Paris Agreement. This guidance is as follows: Investment to keep estates open must occur as one element of an investment strategy that creates opportunities for an expanded market size, based on complementary demands across activities;

The investment must involve increasing returns to scale; Considerations must be given to the positive and negatives of privatization; If several Increasing Returns to Scale (IRS) investments are made, gaining effective demand may need to involve domestic and international markets; There should be anticipation and preparedness for the Dutch Disease phenomenon; When complementary IRS investments are contemplated, consideration should be given to climate change, energy transition, and the possibility for the sugar industry to provide clean, renewable energy in large quantities which could in turn supply the needs of the industry for its value-added goods as well as the needs of complementary investments in other sectors that utilize sugar.

1

Introduction and context of the study

1.1 Brief description of the research project

This study is a technical input from the ILO in support of social dialogue objectives, agreed by national tripartite constituents within the framework of the Guyana – Decent Work Country Programme (DWCP) 2017 to 2021. In fact, the study was designed to focus on three over-arching priorities of the DWCP:

- addressing poverty and inequality through improved Working Conditions and Respect for International Labour Standards;
- increasing prospects for sustainable livelihoods through improved social protection and better economic opportunities; and
- improving the climate of industrial relations and social dialogue.

As such, the study is intended for discussion and dialogue among the tripartite constituents – Government, employer, and worker representatives – though in the case of the sugar industry in Guyana, the Government is also the employer. Moreover, the study aims to provide a basis that supports national actions for adoption/ implementation of the principles embedded in the ILO "Guidelines for a just transition towards environmentally sustainable economies and societies for all" given the importance of the sugar industry in Guyana.

Given the number of persons retrenched and reports of the considerable social impact of the closures, the initial purpose of the research was to gather sufficient quantitative and qualitative information to undertake an assessment of the economic and social impact of the restructuring of the industry and to analyze the current situation of the redundant workers from the four sugar estates.

1.2 Outline of report

Chapter 1 of the report gives a background to the closures and also notes that sugar is only one of several commodities produced and exported by Guyana, a commodity dependent economy. *Chapter 2* gives an overview of the industry before the closures, while the socio-economic impact of the closures and the results of the interviews held in the four focus groups, one for each of the closed estates, are discussed and presented in *Chapter 3*. A "livelihoods sustainability" framework is used to organize the discussion of the specific socio-economic impacts in Chapter 3, while *Chapter 4* is about the implications of the closures for poverty, a more familiar concept. The important point is made that the closures might have driven laid-off workers into a "poverty trap." The nationalization of the sugar industry in 1976 and the creation of the Guyana Sugar Corporation (GUYSUCO) was relevant to the early and the eventual outcomes of the company, and the fact that GUYSUCO remains a state-owned entity will be relevant in any discussion of the potential of the sugar industry in Guyana. *Chapter 5* therefore discusses the nationalization of the sugar industry. Annex II is also about nationalization, with a particular focus on the causes of and the consequences of nationalization. This annex is also important as an introduction to the ideas later presented on the future of the sugar industry and on the reopening of estates. It is important to note that reopening, which was only a possibility when the focus groups were conducted, is now becoming a reality. A 'green economy industrialization' investment framework within which the potential of the sugar industry must be conceived is discussed in *Chapter 6*. Among the many issues raised in this chapter is that sugar production involves Increasing Returns to Scale (IRS), the economics of which implies that the sale of sugar on the world market – the new normal for the sugar industry – will entail losses. This chapter also contains a discussion of the oil discovery that was made in 2015, and the implications of oil and gas for the sugar industry and the economy. *Chapter 7* places the green economy industrialization framework, discussed in Chapter 6, into context by briefly reviewing earlier investment proposals for low carbon development and the repositioning of the sugar industry itself. *Chapter 8* discusses cellulosic, second generation biofuels production as an option that might address the pessimistic implication of increasing returns discussed in Chapter 6. Not only does the proposal for cellulosic energy enhance the likelihood of profitability but it holds out prospects for diversification of the economy even with a growing oil sector, and it does so in a manner that would be sustainable. In summary, the study addresses the following issues:

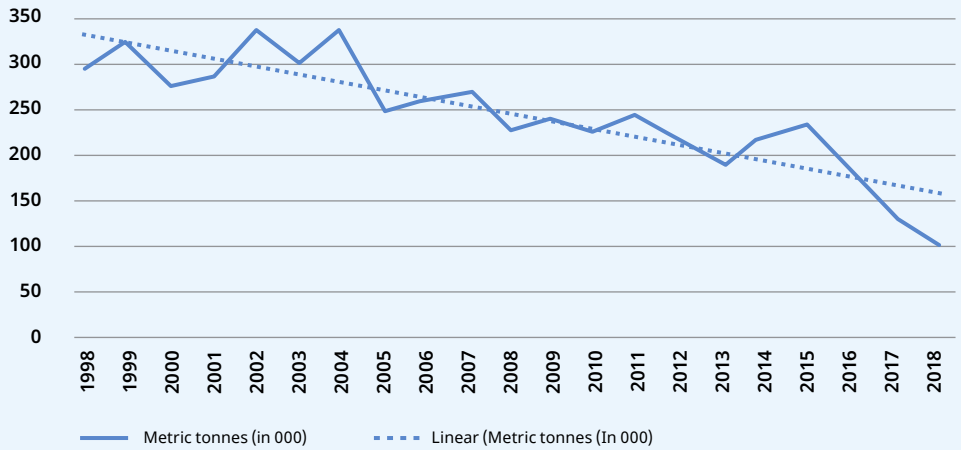
Issues	Chapters where addressed
Historical context of the sugar industry in Guyana.	2, 5
Current situation (no. of workers laid off, terms of redundancy, damages/benefits paid, etc.); protections guaranteed by law and how it was implemented in practice.	3
Number of persons from that cohort currently unemployed, or entered into new employment or other economic activity; In the latter case, what economic sectors are they currently active in?	3
Economic impact on them / their households.	3, 4
Social impact on individuals/families / communities.	3, 4
Sugar industry's potential in the framework of Guyana's commitment to a green economy.	6, 7, 8 & Annex II
Specific challenges and opportunities faced by affected individuals.	3
Lessons to be learnt from managing the transition of the sugar industry	2, 3, 5 & Annex II

Recent history of the sugar industry and context of the estate closures

After decades of being dominated by the British conglomerate Booker Brothers, McConnell & Company, otherwise simply known as 'Bookers', the sugar industry in Guyana was nationalised between 1975 and 1976. At the time of nationalization, there were 11 sugar estates countrywide. These estates represented a mere fraction of the nearly 400 estates that existed in the early 19th century and of the 80 which existed at the beginning of the 20th century. The 11 estates were located at Leonora, Uitvlugt, Wales, Diamond, Enmore, La Bonne Intention, Ogle, Albion, Blairmont, Rose Hall and Skeldon.

Sugar has always been an important export sector of the Guyanese economy but it has also been characterised by a long, secular, decline. Ultimately, with the dismantling of European Union (EU) sugar preferences, exports fell from USD123 million in 2011 to USD49 million in 2017 and USD27.7 million in 2019, according to the Bank of Guyana. The Guyana Sugar Corporation (GUYSUCO), which was established in 1976, has even been running losses for several years. The decline of the state-owned industry resulted in a number of responses ranging from management reform to modernisation and restructuring of the industry, but the state of the industry continued to deteriorate. More recently, the company has even tried to address the financial situation by reducing production, closing and divesting unproductive estates. Figure 1.1. shows the persistent decline in production over the period 1998–2018, during which a deliberate, policy-induced, decline in production took place in the latter part of this 20-year period – from 231,000 tonnes in 2015 to 152,000 tonnes in 2017, 104,641 tonnes in 2018 and 92,232 tonnes in 2019.

▶ Figure 1.1. Sugar production, 1998–2018 (actual and trend)



Source: Bank of Guyana and GUYSUCO Annual Reports

In 2016 and 2017 the Wales, East Demerara, Rose Hall and Skeldon sugar estates were closed. At the time of the closure of these estates, GUYSUCO was the largest employer in the country with a staff of 16,000 and around 160,000 people (one fifth of the population) indirectly dependent on its operations. This *Study of the socio-economic impact of the closure of GUYSUCO sugar estates on sugar workers in Guyana* is being done as an *ex post facto* study of the closure of the Skeldon, Rose Hall, East Demerara and Wales sugar estates.

The closure of these four estates, which had been operated by the Guyana Sugar Corporation (GUYSUCO), occurred over the very short period 2016–2017. Such closures variously occurred amidst announcements of the intention to close the estates, the issuance of termination letters to thousands of workers attached

to the various estates, and the transfer of assets (owned by the company but specific to the closed estates) to a holding company – the National Industrial and Commercial Investments Limited (NICIL). In particular, claiming that the Wales sugar estate would have made a loss of 1–1.9 billion Guyana dollars (G$) in 2016, the Ministry of Agriculture on Monday, January 18, 2016 announced that there would be no further land preparation and planting of sugar cane but that the sugar factory would continue to mill the estate's and private farmers' canes, until the end of the second crop for that year (Haniff 2016). On February 9, 2016, GUYSUCO gave field workers at the Wales Estate a three-day ultimatum to sign an agreement to either accept severance or be transferred to the Uitvlugt Estate, or to be severed summarily from the company. Representation by the Guyana Agricultural and General Workers' Union (GAWU) led to the rescinding of this GUYSUCO decision, which had been made without reference to the union (INews Guyana 2016). The workers at the Wales Estate were subsequently terminated when the estate was closed on December 31, 2016. On May 8, 2017, the Government in a State Paper on the Future of the Sugar Industry presented to the National Assembly by the Minister of Agriculture, announced plans to close the Enmore and Rose Hall sugar factories and sell the Skeldon Sugar Factory. Between November 29, 2017 to December 6, 2017, in one fell swoop, sugar workers at East Demerara, Rose Hall and Skeldon sugar estates were given termination letters indicating that the last day of employment with GUYSUCO would be December 29, 2017, the closure date of these estates (GAWU Guyana 2017).

It would have been desirable to do a study such as this one before the closures to determine if the closures would have been "too costly" or alternatively would have yielded positive net social benefits, even though the industry had required significant Government financial support that could have been used elsewhere in the economy. Even so, this ex post facto study, undertaken some two years after the closures, allows for/considers a variety of compensatory adjustments that have since occurred. It therefore attempts to evaluate the socio-economic steady state into which affected workers, households and communities had (then)/ have (now) settled, and it therefore seeks to give a more comprehensive discussion of the effect of the closures on livelihoods, livelihood sustainability and livelihood security. In particular, the effect of any of the safety and support instruments that were provided by the State after the closures would have been fully reflected in the responses given by persons surveyed, so that this study actually evaluates the socio-economic impact on affected workers of both the closures and any Government intervention that attempted to cushion the first-order effects of the closures.

The timing of the study also coincided with notable developments in the country's political economy. While the study commenced in November 2019, the date for general and regional elections was announced on September 25, 2019. Just prior, in December 2018, the closure of the four sugar estates had been used by a Member of Parliament on the Government side as one of the reasons why he supported a no-confidence motion brought against the President by the Opposition People's Progressive Party/Civic (PPP/C) (News Room Guyana 2019). Soon after that, the PPP/C made the re-opening of three of the closed sugar estates a campaign issue, as the issue was recognized and endorsed by the country's largest union, the Guyana Agricultural and General Workers' Union (GAWU), whose membership comprised mainly sugar workers (GAWU Guyana 2019).

Therefore, in addition to assessing the socio-economic impact of the closures on affected workers, the analysis of the research findings included consideration of the possibility that the aforementioned estates could be re-opened in the near future should the PPP/C win the March 2020 elections. This situation was a major influence in the eventual approach to the required assessment of the industry's potential, within the framework of Guyana's commitment to a green economy. The strategy eventually adopted was to pay particular attention to the 6th objective of the study, that is, to assess the sugar industry's potential in the framework of Guyana's commitment to a green economy (see Chapter 1.1 below).

The study took into consideration Guyana's commitment to a green economy, despite the rapid development of the emerging oil and gas sector. The latest indication of that commitment was the publication of the Green State Development Strategy: Vision 2040 (GSDS). Even before that, Guyana had adopted a Low Carbon Development Strategy. The green economy, being about inclusive growth that is sustainable, is built on the pillars of the economy, the society and the environment. A point to note is that

the report is consistent with these very important principles, though there is no separate discussion of the GSDS as it is a very policy-oriented document that does not contain many specific recommendations.

The possibility of re-opening the estates also led to in-depth examination of the potential for the creation of decent work for various categories of sugar workers, as defined by several international labour Conventions to which the country is a signatory.[1] The ILO's Decent Work Agenda of 1999 was built on four pillars - employment creation, rights at work, social protection and social dialogue. Together, these pillars would ensure that work "is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men." (ILO, n.d.) It would however be incorrect to assume that reversing the closures would automatically restore livelihoods and provide decent work. This is even if the closure of the sugar estates involved the extinguishing of employment in seeming violation of workers' right to work, and if the process did not ostensibly provide any kind of social protection for the workers who were terminated and was done without due consultation with the workers and the Union. The report therefore determines whether the workers who were affected by the closures had found [other] work that is decent, and provides an assessment of whether the re-opening of sugar estates in a manner that simply reproduces the status quo that existed before the closures, would amount to decent work. The former issue is considered in the socio-economic impact assessment of the closures, especially on livelihood sustainability and security (Chapter 3). For the latter, the report offers some guidance on what would be required if re-opening the sugar estates was intended to enhance opportunities for decent work for sugar workers.

1.3 The state, commodity production and the closure of sugar estates

While the study focuses on the sugar industry, it is useful to note that the industry, and indeed the economy, society and even the environment, have always been influenced by the dominant role of commodities in the life of the country, and by the market volatility of (some of) these commodities. It is in this broader context, which includes both oil and non-oil commodities, that the policy decision to close four sugar estates, almost all at once, was evaluated.

Until 2018, Guyana produced and exported sugar, gold, bauxite, shrimp, and rice – these falling in three of the commodity groups, that is, minerals/metals, livestock and meat, and agriculture – and timber. Exports of these commodities amounted to a staggering 91 per cent of total merchandise exports, easily making Guyana a commodity-dependent country.[2] Data on commodity price indices and GDP growth rates are shown below in Figure 1.2. for the period 1990–2019.

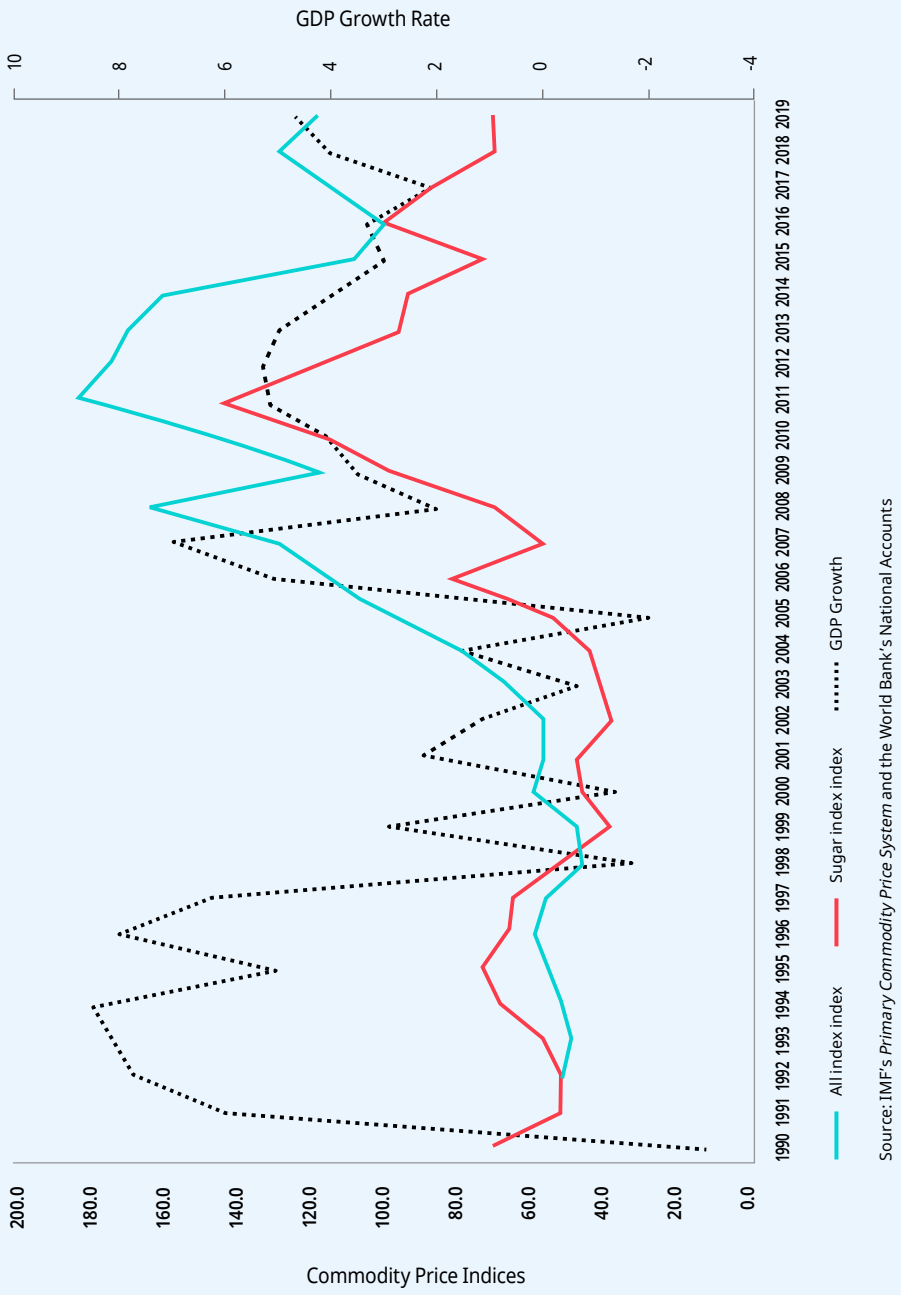
Apart from the period 1990–1998, the growth rate of GDP was closely associated with the level and movement in commodity prices and especially the price of sugar,[3] with a brief lag. The period from 1990 to mid-1997 did not reflect this association because it was the period when Guyana's economy had begun its recovery process after a failed attempt at state planning between 1970 and 1989. During most of the nineties the country embarked on an Economic Recovery Program (ERP) that was supported by the International Monetary Fund (IMF), the World Bank Group (WBG) and other funding agencies. Official Development Assistance (ODA) flowed into the otherwise stagnant economy, so that GDP growth from

1 Guyana's ratifications of international labour Conventions.

2 Calculated from Table 8.2b (See: Bank of Guyana 2020). Guyana's share of commodities in merchandise exports exceeds the 60 per cent benchmark for commodity dependence adopted by UNCTAD, but in its last *State of Commodity Dependence 2019* report, UNCTAD only notes Guyana's dependence on exports of minerals, ores and metals. The difference has to do with the commodities that were included in the calculation.

3 This close association with the world-market price of sugar is quite surprising, considering that Guyana only recently began to export significant amounts of sugar to this market.

▶ **Figure 1.2. Volatility of commodity markets and GDP growth, 1990–2019**



its prior low level was sustained even though the commodity markets did not rise significantly during this period. Thereafter, production having been stimulated with the market and trade liberalization in this period, the role of commodities in the economy became noticeable, though precisely at the time of the 1997 Asian Financial Crisis. This saw a decline in the demand for Guyana's commodity exports, and timber in particular.

Guyana's experience with the volatility of commodity markets even after 1997 was however mitigated by the active role of the state in the sugar industry, and also the bauxite industry until its privatization in the early 2000s (Guyana, Ministry of Natural Resources 2019). In both these industries, the impact of downturns in the market had/has been cushioned at times by the state's actions, which ranged from reductions in taxes and levies, to the provision of support to the state-owned companies that managed the operations in these industries. In contrast to the sugar and bauxite industries, the gold, timber and rice industries have essentially been private, though the state was always involved in the rice industry, initially with debilitating prices and other forms of state control, and later with significant technical, extension, marketing, regulatory and even infrastructural support from the Government (Gillette and Sakai 2020). Hence, while the sugar and bauxite industries were largely able to ride out downturns in commodity markets, this was not the case for rice, timber, gold, shrimp, and other exports.

The closure of the estates marked a change in the state's approach to the sugar industry compared to its approach to the bauxite industry, which was retained as a public sector entity despite its financial difficulties until it was restructured and privatized (Brassington 2008). In both instances, policy makers, who were confronted with the need to provide financial support to the loss-making industries, eventually recognized that some action – privatization or closure – was warranted. In the case of the bauxite industry, privatization (in the early 2000s) was not associated with any closures. In contrast, four out of seven sugar estates were closed within the space of a year, with little evidence to support the claim that the closures would be the basis of restructuring the industry with a view to fully privatizing it.[4]

The second dimension of the 'commodity context' within which the closures took place has to do with the major oil discovery that was made in 2015 (see Chapter 7.3). With the start of oil production in 2019, Guyana added the fourth commodity group (energy) to its portfolio of commodity export, something that would have been anticipated by policy makers in the 2016–2017 period when the four estates were closed. The effects that oil can have on other sectors in an economy, and indeed on a society, are discussed more extensively in various other studies and briefly in Chapter 7.3, but in summary there often is a loss of competitiveness of traditional export sectors, a shift in the labour force into the oil-producing sector, an increase in demand for 'non-tradeable' goods and services and therefore a concomitant decline in the production of 'tradeable' goods or goods that can be exported.

Of particular interest is the potential for the movement of the labour force into the oil and gas sector. This phenomenon has been carefully documented in Hilson and Laing (2017), but with focus on the movement of labour especially out of sugar and rice into gold mining, which was a booming sector since gold prices started to rise from about 2005. Research by Hilson and Laing (2017) provides clear evidence that labour shortages, often cited as reasons for the decline in sugar production are actually due to the movement of labour into the gold mining sector, which pays significantly higher wages than the sugar industry. This is a classic "Dutch Disease" effect, discussed in Chapter 7.3 that would have bid up wages in the sugar industry, though without the strength of the Union, this natural economic dynamic would have been dampened, thereby exacerbating the shift of labour out of the sector.

While the new oil and gas sector might more require the skills of factory as opposed field workers, the average effect on the sugar industry would be the same because other sectors, especially construction and infrastructure, would also experience growth. Field workers, many of whom have experience in housing construction, would also respond to the higher wages that would be offered in this 'non-tradable' sector. Hilson and Laing (2017) argue that the Government failed to deliberately design policy to forestall the onset of the Dutch Disease arising from the booming mining sector. In the case of sugar and the emerging oil and gas sector, the potential increase in the movement of labour out of sugar into oil and gas and non-tradeables was indeed anticipated by the closure of the sugar estates, but not to

4 While the *State Paper on the Future of the Sugar Industry* (2017) indicated only the closure of the Rose Hall and Enmore factories, the latter supporting the East Demerara estates at both Enmore and LBI (whose factory was closed earlier), the plans for the diversification of the Rose Hall and East Demerara field operations away from sugar cultivation were not pursued. This resulted in the closure of the entire estates at Rose Hall and in East Demerara. Meanwhile, a G$30B bond that was supposed to support the restructuring of the remaining sugar estates to facilitate privatization, has been mired in dispute about whether the money should be used to cover operational as well as re-capitalisation costs (Stabroek News 2020).

forestall its onset. Instead, the closure of the sugar estates simply reinforced and accelerated the onset of Dutch Disease, at least as far as the sugar industry was concerned.

1.4 Key recommendations

Recommendations have been implied, suggested and even justified in all the various chapters of this report. The most important (positive) ones are summarized as follows:

The first recommendation is for the development of a National Investment and Diversification Strategy for Guyana, with a particular role being identified for the sugar industry. The existing and growing dependence of the Guyana economy on commodity exports must be accompanied by carefully designed efforts to diversify the economy in ways that would counterbalance the price volatility that characterizes commodity markets. In order to do this, there will be need for a closer understanding of the way the commodities exported by Guyana behave in an effort to exploit any opportunities for hedging against downturns in particular commodities within Guyana' portfolio of commodity exports. Furthermore, there will have to be diversification into non-commodity sectors, taking appropriate[5] cognizance of the tendency for commodity production, and the oil bonanza in particular, to reduce the competitiveness of these other sectors.

The challenges to diversification include the following: the temptation to underestimate if not overlook the riskiness of new activities precisely because Guyana will become wealthier and the state can therefore better afford to underwrite projects; the high cost and poor quality of energy and the (sometimes) severe shortage of human capital; the high cost of doing business in Guyana; and the relatively small (domestic) market for the goods and services that Guyana can produce. Furthermore, the pervasiveness of increasing returns to scale activities and the country's natural resource abundance combine with the aforementioned challenges to make successful diversification even more difficult, even as it is more warranted.

A National Investment and Diversification Strategy shall go beyond identifying sectors or activities for investment, to take account of the challenges mentioned above and clearly identify the respective functions of the Government, the private sector, labour and civil society. The analysis in this report provides a carefully thought-out framework for such a strategy, and in particular, identifies the sugar industry itself, not as a mere sector for investment and revitalization, but more particularly for the vital role it can play within this framework.

The second recommendation of the report is therefore about cellulosic ethanol production. In this regard, Chapter 8 gives an overview of second generation, cellulosic ethanol as a source of renewable, low-carbon energy that could be developed to boost the very profitability of the sugar industry. Consideration must also be given to developing a biorefinery to produce other high-valued chemicals from lignocellulose, both as a strategy for reducing costs and also for further diversifying the industry. Biorefineries would make use not only of bagasse but will also use other kinds of biomass including rice straw, saw-dust, and so forth. They will also allow for the production of several commercial-scale, high-valued co-products that will enhance the profitability of the core cellulosic ethanol facility. Moreover, the technologies for both cellulosic ethanol production and the production of the various co-products are still actively being developed both by applied science and engineering researchers and industry experts. This development is with a view to reducing production costs even further. The scope for developing relevant programmes of biotechnology research and teaching at, for example, the University of Guyana is significant, both as a matter of supporting a cellulosic ethanol and biorefinery sector, and also as a matter of developing the University of Guyana, beginning perhaps with a graduate programme in biotechnology. Needless to

5 The typical reaction to this tendency for the dominance of the oil sector to undermine the competitiveness of traditional exports and to supress the emergence of new exports will be to provide incentives and fiscal support to the latter tradition and new exports. This however will not always be appropriate. Each proposed set of incentives and other forms of fiscal support will have to be carefully designed and evaluated.

say, the contribution of the complementary set of investments that will be required across the sectors will include "green" job creation and will give Guyana an opportunity to become involved in cutting-edge research that could be very attractive investments for global climate finance agencies that are prioritizing off-grid renewable energy initiatives (IRENA and CPI 2020).

Because of the potential volumes that could be produced, cellulosic ethanol would become an important part of Guyana's energy matrix; create many employment opportunities that would require new knowledge and skills that are not unrelated to the stock that currently exists in the industry; yield significant positive externalities by introducing advanced technology to the sugar industry; spur research and development both within the industry and at the University of Guyana; create a new corporate model with innovative financing strategies, and so forth. It will also contribute to the elimination of negative externalities such as pollution that is created when biomass (in sugar and other sectors) is produced as a by-product of other commodities. It will also create a new corporate model with innovative financing strategies that would involve private equity and debt financing at concessionary rates, along with some amount of sharing of the risks to be built into the capital structure. Financing at concessionary rates can be obtained from the several climate financing funds that are now available, including various forms of debt instruments such as green bonds that would actually lower the cost of capital for investors. Additionally, public sector equity financing, with reasonable dividend policies, along with equity involvement by organized labour within the sugar industry, would reduce the financing cost of cellulosic ethanol production while also ensuring that there is appropriate risk-sharing among the various stakeholders. Finally, a system for the granting of credits for emissions reductions to investors, commensurate with their equity holdings, must be put in place. This will allow private sector firms, and especially the major investors, to earn valuable carbon credits.

Together, these two elements of the proposed framework form the basis of a "Green Research and Innovation" Industrialization Strategy that would take advantage of the efforts to revitalize the sugar industry at a time when revenues from the oil industry would become increasingly more significant.

The third recommendation has to do with ensuring greater stakeholder involvement and consultation, both as a matter of good governance but more so as a way to garner information about people's expectations, perceptions and intended behaviour. This is extremely important as the oil and gas sector becomes more dominant in the economy.

Quite apart from the fact that there was limited stakeholder involvement and consultation in the decision to close the sugar estates, there is still a need for consultation with sugar workers, especially those who were laid off, on what they require to sustain their livelihoods. Not everyone would want to return to the sugar industry, many having already made a decision to seek employment elsewhere. It would even be appropriate to consider conducting a comprehensive survey and scenario analysis of the needs and expectations of sugar workers affected by the closure of the sugar estates. This will help the Government to learn of opportunities to provide skills training where that is needed, as well as get a sense of the number of workers that are willing to return to the sugar industry, and at what wages. Such a survey will be extremely useful as the Government proceeds with its plans to re-open closed sugar estates. The base on which this re-opening should stand and on which activities are maintained is that the livelihoods that will depend on the revitalized industry must be sustainable, and must be able to withstand any major shock that might arise in the future.

A fourth recommendation that follows from the analysis herein is that there will be need to assist affected workers and their families to avoid potential, if not real, poverty traps. The closure of the four estates, each of which was the backbone of the local economies that grew up around them, entailed a significant reduction in income. The closure was also so disruptive on those economies that the households of many of the affected workers could have been driven into poverty traps, the emergence from which would require more than just the reopening of estates and the re-creation of employment opportunities. Particular support must be provided to those students who were unable to write Caribbean Examinations Council (CXC) examinations or were forced to miss classes. Similarly, the increase in alcohol consumption, crime and even suicide will also warrant carefully designed interventions to change the new social norms

that might have taken root in communities. In thinking about ways to help people to avoid being caught in poverty traps it will be useful to have as a guiding principle the restoration, if not surpassing, of the aspirations that families had for their children, as many of these were by no means unattainable before the closures.

Other recommendations are not as specific as the foregoing and have more to do with what the Government and the unions in particular might do if situations with characteristics that resemble the closure of the estates were to occur again. The first of these is that a comprehensive communications strategy should be developed for each stage of any process that follows a major disruption of economic activities. Such a communications strategy will not be a mere public relations one, as it will involve a deliberate effort to get feedback and suggestions on the effects of whatever is being proposed. The various stages would be demarcated in time by the occurrence of the trigger of the dislocation, the period of transition to full implementation, the period immediately following full implementation, and finally the period of adjustment afterwards. Once the importance of having a communication strategy that addresses these stages is accepted, then the need to have some content to the strategy will lead to the development of proposals that will result in a less haphazard approach to dealing with potential dislocations in the economy, at a time when more of them are likely to occur.

Another general recommendation is that all stakeholders must at all times make the livelihoods of people, particularly the vulnerable, who are about to be affected by any serious economic dislocation central to the design of any proposed action that will have large-scale effects. The sustainable livelihoods framework used in the socio-economic impact analysis of this report is especially useful in this regard as it requires that consideration be given to potential shocks to livelihoods in the future, and can be so applied that the likelihood of those shocks along with the potential magnitude of the effects are incorporated in the analysis. This general recommendation is not however one that might be taken lightly as the growth of the oil sector will indeed lead to many dislocations that will warrant Government attention.

2

Overview of the sugar industry before the closures

Sugar has a long history in Guyana, having been first grown in the country in 1658, in Essequibo, specifically. At one stage, towards the end of the 18th century, there were 380 separate sugar estates in the Dutch-controlled colony, and by the beginning of the 19th century there were about 400 sugar estates in what was then British Guiana. By that time, the population and all activities were firmly concentrated on the narrow coastal plain of the country, with sugar playing an increasingly significant role in the economy and society. Though the economics of sugar eventually led to consolidations – to the extent that by 1967 there were 18 estates and ultimately only 11 estates at the time of nationalization in 1976 – sugar remained the mainstay of the economy. It dominated export revenues, employment and cultivated land. Further, wherever there was a sugar estate, the equivalent of a company town (Government of Guyana 2000) emerged as sugar workers lived in the communities that were formed around the estates.

These separate communities were often contiguous at least over large sections of the coastal plain, and they shared common ties to the company that owned the estates.[6] What emerged then were dense networks of economic, social, demographic and even geographical relationships undergirded by shared norms, household characteristics, work routines, earning and spending patterns, political allegiances and even the visible public works such as drainage and irrigation that supported the life of sugar communities.

Table 2.1. below shows sugar's relative contribution to Guyana's GDP from 1996 to 2016 compared to other productive sectors. Sugar production relative to GDP peaked in 1996 at 14.7 per cent and hit its lowest point in 2014 at 2.8 per cent. From 1996 to 2005 sugar's annual average contribution to GDP was 12 per cent, and from 2006 to 2016, it declined significantly to 4.54 per cent of GDP. The decline in the mid-2000s is attributable largely to the loss of preferential prices in the European market in 2006, at which point the November 2005 decision by the European Agricultural Council (EAC) to reduce the guaranteed price for sugar by 36 per cent over a four-year period took effect. Prior to that, the European market had accounted for 50 per cent of GUYSUCO's sugar output, and 70 per cent of its revenues.

6 These ties were established long before the industry was nationalized. McDonald (2005) describes it well, noting the "15,000 new houses in 75 housing areas built, with roads and water supplied; medical services upgraded to cater for all sugar workers and their families, and the scourge of malaria eradicated; community centres established on all estates, and welfare, sporting, cultural, and library activities expanded; training and education immensely stepped up; a world-class apprentice training centre established; a cadet scheme and scholarships introduced; and, all along, Guyanisation pressed forward until the time came when the industry was being run almost entirely by Guyanese."

▶ Table 2.1. Sugar's relative contribution to GDP compared to other productive sectors

Year	Sugar	Rice	Mining	Other agri.	Forestry	Construction
1996	14.700	9.940	15.720	4.010	2.620	3.780
1997	13.650	8.720	14.590	4.200	2.910	4.170
1998	11.510	8.740	13.370	4.590	1.950	4.550
1999	13.670	8.050	13.060	4.430	2.080	3.860
2000	10.650	5.650	13.260	4.600	1.720	4.100
2001	9.020	6.790	13.200	4.370	1.820	4.190
2002	11.120	6.190	12.760	4.310	1.660	4.030
2003	12.810	5.980	11.060	3.760	1.670	4.300
2004	12.840	5.620	10.100	3.760	1.640	4.370
2005	10.210	4.830	8.500	3.860	1.880	5.080
Average	**12.018**	**7.051**	**12.562**	**4.189**	**1.995**	**4.243**
2006	7.380	4.210	10.680	5.010	4.170	9.880
2007	6.990	4.060	12.960	4.420	3.850	10.330
2008	4.610	9.170	14.180	4.070	3.410	10.030
2009	5.500	6.060	14.180	4.050	3.520	10.110
2010	2.910	6.100	15.970	3.920	3.570	10.380
2011	4.280	6.550	19.110	2.790	2.980	9.560
2012	4.810	6.240	21.320	2.540	2.700	7.780
2013	4.100	7.110	18.030	2.530	2.850	8.940
2014	2.800	6.650	15.260	2.580	4.140	10.260
2015	3.330	5.010	15.090	2.570	3.660	9.210
2016	3.250	5.210	21.800	2.960	2.250	8.960
Average	**4.540**	**6.030**	**16.240**	**3.400**	**3.370**	**9.590**

Source: Bank of Guyana Annual Reports, 1996–2016

Table 2.2. below shows company data on employment by estates and categories for GUYSUCO in 2015 GUYSUCO has always been the largest employer in the country. At the point of nationalization in 1976, employment stood at 28,406 and the level of employment was maintained throughout the period of state planning, the employment figure being 28,081 in 1992 (Guyana, Ministry of Agriculture 2017). Table 2.3. shows that at 16,937 or some 6 per cent of the total labour force of the country, the workforce of the company in 2015 was still large, though it was a little less than half of what it was before the economic liberalization programme started under the Economic Recovery Program.

The composition of the workforce in 2014, ahead of the closures, was as follows: field workers, 81.3 per cent of total employment; factory workers, 9.7 per cent of total employment; while the junior and senior staff in both categories together accounted for 8.97 per cent. On average, only about 5 per cent of the workforce were women (Thomas 2015, 2).

▶ Table 2.2. Employment statistics of GUYSUCO by estate and worker category

	Field			Factory			
Estate	Workers	Junior staff	Senior staff	Workers	Junior staff	Senior staff	Total
Skeldon	2 029	110	33	312	41	24	2 549
Albion	2 719	107	22	185	47	11	3 091
Rose Hall	1 866	112	17	235	49	10	2 289
Blairmont	1 756	84	17	191	49	12	2 109
Enmore	1 022	56	15	225	54	18	1 390
LBI	611	43	12	0	0	0	666
Wales	1 160	73	14	169	46	11	1 473
Uitvlugt	1 356	64	13	181	48	9	1 671
Head-Office							149
Total	**12 519**	**649**	**143**	**1 498**	**334**	**95**	**15 387**

Source: GUYSUCO Commission of Inquiry (2015)

▶ Table 2.3. Total GUYSUCO employment, 2006–2015

Year	Employees
2006	18 018
2007	19 721
2008	19 695
2009	18 461
2010	18 033
2011	16 990
2012	16 942
2013	16 939
2014	16 942
2015	16 937

Source: Guyana, Ministry of Agriculture (2017)

Table 2.4. below shows the financial performance of GUYSUCO's various estates over the period 2011–2016. While in 2012 there were three estates that added to the company's profit position, a stark reality has been that since then, all the sugar estates were loss-making. Of these seven estates, the four with the worst average performance were Skeldon, East Demerara, Uitvlugt and Wales in 2013, in descending order of losses. Rose Hall outperformed Uitvlugt and Wales in 2011–2013, and Wales (alone) in 2014.

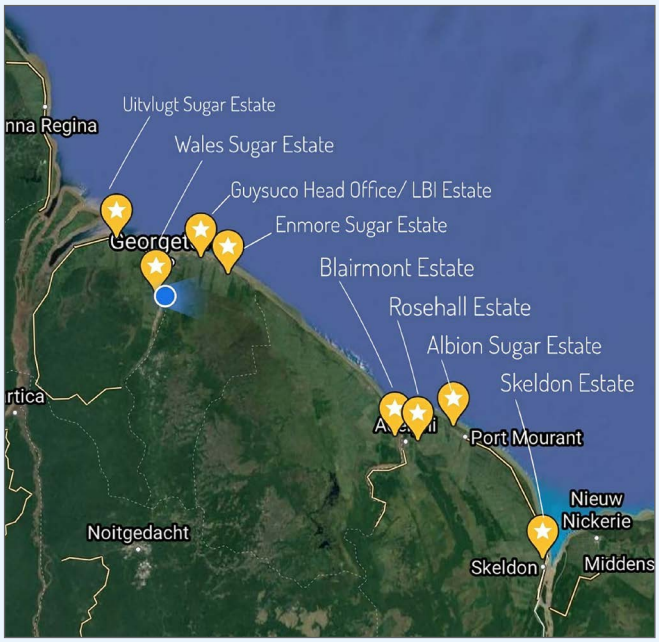
Skeldon, which is in Berbice as shown in Figure 2.1., was the worst performing estate. The Berbice estates were always known to be the most productive and also the most efficient (Hewitt 2001). The heavy losses at Skeldon can be attributed to the failed Skeldon Sugar Expansion Project that involved the building of a new and much larger factory and the reorganization of sugar cultivation in the Berbice region.

▶ Table 2.4. Financial performance of individual estates in millions of Guyana dollars

Estates	2011	2012	2013	2014	2015	2016	Average
Skeldon	(3 420)	(3 163)	(4 090)	(4 729)	(4 625)	(2 643)	(3 778)
East Demerara	(2 233)	(1 940)	(2 819)	(3 241)	(3 160)	(2 399)	(2 632)
Uitvlugt	(943)	(885)	(1 477)	(1 794)	(1 895)	(1 657)	(1 442)
Wales	(790)	(917)	(1 407)	(1 923)	(1 565)	(1 010)	(1 269)
Rose Hall	(5)	116	(971)	(1 909)	(2 346)	(1 768)	(1 147)
Albion	412	968	(100)	(1 418)	(1 529)	(642)	(385)
Blairmont	661	892	(342)	(1 151)	(1 151)	(475)	(261)

Source: Guyana, Ministry of Agriculture (2017)

▶ Figure 2.1. Location of sugar estates



Source: Google Maps (2021)

GUYSUCO was however more than the estates of which it was comprised. Beyond the national significance of the company as an aggregate of its various operations and estates, and beyond the significance of each estate for the workers and immediate communities that were directly connected with it, was the significance of each estate to a sub-regional economy and even a subsection of society that developed around that estate. Rose Hall was not just an estate, it was (and still is) also a town. And while Skeldon was not a town, Corriverton, to which it was contiguous, was a town. Similar spatial socio-economics pertained to all the other estates.

Among the most important aspects of this idea that estates were effectively "company towns", was the importance of the incomes of the field and factory workers employed on a sugar estate. The spending power created had natural multiplier effects. While the data are not available to allow an estimate of the size of the multiplier, one only has to consider the various shops, supermarkets, stationery and school-supplies' outlets, markets, workshops, and service-type businesses that arose to serve the needs of each estate, to get a sense of the socio-economic importance of GUYSUCO's estates.

One of the most useful statistics that give a sense of this is the number of private cane farmers that grow sugar cane independently of GUYSUCO, but for sale to the company. Table 2.5. shows the figures for the four estates that were closed in 2016–2017. More than twelve hundred sugar workers were employed by private cane farmers outside of the estates. Wales, in particular, had employed 774 workers. The fact that this activity took place outside of the estate operations of GUYSUCO is not material to the discussion of the multiplier effects of income and spending associated with estates because the private cane farmers used the income earned by sales to GUYSUCO to pay their sugar workers. [7]

▶ Table 2.5. Total number of private cane farmers

East Demerara	177
Rose Hall	61
Skeldon	198
Wales	774
Total	**1 210**

Source: Guyana, Ministry of Agriculture (2017)

Finally, there are the other ancillary activities that communities relied on, and that created income-earning opportunities for people who were not directly involved in sugar production. These include drainage and irrigation operation and maintenance, water management services for entire sub-regions, along with the social welfare, sports, health and recreational services that are provided to the community by estates.

The foregoing overview of the sugar industry forms the background to the discussion of the socio-economic impacts of the closure of the estates.

7 It is not clear that any provision, such as severance, would have been paid to these workers.

A former GUYSUCO employee processes the transaction for the balance of his severance. | Photo compliments: DPI Guyana

3

Socio-economic impact of closure of sugar estates

3.1 Sustainable livelihoods: Framework and methodology

The evaluation of the socio-economic impact of the closure of sugar estates in this chapter uses the "sustainable livelihoods" framework, described by (Chambers and Conway 1992) as follows:

> A person's livelihood comprises the capabilities, assets (stores, resources, claims and access), and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

The GUYSUCO estate closures are treated as shocks that have an impact on workers, and particularly on their livelihoods and on the sustainability of those livelihoods. There have been various "sustainable livelihood" or "livelihood security" approaches that have been developed from the above definition, most notably by the United Nations Development Programme (UNDP), the Department for International Development (DFID) and the international NGO, Cooperative for Assistance and Relief Everywhere (CARE). Each gives slightly different emphases to particular aspects of the definition, but all recognize that economic growth does not automatically enhance the capabilities of persons to take advantage of expanding economic opportunities; livelihoods do not depend only on income; and that persons (particularly the poor), must themselves be involved in decisions about their future livelihoods if any proposal to enhance livelihoods is to be successful (Krantz 2001, 2).

Especially appealing is the emphasis on the factors that will affect sustainability, and this includes the natural capital regarded as a fundamental resource on which the poor depend. Particularly valuable for this socio-economic impact study are the following elements of the livelihood security framework:

- Livelihoods depend on capabilities, assets and economic activities. Capabilities refer to the ability of persons to achieve their agency or the things they want to do or be. Assets include a range of financial and non-financial assets and importantly, the access to those assets that persons can use for food and nutritional security, and the preservation of the assets themselves. Finally, economic activities (such as working on a sugar estate) allow persons to earn incomes;

- Livelihoods are only sustainable if capabilities, assets and activities can be deployed to withstand the effects of infrequent external shocks (such as closure of sugar estates) and more frequent stresses;

- Livelihoods must be seen as having, or occurring within, a hierarchy of relevant levels, from the individual to the household and ultimately the community and the country. It should also be recognized that the feedback from the individual and the household to the community and vice versa can create resilience and livelihood security that cannot be secured by a narrow focus on individual livelihoods; and
- Livelihood security can only be meaningfully discussed if future contexts, constraints and opportunities for persons, households and communities are considered along with the current effects of a particular shock. There are two future contexts to be considered. There are:
  - The significant oil discovery that was made in Guyana in 2015 and the potential Dutch Disease and the Resource Curse that could attend that discovery given the perennial problem of weak institutions; and
  - The potential re-opening of closed sugar estates. The economics of doing this successfully cannot be taken for granted in an uncertain world, and will be important to the security of livelihoods. For one thing, if the re-opening is not successful and closures have to once again be contemplated, livelihoods will be insecure even with the re-opening of the estates. The approach taken to this issue will be to consider the issues and options that would make re-opening enhance livelihood security.

In the discussion of Decent Work in Chapter 1, allusion was made to the importance of the following: considering whether the work persons had found after the closures and in particular, whether the opportunities that could have been envisaged even when the focus groups were being conducted constituted/were going to constitute productive, as against rent-seeking and "make-work" jobs that provided a fair income; security and freedom to express concerns, organize and participate in the decisions; social protection for workers' families; better prospects for personal development and integration into the Guyanese society; and equality of opportunity and treatment for all women and men. This concern for decent work, even if not explicitly labelled as such, guided much of the discussion on livelihood security.

Noting the lack or incompleteness of relevant (documented) data for the study, focus groups were organized over the period November–December 2019, and a questionnaire based on the sustainable livelihoods framework was administered to a total of 41 respondents. Admittedly, the focus groups were organized by (closed) estate, so that the overarching reality of having four estates closed at once was not captured in each of the individual focus groups.[8] The questions used in the focus groups and the mapping of the questions to assessments of the impact of estate closures on livelihoods, livelihood sustainability and livelihood security, are given in Annex 1.

The rest of this chapter reports on the responses given in the focus groups. While in many instances, because of the relative homogeneity of the sugar worker population along several dimensions, it is possible to make inferences from these responses about the entire population of workers affected by the closures, in other instances respondents were asked for their opinion about the effects of the closures on other persons and on their communities. In the latter case, it is inadvisable to attempt to make any inference about the population on the basis of focus group responses.

8 There was one exception to this: When asked if they received support from family members, respondents generally said that they did not, and that other family members also worked with GUYSUCO and were therefore unable to offer any support.

3.2. General observations

There are different estimates of the number of workers laid off when the estates were closed. Below is GUYSUCO's response to a request for a statement of the number of workers that were dismissed by the company:

▶ **Table 3.1. Number of workers laid off by GUYSUCO**

Estates	Number of persons
Wales	937
East Demerara	1 531
Rose Hall	903
Skeldon	1 789
Total	**5 160**

Source: GUYSUCO

As depicted in Table 3.1. above, GUYSUCO dismissed five thousand, one hundred and sixty (5,160) workers. Of all the estates, the Skeldon Estate, which is the largest estate in the country, saw the dismissal of the most workers – one thousand, seven hundred and eighty-nine (1,789), followed closely by the East Demerara Estate with one thousand, five hundred and thirty-one (1,531) workers. Dismissals from the Wales and Rose Hall estates were both below one thousand but nevertheless significant relative to their total employment.

In response to a request for confirmation that these numbers were correct, the union, GAWU, commented that the numbers seemed lowered and according to the Government roughly 7,000 sugar workers were sent home. [9]

The company also provided a breakdown on the categories of workers that were laid off when the estates were closed:

▶ **Table 3.2. Categories of workers laid off**

Category	Number of persons
Senior staff	95
Junior staff	314
Workers	4 751
Total	**5 160**

Source: GUYSUCO

9 Email exchange between Thomas B. Singh (author) and Aslim Singh (GAWU), 18 February 2020.

92 per cent of all laid-off workers were categorized as 'workers' meaning they offered mainly manual labour such as is the case with cane harvesters. The other 8 per cent were junior and senior staff who were in administrative, mechanical or scientific capacities.

Lack of work has immediate consequences for persons. The loss of income and other economic benefits of working with GUYSUCO affected current livelihoods and the security of those livelihoods along with lifetime earnings, of the individuals counted in the tables above.

At the household level, there could have been compensating increases in economic activities outside of the sugar industry, and there could have been an increase in the number of other persons within the household who engaged in income-earning activities after the closures. The focus group data however, confirmed that weekly household incomes had also fallen dramatically by 64 per cent, from an average of G$32,238 to G$18,450 after the closures.

A key overarching factor that played a very important part in the livelihoods of laid-off persons and their communities, and in the prospects that they had after the closures, was the sheer dominance of the sugar estate in the economy of the communities that surrounded each estate. The incomes, the rhythm of life of individuals and the communities, the aspirations of families, the opportunities that existed for alternative employment, the types and successes of business ventures, the services available in the community – every single thing seemed to depend on the functioning of sugar estates. Ostensibly, if a sugar estate were to close, its effects would be not just be felt on the livelihoods of immediate workers and their families, but it would affect the entire community.

Another recurring reality was that sugar estates and communities, while being enclaves within themselves, tended to share many of the aforementioned features across all communities that were tied to the sugar estates. This meant that there were cultural beliefs and practices that were shared by all the communities, giving them a sense of belonging to entities that were larger than their particular communities. It meant as well that there were shared "learning-by-doing" benefits that were applicable in all sugar estate-based communities, creating a sort of complementarity in experiences and opportunities that would have allowed people across the sugar industry to all benefit from relevant common knowledge of how to enhance their livelihoods. A particular example of this would have been the development of similar livelihood-enhancing portfolios of activities and options within and across the communities that developed around sugar estates. Thus, in all sugar communities, most people engaged in activities that either directly supplemented family livelihoods, as with the cultivation of kitchen gardens, or indirectly benefited the family by sharing information about jobs, educational options and opportunities for children and so forth.

3.3. Livelihoods

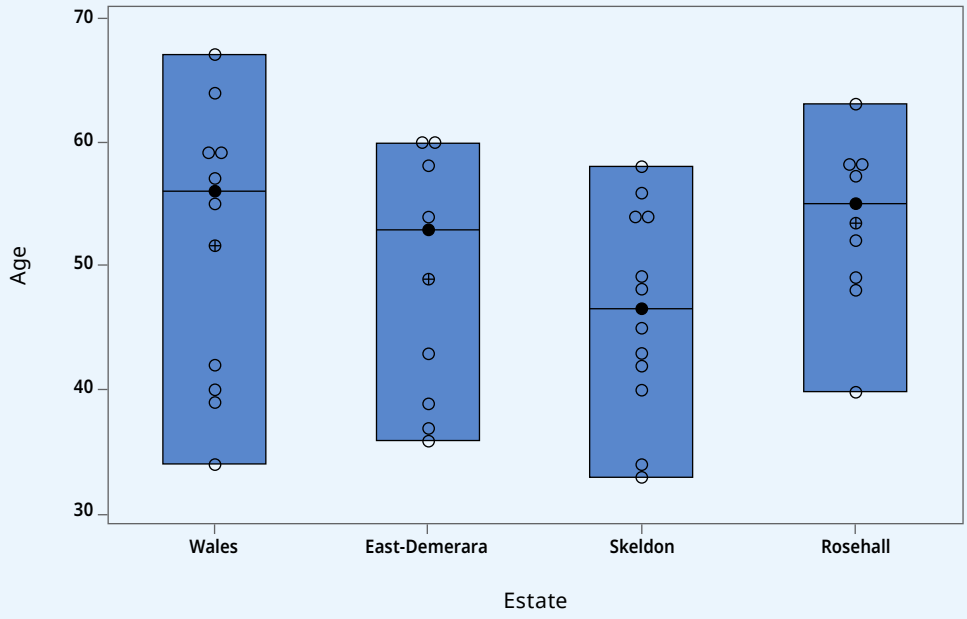
Below are the responses to questions on each respondent's capabilities, assets and economic activities that contribute to his or her livelihood as head of a household. After the various responses are presented, there will be a concluding discussion on what are the implications for the livelihoods of workers that were laid off when the sugar estates were closed.

3.3.1. Capabilities

1. Background and beliefs

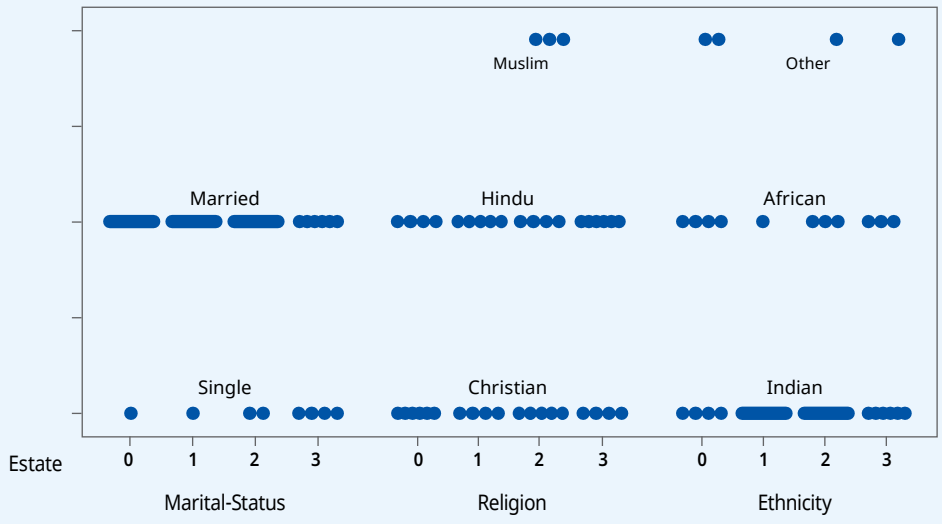
The average age of respondents across all the four closed estates was 50 years, with workers at the Rose Hall Estate being on average the youngest, with an average age of 46 years. Some of the respondents that were laid off were quite young in their careers, while most would have found that they were too advanced in age to be considered by new employers, especially in the context of wider unemployment in the country.

▶ **Figure 3.1. Age of laid-off workers, by estate**



As can be seen from Figure 3.1. above most of the respondents were married (80 per cent), Hindu (46 per cent) and Indo-Guyanese (63.4 per cent), though a significant number were Christian (44 per cent) and Afro-Guyanese (26.8 per cent). Additionally, Figure 3.2. below shows that most of them were also from stable families.

▶ **Figure 3.2. Marital status, religion and ethnicity of laid-off workers, by estate**

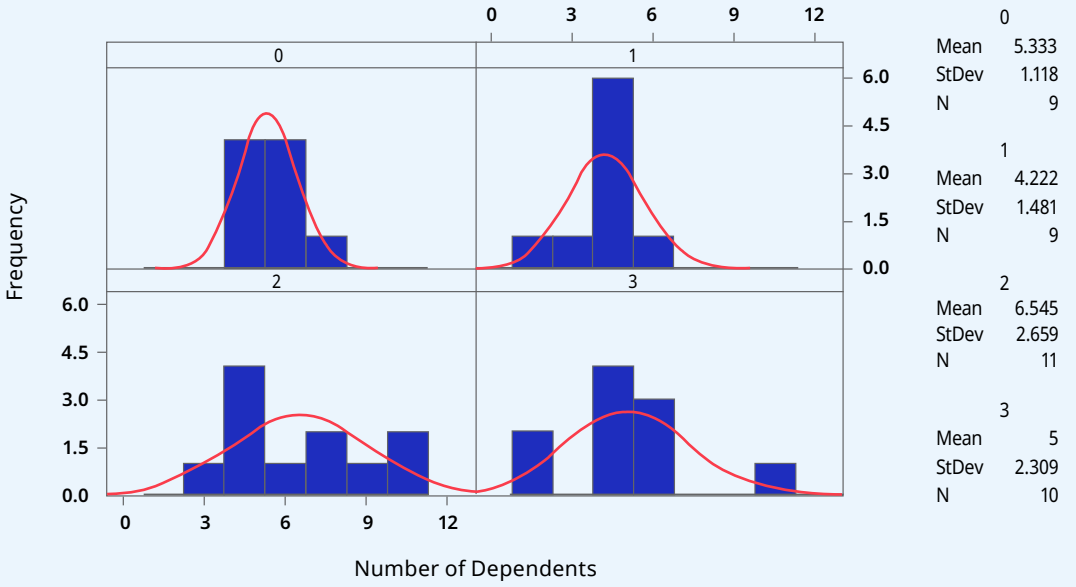


Estates: 0 - Wales, 1 - East-Demerara, 2 - Skeldon, 3 - Rosehall

2. Skills

Respondents were asked to state the number of children and other family members who depended on the head of the household.

▶ **Figure 3.3. Family size: Number of children and other dependents**



0 - Wales, 1 - East-Demerara, 2 - Skeldon, 3 - Rosehall
Panel variable: estate

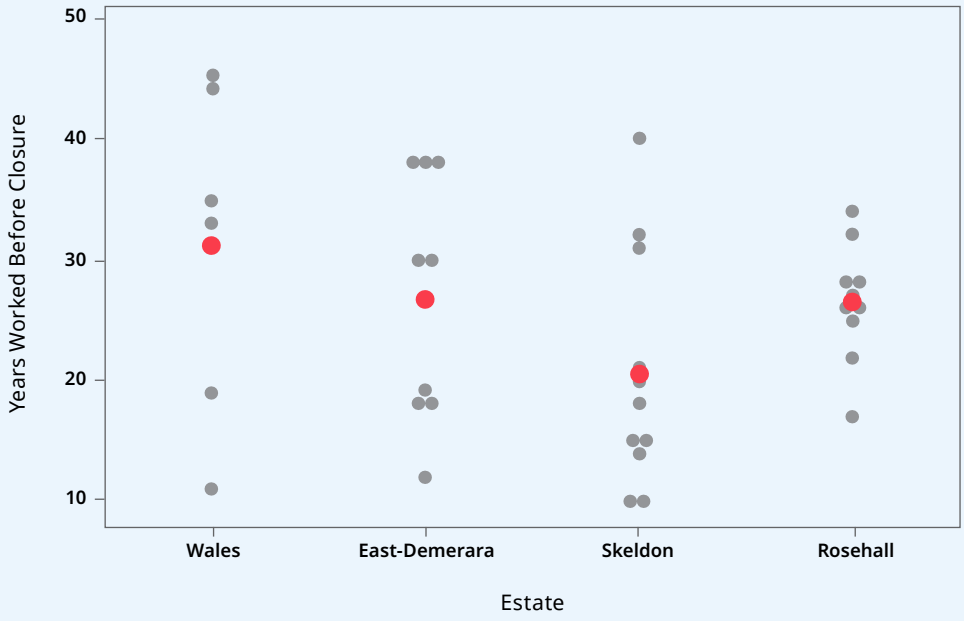
The overall average number of dependents was 5.3, with the average size being largest in Skeldon (6.5) and the lowest being East Demerara (4.2). 62 per cent reported that they still had children going to school and their career aspirations, included becoming teachers, nurses, policemen and doctors. Several of the respondents pointed out that even if they were able to send their children to school, they were unable to pay the fees for writing the exams, though in some cases, the severance payments were received in time to allow them to pay the fees.

Taken together, one might conclude that the respondents had stable backgrounds, characterized by faith-based, family-oriented values and they were clearly exposed to and worked with people of diverse ethnicities. The sense of solidarity with each other was strong among all respondents and all focus groups.

These observations are important at two levels. First, there is good reason to believe that this tendency for laid-off workers to all share similar backgrounds and values might have in some way been the result of having been employed by the same company, in the same industry, living together in communities that developed around the estates, doing similar work, and facing similar challenges – including the challenge of having been made redundant. Second, it would seem reasonable to also expect that this background would have either enabled the affected workers to do well if they were to find alternative employment to support their families, or to share a similar sense of resignation if their families were threatened by an inability to find alternative employment.

Respondents were asked to state how many years they worked with GUYSUCO before they were laid off.

▶ **Figure 3.4. ¬Service to GUYSUCO before closure of estates, by estate**



Mean number of years indictaed by red dots.

For laid-off workers whose skills were very specific to their jobs at GUYSUCO, the most important factor in determining their income earning capabilities to achieve their agency was their years of experience with GUYSUCO. This, as the workers realized, could have both good and bad effects. First, the average worker had 26 years of experience with GUYSUCO, with almost 50 per cent having more than that amount of experience.

Skills such as those acquired from working for GUYSUCO largely doing manual labour would not count as human capital that can serve to find comparable alternative jobs, as these skills are quite specific to things such as cane harvesting.

To the extent that such comparable alternative employment was difficult to secure, the threat to livelihoods from the closure of estates was even larger.

3. Access to opportunities

Of those who found alternative employment, about 81 per cent were able to get part-time jobs; full time alternative employment was not readily available.

An important aspect of working for GUYSUCO was that employees were transported to their jobs by the company. This not only meant that there was no need to deduct transportation costs from workers'

earnings to arrive at how much was available to support their livelihoods, but it also meant that having to pay for transportation to a new, alternative, job would have effectively decreased laid-off workers' access to opportunities.

To the extent that they were able to find employment after the closures, all workers had to bear their own transportation costs, the highest being at Wales. Weekly transportation costs amounted to an average of G$1,200 or 6.5 per cent of weekly household income, which itself had fallen dramatically.

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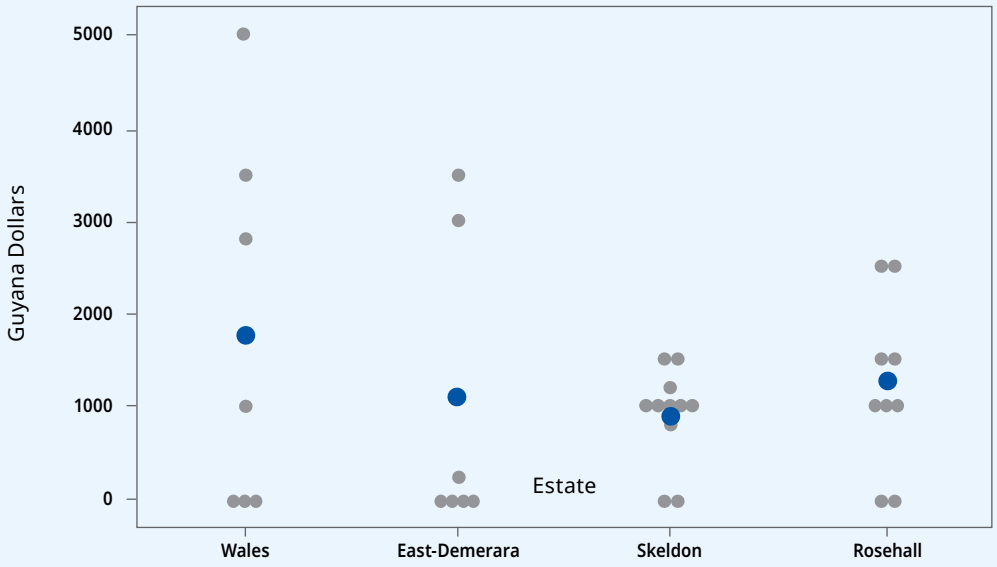
Respondents who were able to find employment after being laid off (see below, Sec. 3.3.3) were asked to estimate their transportation cost to their new employment.

▶ Figure 3.5. Laid-off workers' cost of travelling to new job, by estate



Access to opportunities could have been enhanced by the company itself, and also by the unions. A common theme among the respondents was that the labour unions, primarily the Guyana Agricultural and General Workers' Union (GAWU) and the National Association of Agricultural, Commercial and Industrial Employees (NAACIE), were unable to assist workers in finding or creating employment. In fact, 94 per cent and 97 per cent of the respondents said that they had not received help from GUYSUCO or the Unions respectively, to find new jobs.

This finding was the perception of respondents in the focus groups, but GAWU pointed out that it did engage companies which desired labour, though "the need very much outstripped the want but we did the best in our circumstances." [10]

10 GAWU Comments on first draft of the report, 24 August 2020.

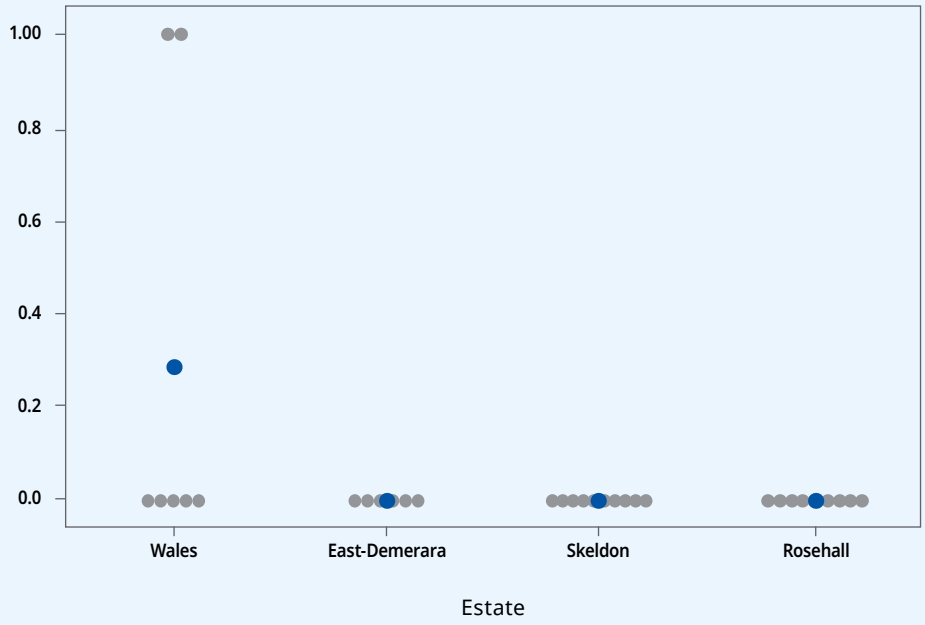
Focus group respondents indicated as well that no assistance was given by the unions for technical training, but that the role of the union was restricted to representation. GAWU did however indicate that it had in fact produced a paper on the transition of workers, and that it had set out some of the bottlenecks that it envisaged. A proposal for funding to address the needs for a just transition for workers was submitted to the EU, but did not receive funding.

3.3.2. Assets

1. Human capital

Respondents who were able to find employment were asked to compare their new jobs with the ones they did at GUYSUCO.

▶ **Figure 3.6. Difference between current job and GUYSUCO**



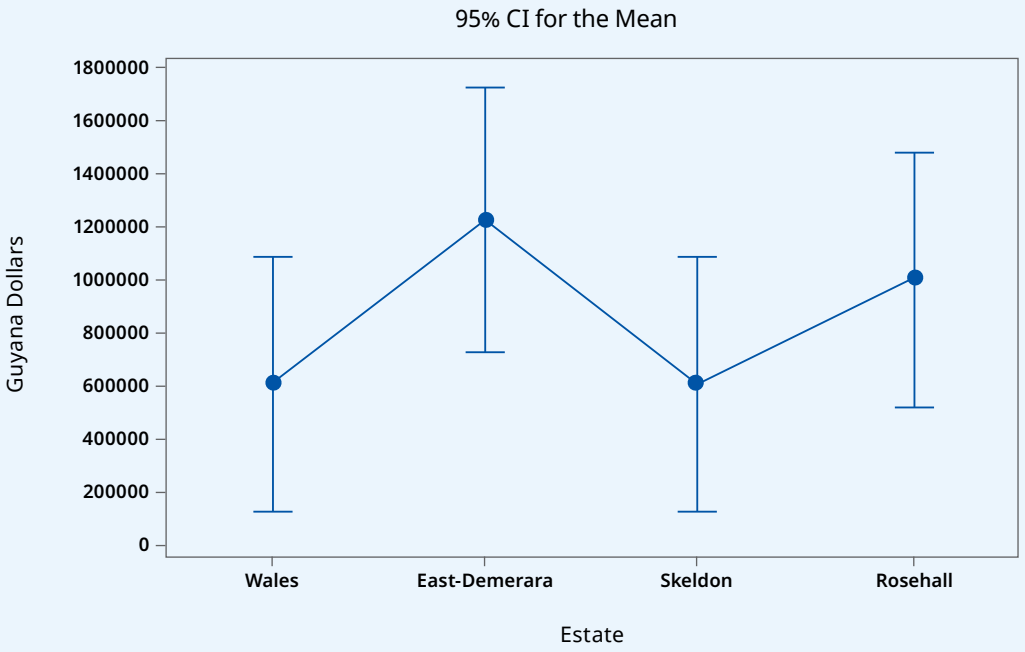
While at the macroeconomic level it is now well known that human capital is a key source of (endogenous) growth, at a more disaggregated level it is a key factor in the livelihoods of people. It was noted that manual workers, who constituted the majority of those laid off, hardly had any human capital. What they had however were the skills they acquired while working at GUYSUCO. It was also pointed out that these skills, such as the manual harvesting of cane, were quite specific to the sugar industry.

Figure 3.6. above shows that most workers (94 per cent) who found jobs, were doing similar jobs to the ones that they did at GUYSUCO (indicated by a score of 0 in the diagram). However, this was only in the very general sense that the work they found was “manual” and in that particular sense, appeared to have been low-income and low-skilled.

2. Financial capital

Respondents were asked if they were paid the severance due them.

▶ **Figure 3.7. Amount of severance received by respondents, by estate**



The pooled standard deviation is used to calculate the intervals.

The severance paid to a worker averaged across the four estates was at G$838,177. The averages for Wales, East Demerara, Skeldon and Rose Hall were G$613,800, G$1,227,642, G$509,666 and G$1,001,600 respectively. Notably, East Demerara and Rose Hall were significantly above the industry mean and almost double the amount of the other two estates. It is not clear why this was the case.

Overall, an estimated 27 per cent of redundant workers received severance that exceeded one million Guyana Dollars, 17 per cent received no severance or were yet to receive (at the time the interviews were conducted), 32 per cent received more than half a million dollars but less than a million dollars, and 24 per cent received between one dollar and half a million dollars. 31 out of the 41 respondents reported that they had not received their payments on time.

Table 3.3. shows that workers at the the Wales and Skeldon estates received lower severance payments on average than East Demerara and Rose Hall. The question however is whether there was a statistically significant difference in severance payments across all four estates, as this might mean that the observed difference was in some sense structural in nature. An ANOVA test comparing means yielded an F-Statistic of 1.6 and a P-value of 0.2. We cannot therefore reject the null hypothesis of equal means, and so we cannot conclude that there was a significant difference in the average severance paid to workers across estates. Note that from the standard deviations, we can use the F-statistic because the largest sample standard deviation is no more than twice as large as the smallest.

▶ **Table 3.3. Severance payments to workers across closed estates**

Estate	No.	Mean	Standard deviation	95% CI
Wales	10	613 800	720 611	(137 997, 1 089 603)
East Dem.	9	1 227 642	857 747	(726 102, 1 729 182)
Skeldon	10	611 600	535 234	(135 797, 1 087 403)
Rose Hall	10	1 001 600	822 470	(525 797, 1 477 403)

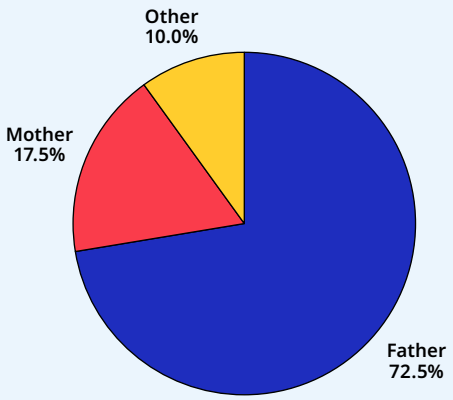
3. Social capital

Membership in civic organizations is regarded as an important element of the social capital that forms the "glue" of society and of persons living in communities. Social capital could be positive, as would be the case when people have a shared sense of family – or community-oriented values, or a shared sense of responsibility towards the environment. It could also be negative, as would be the case when people have a shared sense of distrust, or that most persons in a community engage in criminal activities, either because this is the empirical norm, or because this is what is deemed appropriate behaviour because of circumstances, for example (Bicchieri 2006).

These "shared-values" elements of social capital operate at the level of the community, and to some extent, at the level of the family. There is an important feedback between communities and families as communities are usually based on strong family values. In this regard, the role of fathers is a significant one if, as the main income earners, they are the 'heads of the household' who set the tone for family values – though this is not to discount the very significant role played by women in families in the sugar belt. Figure 3.8. below shows that, 72.5 per cent of respondents reported that fathers were the main providers of income for the households. The implication of this therefore, is that a loss of jobs by fathers, who represented the large majority of the laid-off persons, could have at a minimum disrupted the relationship between communities and strong family values.

Respondents were asked who the main earners in the household were.

▶ **Figure 3.8. Main provider of income for household**



All the respondents were affiliated with a union (GAWU) even though only 19.5 per cent had been up-to-date with their union dues.

As was noted earlier in the section on Background and beliefs, 90 per cent of the respondents identified as Hindu or Christian, suggesting that they, along with those who were Muslim, would have in some fashion participated actively in religious organizations.

59 per cent of the respondents said that they did not get any help from their extended family after the closure of the estates. This was a surprising result as the support of the extended family is important to the livelihoods of people in the sugar belt. On the other hand, it was also probably understandable as the extended family might also have faced lay-offs, or else would have been faced with the risk of lay-offs.

3.3.3. Economic activities

Respondents were asked if they were working.

▶ **Table 3.4. Number of laid-off persons still unemployed (December 2019)**

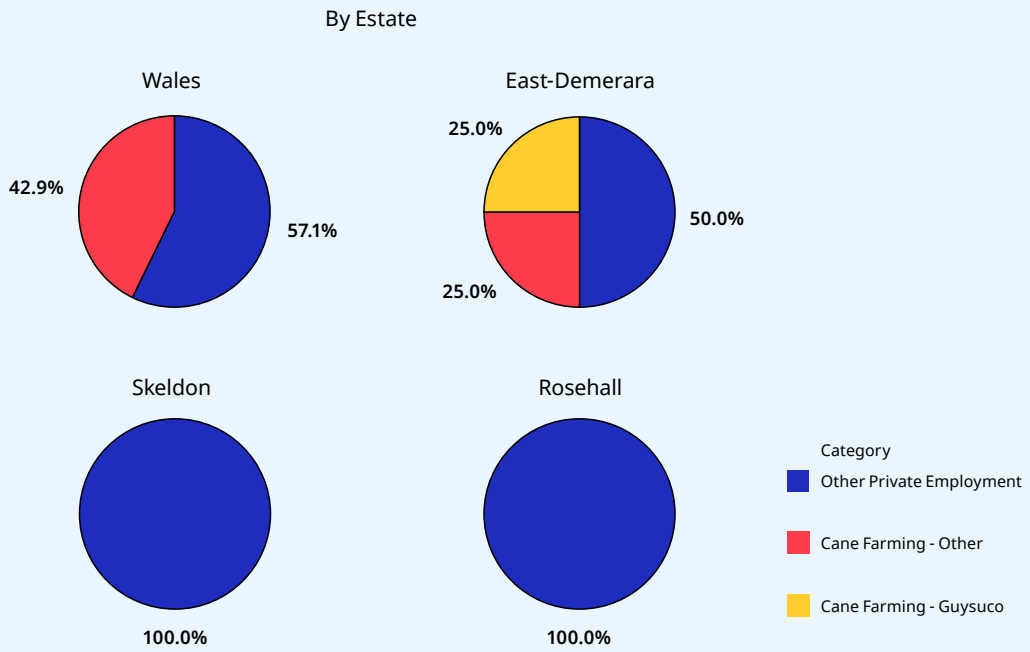
Estate	Unemployed
Wales	60%
East Demerara	55%
Skeldon	12.5%
Rose Hall	20%

As highlighted in Table 3.4. above, redundant workers found it difficult to obtain new employment. Many of those who did find new jobs were employed on a part-time or seasonal basis. The highest continuing unemployment rates among the respondents in focus groups, occurred at the Wales and East Demerara estates, at 60 per cent and 55 per cent respectively.

The unemployment rates among the respondents drawn from the Berbice estates were lower, with Skeldon and Rose Hall unemployment rates pegged at 12.5 per cent and 20 per cent respectively. In Rose Hall, many of the laid-off workers found part-time work.

As shown in Figure 3.9. below, other laid-off workers found employment in private cane farming, some were re-absorbed by GUYSUCO, while others found different forms of employment.

▶ **Figure 3.9. Economic activities of households outside the home**



3.3.4. Respondents' evaluation of livelihoods of laid-off workers

The foregoing discussion could be summarized by considering the evaluation by the respondents themselves of their sense of well-being compared to when they worked with GUYSUCO.

▶ **Figure 3.10. Individual's welfare now, compared to working with GUYSUCO**

As can be seen from the diagram above, only one respondent, a female, felt that she was better off compared to when she worked with GUYSUCO. While she was the only person among those interviewed to have identified herself as better off, this finding reflects the intuition that empowering women and reducing gender inequality are key to overcoming poverty and indeed, to achieving the United Nations Sustainable Development Goals (SDGs). [11]

That said, given the age of laid-off workers, their lack of transferable skills, limited access to opportunities, and so forth, it does not come as a surprise that respondents felt that they were worse-off after the closures than before.

3.4. Livelihood sustainability

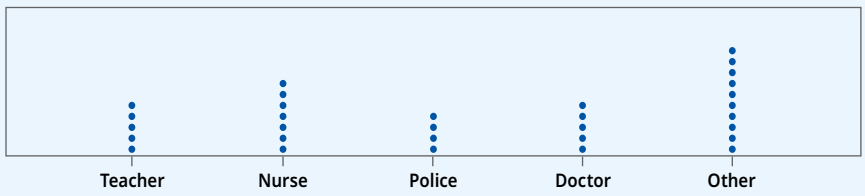
This section focuses on the ability of laid-off persons and their families to respond to the shocks that were caused by the closure of the sugar estates, taken individually and together.

3.4.1. Capabilities

1. Background and beliefs

Respondents were asked to state the career aspirations of their children.

▶ **Figure 3.11. Career aspirations of children**



A famous saying among cane-harvesters is that no cane-harvester wants his children to become cane-harvesters. Out of the 41 respondents, only 9 were unable to state the career aspirations of their children. In any given family, the career aspirations of children are a reflection of what the family considers possible and reasonable for the child to expect, and the goals that are embraced by both the child and the family. These aspirations are therefore not to be dismissed, but they can indeed form the basis of the family's ability (and motivations) to rise out of any poverty trap that might have kept the family in the sugar belt over the years. [12]

11 UN Secretary General's High Level Panel on Women's Economic Empowerment, Leave No One Behind: A Call to Action for Gender Equality and Women's Economic Empowerment.

12 In this regard it is certainly noteworthy that Dr. Mahendra Carpen, FACP FESC FACC, Head of Internal Medicine/Cardiology, Georgetown Public Hospital Corporation; Director of Electrophysiology, St. Clair Medical Center, Port-of-Spain Trinidad; and Consultant Cardiologist, Caribbean Heart Institute, Georgetown, Guyana, was himself the son of a "cane-cutter".

▶ **Table 3.5. Suicide increases since the closure of estates**

Estate	Yes
Wales	33%
East Demerara	12%
Rose Hall	100%
Skeldon	100%

In the final question on social impact, respondents were asked if there was an increase in suicide since the closure of the estates. The responses, summarized in Table 3.5. above, were stark; in Rose Hall and Skeldon every respondent noted 'yes'. This is dramatically different from Wales and East Demerara where 33 per cent and 12 per cent of respondents respectively noted 'yes'.

This perception by focus-group participants in Rose Hall and Skeldon, that the closures were associated with an increase in the suicide rate in their communities could be biased. This is because Berbice, the county in which Rose Hall and Skeldon are located, is known to have the highest suicide rate in the country and is even known as the 'suicide capital of the world'.[13] But the stark difference between the perceptions of participants in Rose Hall and Skeldon and those in Wales and East Demerara might also suggest that there were more suicides in Rose Hall and Skeldon in response to the closures. This would be consistent with a view that suicide is culturally determined, and that suicide ideation is more prevalent in communities with higher suicide rates.

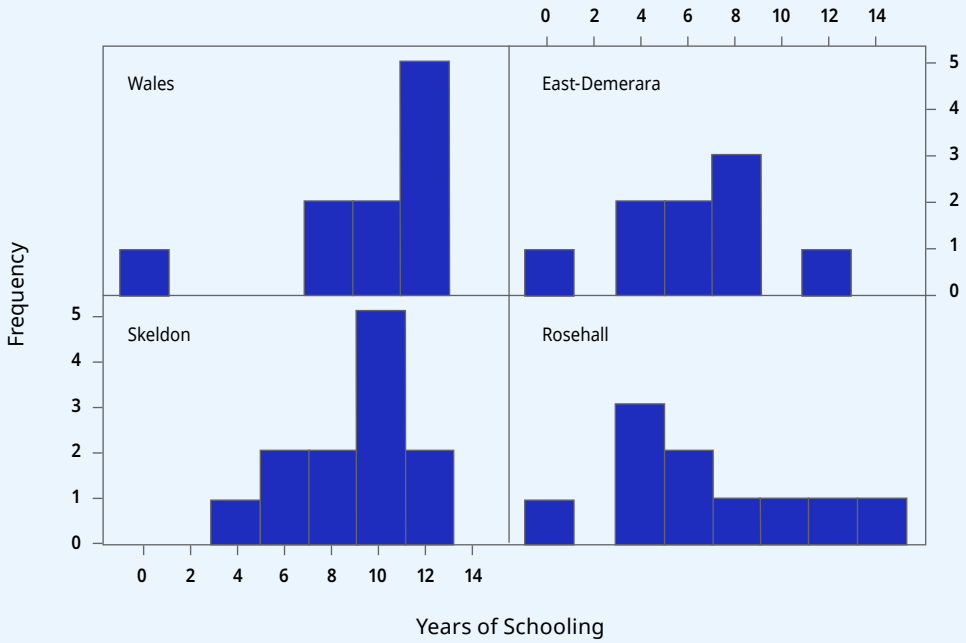
2. Individual Educational Attainment

Individual educational attainment was not considered in the discussion of livelihoods because employment at GUYSUCO, at least for the majority of respondents, did not require any extensive or specialized schooling. Conversely, for the sustainability of the livelihoods of workers who were laid off, individual educational attainment could serve to enable them to better withstand and respond to the shock to their livelihoods.

13 Guyana now has the third highest suicide rate (29.2 persons per 100,000) in the world, a significant improvement over the 44.2 persons per 100,000 reported by the World Health Organization (WHO) in 2014. See Suicide Rate by Country 2021.

The respondents were asked to indicate their highest level of schooling and the highest class of that level. This data was then used to quantify years of schooling for each respondent.

▶ **Figure 3.12. Histogram of education, by estate**



The average years of schooling was 7.5 across all estates, which is just a little more than primary school education, which ends in Grade or Year 6. Beyond this, the average years of schooling at Wales and Skeldon were 9.2 and 8.4 respectively, while the corresponding figures were 6.0 and 6.4 for East Demerara and Rose Hall. It is highly unlikely that their individual educational attainment would have assisted workers to respond creatively to the shock of being laid off.

3. Access to opportunities

A measure of 'access to opportunities' that would be meaningful for the discussion of the sustainability of livelihoods after the shocks of estate closures was taken to be the ability of family members to work. 38 per cent of the respondents said that their children were working. [14]

14 While there was no question about it, the discussions in the focus groups did not reveal that the children who were working were below the minimum age.

3.4.2. Assets

1. Human capital

62 per cent of the respondents said that they had children going to school. Several of the respondents pointed out however that even if they were able to send their children to school, they were unable to pay the fees for writing the exams, though in some cases, the severance payments were received in time to allow them to pay the fees. While not asked specifically about this, the respondents did not mention whether their children had dropped out of school after the closures.

2. Financial capital

93 per cent of the respondents owned their homes, though many were still paying mortgages. Indeed, the severance payment was used by many of the respondents to (partially or fully) pay off those mortgages. Hence many people had good reason to continue living in their communities and to enjoy the stability that came from not having to move.

3. Social capital

Respondents were asked if alcohol consumption and crime increased in their communities after the closure of the estates.

▶ **Table 3.6. Increase in alcohol consumption after estate closures**

Estate	Yes
Wales	80%
East Demerara	44%
Rose Hall	100%
Skeldon	63%

According to the respondents, alcohol consumption indeed increased in their communities after the closures, as shown in Table 3.6. above. Similarly, a perceived increase in crime was experienced in all the communities affected by the estate closures.

As indicated in Table 3.7. below every respondent from East Demerara and Skeldon said that there was an increase while in Rose Hall and Wales, 90 per cent and 80 per cent of the respondents respectively said that there was an increase in crime.

▶ **Table 3.7. Increase in crime after estate closures**

Estate	Yes
Wales	80%
East Demerara	100%
Rose Hall	90%
Skeldon	100%

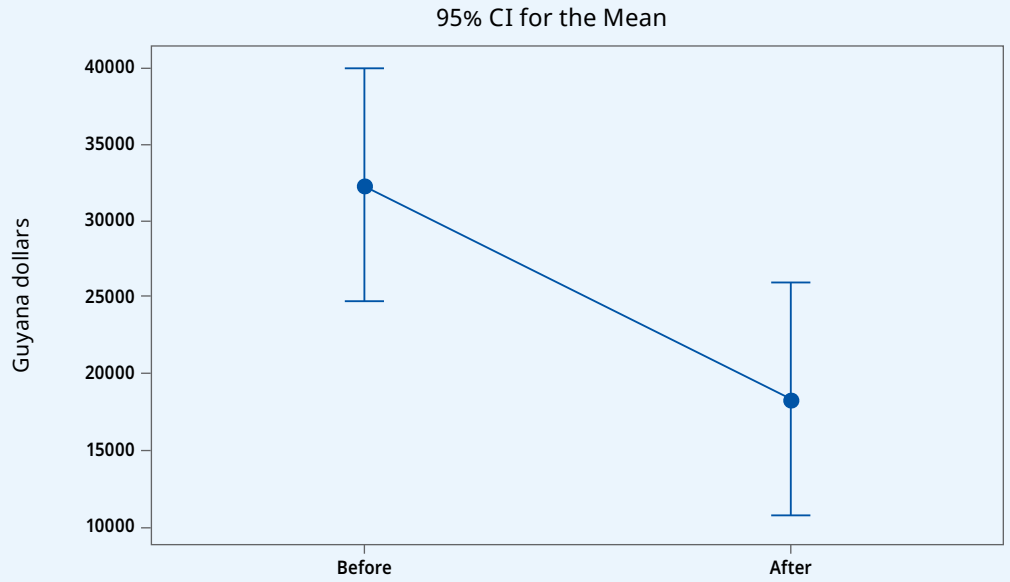
Neither of these findings (the increase in alcohol consumption and crime), even if anecdotal, is surprising. The workers affected by the closures had more leisure time, even if their incomes were lower. Alcohol is relatively cheap in Guyana, and the prevalence of excessive alcohol consumption in rural communities and in the sugar belt in particular is a known, if undocumented, fact of life. An increase in crime is not unrelated to an increase in substance abuse itself, but beyond that, many of the factors that lead to an increase in substance abuse also lead to an increase in crime. This includes the loss of income, unemployment, and the despair and the seeming hopelessness that arose in the households and communities after the closures. These things undermine the very social capital from which workers, their families and communities could have benefitted as they learnt to deal with the closure of estates in a manner that would sustain their livelihoods.

3.4.3. Economic activities

Respondents were asked to indicate the difference between their household income before and after the closures.

The mean household income after termination was significantly below what the household earned before termination. In particular, at the five per cent significance level we reject the null hypothesis that the mean household income before and after termination was the same. We can use the F-test because the standard deviation of the larger sample was almost as large as the standard deviation of the smaller sample.

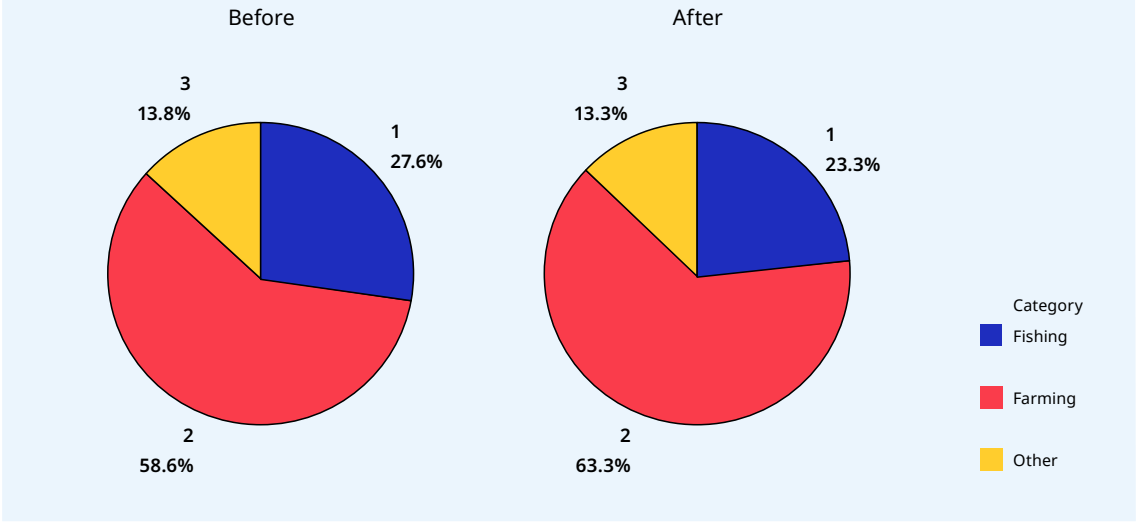
▶ **Figure 3.13. Weekly household income before and after termination from GUYSUCO**



The pooled standard is used to calculate the intervals

Respondents were also asked to compare their economic activities outside of sugar, before and after the closure of estates.

▶ Figure 3.14. Household economic activities, before and after closure of sugar estates



Since the closures, there has been an increase in farming, and a small reduction in fishing. The distinct impression however was that there was not much of an increase in other, non-sugar economic activities at the household level, as reported by respondents.

This might reflect several things. First, respondents' other economic activities might already have been at an optimum level, given the assets at the disposal of workers and their families. For example, increases in farming beyond the needs of the household would have made sense only if there was a demand for increased farm (kitchen garden) output, but if incomes had fallen dramatically in the community, such demand would not have existed.

Second, it reflects how dominant the sugar estate was in the economies that grew up around them. We were told about the many failed efforts to find alternative employment, or to start doing things that could have earned income. The harsh reality was that no one seemed to be in a position to afford additional expenditure on hiring people or buying new goods and services in the community.

Finally, it became clear as well that something akin to the 'discouraged worker hypothesis' was at work among the respondents. Many had simply given up, and almost all were just hoping that the sugar estates would be reopened. There just seemed to have been no alternative for the respondents.

3.4.3. Evaluation

Respondents were asked to evaluate the welfare of their households after the closure of the estates. 1 represented not better off and 0 represented better off.

▶ **Figure 3.15. Individual's subjective evaluation of well-being after closure**

As the shock that was being considered was very specific, namely the closure of sugar estates, respondents were asked to compare the welfare or well-being at the time of their participation in the focus groups, with their welfare or well-being after the closures, having had almost 24 months to adjust.

This framing of the analogous question for the assessment of the impact of the closures on livelihoods entailed asking respondents to evaluate their well-being "when working with GUYSUCO". The difference is that they were now specifically being asked to consider their well-being in the "after-closure state" of their lives and personhoods, without reference to the company to which they might have felt some emotional connection, either positive or negative.

3.5. Livelihood security

Livelihood security can only be meaningfully discussed if future contexts, constraints and opportunities for persons, households and communities are considered along with the current effects of a particular shock.

Having been laid off from GUYSUCO, workers have to face a new reality of an economy that has become an oil producer and exporter. The implications of this, and particularly of the possible "Dutch Disease" phenomenon [15] that might arise, are discussed in section 6.3.5, but the key factors that were considered in evaluating the security of livelihoods that depend on the growth of the oil and gas sector included whether respondents were willing to consider working in that sector, had access to retraining opportunities, were willing to relocate if jobs outside of the sugar industry became available, or were only interested in jobs that required no relocation and/or no retraining. The discussions in the focus groups were therefore structured to extract some sense of the readiness of respondents to deal with the new reality of Guyana becoming an oil producer.

3.5.1. Capabilities

1. Background and beliefs

42.5 per cent of the respondents indicated that people in their communities are thinking about getting jobs in the oil and gas sector. This has potential to lead either to a more or a less secure livelihood for dismissed sugar workers.

In the first instance, it means that just under half of the respondents were thinking about their future livelihoods outside of sugar and were willing to consider taking steps to become employable in the sectors that might develop around oil and gas, and in the sectors such as infrastructure development that might arise from the Government spending of oil revenues.

On the other hand, this readiness to move away from sugar might mean that any effort to revitalize the sugar industry might confront a serious challenge of a labour shortage, or that might demand higher wages to return to jobs in the sugar industry. While the risk of this happening might be low at this time when oil production has just begun, and while it may be low for workers in the agricultural operations of the sugar industry, that risk will rise as oil revenues increase and as other categories of workers are considered.

To the extent that there will be a labour shortage created by laid-off workers' expectations, any attempt to revitalize the sugar industry to provide employment will face serious risks that could compromise livelihood security for laid-off workers.

15 The Dutch Disease phenomenon, which refers to the loss of competitiveness of traditional export sectors due to an appreciation of the real exchange rate, would place enormous pressure on any of Guyana's traditional exports.

Respondents were asked if they were worried about their future after estate closures.

▶ **Table 3.8. Respondents' worry about the future**

Estate	Average score
Wales	9.80
East Demerara	9.77
Rose Hall	10.00
Skeldon	10.00

On a scale of 1 to 10, with 10 being the most worrisome, laid-off workers were asked to gauge how worried their communities are about their economic future. Skeldon and Rose Hall respondents all responded by saying that they were most worried, as shown by an average score of 10 in Table 3.8. above. There was a small deviation in scores from Wales (9.8) and East Demerara (9.77). The closed estates' average of 9.9 depicts a grim economic outlook for GUYSUCO communities.

2. Access to opportunities

73.1 per cent of the respondents indicated that members of their communities who used to work with GUYSUCO have not found jobs as yet. This is not surprising, considering the dominance of the sugar estate in the economies of the surrounding communities. It could also mean that, even when the interviews were being conducted, a large fraction of workers were depending on the revitalization of the sugar industry to provide them with jobs. As mentioned before, it was already known at the time of the interviews that elections would have been held in three months' time. While this would certainly allay concerns about a possible labour shortage after investments have been made to reopen sugar estates, it will not be sufficient to consider the availability of workers for agricultural operations, as sugar factories and management positions will also need workers who might not be available in the new economy.

3.5.2. Household and community assets

1. Social capital

▶ **Table 3.9. Respondents' perception of departures from estates**

Estate	Per cent
Wales	90%
East Demerara	67%
Rose Hall	88%
Skeldon	100%

To gauge the social impact that the closure of the estates had on communities, respondents were asked if persons left their respective communities after the closure of estates. In Skeldon, all of the respondents noted 'yes'. Further, in Wales and in Rose Hall, the numbers were slightly lower at 90 per cent and 88 per cent respectively. The lowest response came from the East Demerara Estate, at 67 per

cent. It is noteworthy that the lowest percentage of respondents to have indicated that persons had left the community was in East Demerara, as it is in this area that there was a greater likelihood of people finding alternative jobs that were within travelling distance. If this represents what has happened across the communities, the possibility of a labour shortage is indeed significant, and higher wages than before the closures might be required as the community life (social cohesion) that might have contributed to keeping people on the estates has now been disrupted.

3.5.3. Economic activities

▶ **Table 3.10. Economic sectors that have absorbed laid-off workers**

Estate	Sectors
Wales	Agriculture (50%), Self-employed (50%)
East Demerara	Laborers (75%), Agriculture (25%)
Skeldon	Laborers (55%), Agriculture (27%), Other (18%)
Rose Hall	Security (25%), Domestic services (37.5%), Others (37.5%)

Most of the workers found jobs as unskilled labourers in construction or doing handyman work, agriculture or some basic economic activity of their own. This is largely characteristic of communities nearing estates. Agriculture, primarily rice, small farming/kitchen garden, and subsistence fishing were activities used to supplement persons' GUYSUCO earnings, even when the estates were fully operational.

The single anomaly in the data was security employment (25 per cent) in and around the Rose Hall Estate.

3.6. Willingness to pay to reopen closed estates

The final and perhaps most interesting statement on the socio-economic impact of the closure of the four estates could be inferred from the responses to the question on the willingness of workers to pay to restart or reopen the closed sugar estates.

Before this question was posed to the respondents, they were asked to state how much they earned and how much they spent per month to sustain their livelihoods. These questions, which are usually recommended for "willingness to pay" studies, were intended to ensure that respondents made realistic estimates of how much they were willing to pay to reopen the estates. An individual's willingness to pay to do something is a measure of the value that that individual attaches to whatever is being discussed.

Responses were computed as the number of days' pay per month that workers were willing to sacrifice to reopen the factories, as shown below. As a measure of willingness to pay, the respondent in the focus group interviews was asked to quantify what sacrifice they were willing to make to reopen the closed estates. This was done in terms of the daily work rate, meaning the salary for a day's work.

Of all the estates, the Skeldon Estate had the highest willingness to pay at almost two days (1.83) per respondent, followed by Wales at 1.6 and East Demerara and Rose Hall at 1.11 and 1 respectively. On average, laid-off workers were willing to pay an average of 1.4 days' pay to reopen the estate. The greatest deviation from the average came from Skeldon at 0.43 and Rose Hall at 0.4.

Respondents were asked how much they would be willing to pay to reverse the closure of the estate whose closure affected them.

▶ **Table 3.11. Number of days' pay workers were willing to give up to reopen estates**

Frequency	Wales	East Demerara	Skeldon	Rose Hall
1	1.00	1.00	1.00	1.00
2	1.00	1.00	1.00	1.00
3	1.00	1.00	2.00	1.00
4	2.00	2.00	2.00	-
5	1.00	1.00	2.00	1.00
6	4.00	1.00	3.00	1.00
7	1.00	1.00	2.00	1.00
8	1.00	1.00	2.00	1.00
9	1.00	1.00	2.00	1.00
10	3.00	-	1.00	1.00
11	-	-	3.00	-
12	-	-	1.00	-
Average	**1.60**	**1.11**	**1.83**	**1.00**

3.7. Conclusion

This chapter has employed the sustainable livelihoods framework to consider the socio-economic impact of the closure of the four sugar estates on affected workers, their families and their communities. The results show that the livelihoods of sugar workers who were laid off were severely compromised. It is necessary to take into consideration the fact that the focus groups were conducted in December 2019, some time after the closure of the estates. By then, workers had made adjustments, including moving out of the sugar sector entirely. Even though life was clearly better when the estates were in operation, and though most of them would have welcomed getting back their jobs, the revitalization of the sugar industry would require far more than the collective willingness of workers to pay for the re-opening of the closed estates.

While the sustainable livelihoods framework has proven to be extremely useful in organizing and discussing the socio-economic impacts of the closure of the four estates, the rest of the report is necessarily more forward looking and more analytical, as the ultimate interest is in developing a framework that would be useful in addressing the future prospects of the sugar industry and of the livelihoods of sugar workers. To do this, due consideration was given to the need to develop a framework that would be consistent with the ILO's Decent Work Agenda that emphasizes productive work that yields a fair income to workers, workplace security and family social protection. All the ensuing chapters taken together constitute what might be considered a framework for a national strategy for investment and diversification, because without such a framework, attempts to mitigate the socio-economic fallout of the closure of the estates would prove difficult, if not futile.

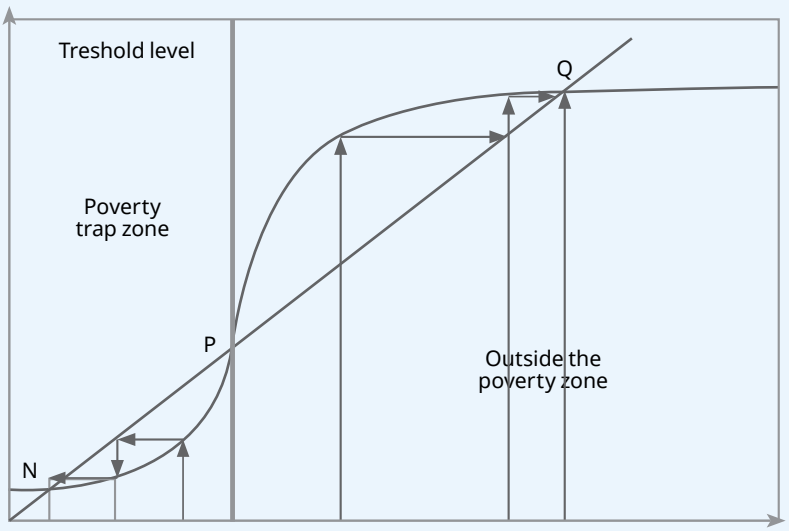
4

Estate closures and poverty

The livelihood security categories, though very useful for considering the socio-economic impact of the closure of sugar estates, can be related to poverty which is a more widely used, more measurable and commensurable, and more analytically developed notion. While it is recognized that well-being goes beyond income, a great deal of information can be summarized by measures such as the amount a person earns per day, average consumption, the nutritional value of food, and so on. The first order effect of the closure of sugar estates was the loss of income of the affected workers. At the individual and the household levels, consumption, nutritional value of meals, and indeed the range of capabilities that give a person agency would have been affected. So too would have been community-level opportunities.

It is useful to note that even while they were employed at sugar estates, workers invariably had a portfolio of other economic activities such as cultivating kitchen gardens, fishing, rearing livestock, and so forth, to supplement their incomes and more particularly to reduce the risks associated with working on sugar estates. With the closures however, the affected sugar workers lost their primary source of income. Figure 4.1 shows the likely effect of this first order effect of the closures on the potential poverty of sugar workers.

Figure 4.1. The logic of poverty traps



Source: (Banarjee and Duflo 2011)

The responses given in the focus groups imply that the loss of primary income would mean that persons had to depend on the portfolio of activities that they had previously used to avoid being trapped in poverty. A poverty trap is said to exist if "poverty feeds on itself," as would happen if someone is earning so little that they are unable to afford to save enough, or to have enough energy to undertake respectively the investment or the productive effort that is required to lift themselves out of poverty. There are many sources of poverty traps – capital investment and nutritional deficiencies arising from low incomes being just two.

Figure 4.1. shows that if a person's income today (on the X-axis) is below some threshold amount indicated by the vertical line passing through the point P, their income will keep dwindling over time to some bare subsistence level. Above the threshold, income today is high enough for savings and investment (even in fertilizer) to be possible, raising income tomorrow (measured on the Y-axis) by increasing increments. Below the threshold level of income, the person is caught in a 'poverty trap,' and cannot exercise their agency to get out of it.

Sen (1999) argues that poverty is not just about income, which is all that has been discussed so far. Rather, it is about a person's capabilities, or ability to achieve the things they value. In turn, capabilities depend on entitlements, which are the totality of legal rights and obligations that define a person's command over the means of achieving the things they value. As such, a person's entitlements might not be sufficient to allow them to achieve the things they value. These are important ideas, easily accommodated in Figure 4.1. by an appropriate redefinition of the axes, which resonate with the aspirations harboured by cane harvesters, that by dint of their efforts their children might escape the cycle of poverty in which they might otherwise be trapped.

Figure 4.1. also displays a characterization of the potential outcomes of the counterfactuals to the closure of sugar estates, in terms of their potential to lift workers out of poverty. In this study there were various counterfactuals to consider, namely:

- The non-closure of the sugar estates without restructuring;
- The non-closure of the sugar estates with restructuring; and
- The closure of the sugar estates in a different manner – phased closure, with more consultation with unions and workers themselves, with more training for laid-off workers, and so forth.

The position of this study is that none of these alternatives to the actual process used for closure of the estates would represent a self-sustaining improvement in well-being, such as point Q in Figure. 4.1. The second alternative, which is somewhat like the re-opening of the sugar estates, could, if not done properly, lead to incomes below the threshold.

If the closure of the estates has compromised livelihoods and even increased the risk of poverty traps among sugar workers, any attempt to resolve the predicament of having some 5,000 workers without work must provide options that enhance livelihoods and reduce the risk of trapping people in poverty. The search for an alternative approach must therefore begin with a brief analysis of why the industry had reached the stage where closures made financial, if not economic, sense.

Addressing the problems created by the closure of the estates in a meaningful way requires an analytical background and context, however, if the decisions and factors that contributed to the closures are to be avoided. Chapter 5, below, considers briefly the single most important decision that was made about the sugar industry, to wit, the decision to nationalize it.

5

The nationalization of the sugar industry

Guyana's decision to nationalize the sugar industry must be seen as part of a post-independence economic policy programme, and as part of an ideological and philosophical stance on the achievement of economic progress and prosperity. Independence itself was achieved in 1966, and just ten years after, the sugar industry was nationalized. In fact, what was nationalized in this period was an entire range of largely complementary investments owned by the British conglomerate that controlled a large part of the Guyana economy. The Booker Brothers company – McConnell & Co., Ltd., group of companies, had large investments in tropical agriculture (mainly sugar), shops and wholesale distribution, engineering and industries, rum and produce, and shipping, pharmaceutical and printing industries as well as department stores and retail outlets (New York Times 1964).

While owned by one company, no doubt with group business strategies that supported overall company performance, the key economic feature of the Booker investments was that each of them created incomes that simultaneously became the effective demand of the other investments. This notion of demand spillovers is discussed extensively in the last chapter on the prospects for green industrialization, with the sugar industry as one of a set of complementary investments. It suffices at this point to say that several of the Booker investments were precisely in the nature of what is being recommended here under the rubric of *coordinated, complementary large-scale investments to provide for a big push to (green) industrialization*.

Before nationalization, this coordination (among business units) was in fact done by the management of the Booker group of companies, and it resulted in a network of investments that was profitable overall, even if any one of them would have been unprofitable had it been operating independently, without the effective demand created by the other companies in the group.

An important factor in the historical performance of the sugar industry was the Commonwealth Sugar Agreement (CSA), and subsequently the Sugar Protocol which came into effect when the UK became a member of the European Economic Community (EEC) in 1973. As pointed out by Davis (1967), this 1951 Agreement allowed the UK to purchase Guyana's sugar at premium prices that would offer "reasonable remuneration to efficient producers." Though it was long recognized that the cost of production in Guyana was relatively high, the premium prices ensured that the sugar industry owned by Bookers was highly profitable.

Added to this, there was a commodity price boom in the early seventies (1974–75) that led to a significant increase in sugar revenues and profits.[16] The political leadership of the country from both of the major political parties saw in sugar and the other multinational companies (mainly the bauxite company) the possibility of using the windfall revenues to transform the economy and society in ways that until then could not have been imagined. Indeed, the *Sugar Levy Act* was passed in 1974 precisely to finance economic transformation projects from the windfall revenues. [17]

▶ Box 5.1. Political and economic philosophy and the nationalization of the sugar industry

In the period immediately following independence, two broad strategies for economic development emerged in the former British Caribbean colonies. One strategy favoured industrialization through foreign investment that would lead to transfers of technology and finance, while the other urged a thorough transformation of Caribbean economies, including through nationalization of foreign companies, import substitution and changing the pattern of tastes, and developing industries based on domestic resources.

[Guyana opted for the latter strategy and used the windfall sugar revenues from the commodity price boom of 1973–1975 to pay for the nationalization of the sugar industry in 1976.]

An assessment of the responses to the crises indicates that Barbados's was characterized by a consensus on policies backed by an institutional capacity to implement them, a greater propensity to save, and access to financial markets. Partly as a result of its handling of these shocks, and also because of its diversified export base the country was able to maintain stability, recover from the recession in the first half of the 1980s, and achieve a recovery in the second half of the decade. Guyana's decision to use the sugar windfall to press ahead with the nationalization of the sugar industry in 1976 deprived the country of an important pool of savings. Moreover, the nationalization of sugar, occurring shortly after that of the bauxite industry in 1971, placed an unsupportable burden on the country's limited technical capacity and weak institutions in the context of the heavy emigration of skills. These factors, exacerbated by political tensions, resulted in Guyana's emergence from the first commodity boom with its international reserves exhausted. The response to this—the introduction of controls over imports and foreign exchange—led to severe distortions, promoted rent seeking, and disrupted economic activity.

Source: DaCosta (2007)

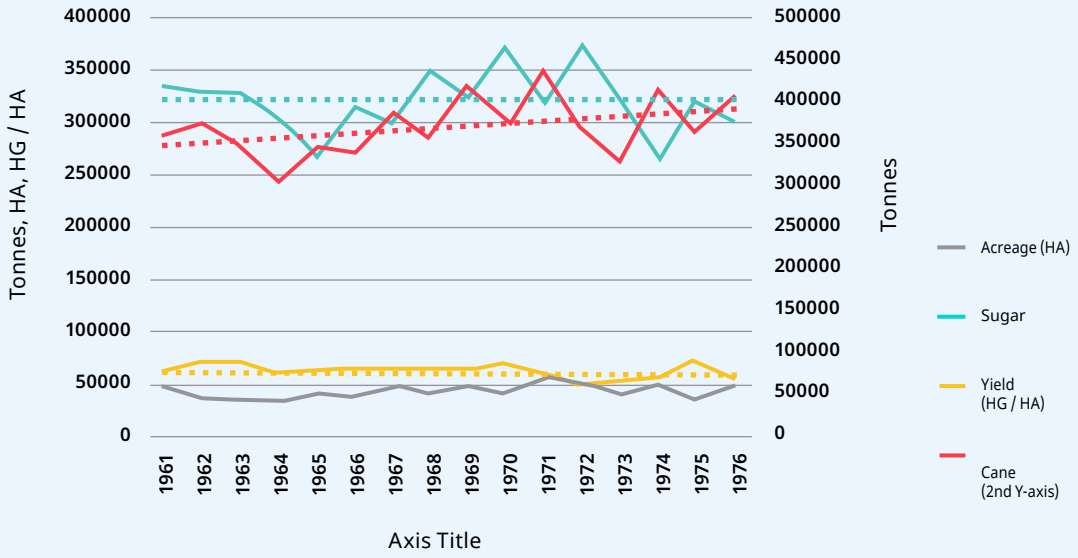
This view about the need for economic transformation and independence, along with the similarity of the ideological positions held by the two main political parties made nationalization of the Booker Group and sugar, in particular, a very appealing option. DaCosta (2007) further points out that the very windfall from the commodity price boom that made nationalization so appealing, was also used to pay for the nationalization of the Booker Group of companies.

16 The windfall sugar revenues, along with the increased revenues from the bauxite industry, would confer on Guyana its first experience with Dutch Disease and later, the Resource Curse. In the former case, sugar and bauxite dominated the economy, the real exchange rate appreciated and remained high (Bennett 1992) and the international competitiveness of other exports was seriously eroded. In the latter case, there was both the economic crisis that followed the Dutch Disease and a more "general crisis" that included serious conflict and human rights violations in the country as discussed in Guyana: The IMF–World Bank Group and the General Crisis (Thomas 1982).

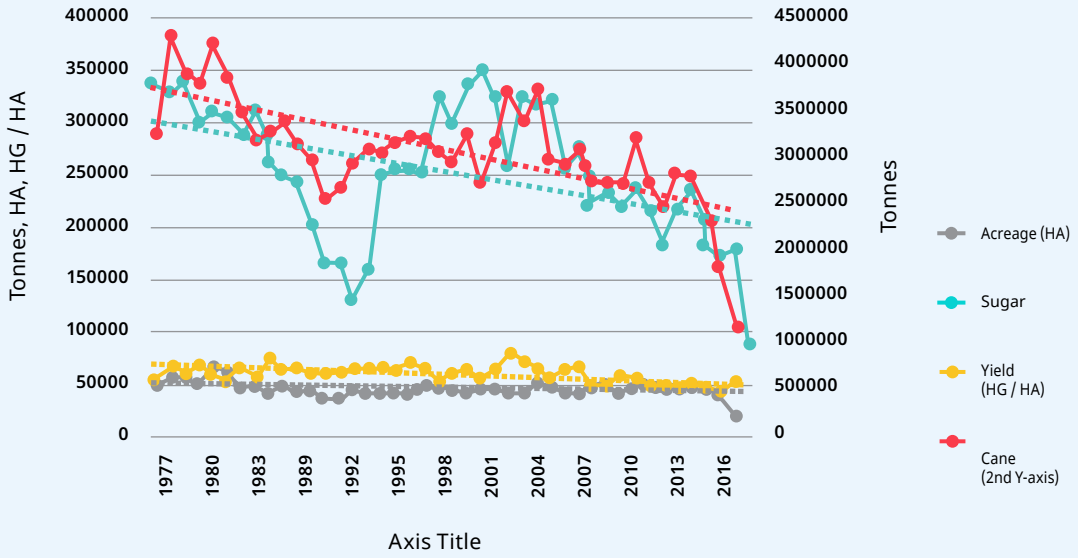
17 Two notable things about the Sugar Levy Act, No. 2 of 1974 were that it did not even state a reason for the introduction of the levy, much less state rules to govern withdrawals or give guidance on expenditures; and it was in fact a significant levy, amounting to 55 per cent, 70 per cent, or 85 per cent of every dollar or part of a dollar, respectively, as the sugar price p was $365<p≤$521, $521<p≤$625, and p>$625.

GUYSUCO was created in 1976 to be the state company that would manage all the sugar-related assets of the former Bookers sugar estates, and would continue sugar production. Figure 5.1a and Figure 5.1b below are about sugar and sugar cane production in Guyana, before and after nationalization respectively. Before nationalization, sugar production had averaged 320,375 tonnes per annum, while in the 1977–2018 period the corresponding figure was 252,404 tonnes per annum. In the latter period, sugar production had averaged 281,616 tonnes over the period 1977–1989, which was the period of centralised planning. The production of sugar fell dramatically over this period, as shown in Figure 5.1b.

▶ **Figure 5.1a. Sugar production indicators, 1961–1976**



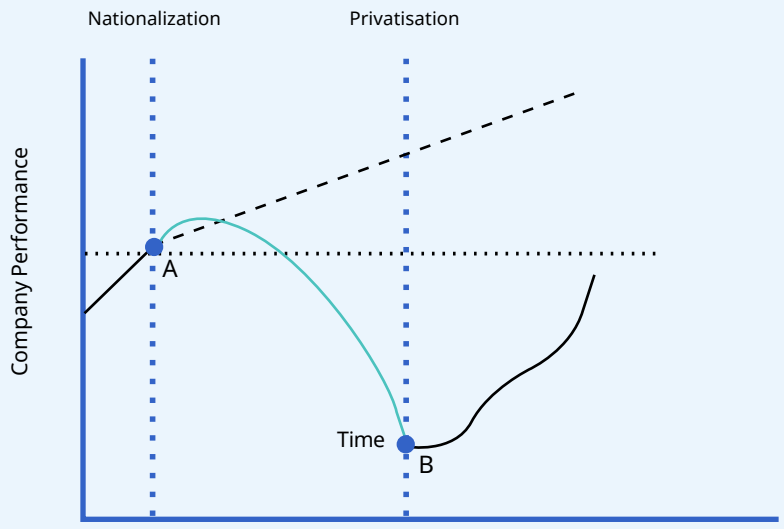
▶ **Figure 5.1b. Sugar production indicators, 1977–2018**



The precipitous decline in sugar production reached its lowest point in 1991, two years after the economic liberalization had begun in 1989. There was a recovery in the period 1992–2005, after which sugar declined again. A point of significance is that the industry was not privatized during the period of privatization and economic liberalization that began in 1989, and even now it remains a state-owned entity. What the political leadership of the country, and indeed influential persons such as Girvan and Vale (1973), who provided the intellectual leadership for nationalization, did not realize however was that two of the strongest arguments used to justify nationalization would in fact be lost after nationalization, and contribute significantly to its subsequent poor economic performance. These, which were both related to the profitability of the Booker Group of companies, were (i) the complementary set of investments by the Booker Group of companies, of which the sugar industry was just one (though admittedly the major one), and (ii) the premium prices that were being paid for Guyana's sugar exports to the UK. These issues are considered in Annex II, but essentially, after the sugar industry was nationalized, the other activities of the Booker Group became independent entities (although all were owned by the state), while in the latter case, the erosion of sugar preferences and premium prices gained momentum.

More generally however, the experience of public enterprises that were created by nationalization was often one in which the perception of "waste, lethargy, inefficiency, and poor quality of output in the operations of state-run enterprises [appeared to be in sharp contrast to the] dynamism, cost-effectiveness, high quality, and creative productivity (Willig, 1994) of private enterprises." It was this sharp contrast that would later provide the justification for widespread privatization in the 1980s and 1990s, not so much to restore economies to the paths they would have followed had there been no nationalization, as it was to arrest the free-fall into economic devastation. Hence, in the diagram below, company performance was strong at the point of nationalization (A) but it had deteriorated badly at the point of privatization (B). The diagram also makes it clear that even if the privatized company eventually did attain the performance at the time of nationalization, it could never catch up to some hypothetical counterfactual path that might depict what the company profits would have been had there been no nationalization (that is, the broken, upward-sloping black line). Note that the reality after privatization has, for many countries, been a further output collapse, but Guyana's experience was different because at B it had, perhaps, already reached its economic nadir.

▶ Figure 5.2: Nationalization, privatisation and company performance



Even after the reforms embarked on since 2016 including the closure of 4 estates, the poor performance of GUYSUCO placed a significant burden on the fiscal authorities for "bailouts" that simply involved transfers from the central Government to the company so that it could continue to operate the estates that remained open and meet other urgent contingencies that arose. In fact, the Ministry of Agriculture (2017) noted that "GUYSUCO incurred a debt of more than G$82 billion by 2015. The Government, owing to the industry's ongoing financial crisis, had to provide the required financial relief from the treasury. Within less than two years (since 2015), Government subsidies were estimated to be G$32 billion." More recently, the Ministry of Agriculture noted that GUYSUCO will require G$1.6Bn of external funds between August and December, 2020 "for capital and ongoing operational expenditure as revenues from sugar and molasses sales will not be sufficient to cover expenses for that period." (Mustapha – Minister of Agriculture 2020).

The Commission of Inquiry into the Sugar Industry (2015) categorically recognized that "[a] decisive shift to private ownership and control of the assets now employed in sugar production has to be an essential element of any long-term resolution of the present paradoxical situation" (Vol. 2, p. 23), but notably, it stopped short of pronouncing on the closure of any sugar estate. As discussed in Chapter 7, the Commission of Inquiry into the Sugar Industry (2015) stopped short of actually recommending the privatization of GUYSUCO.

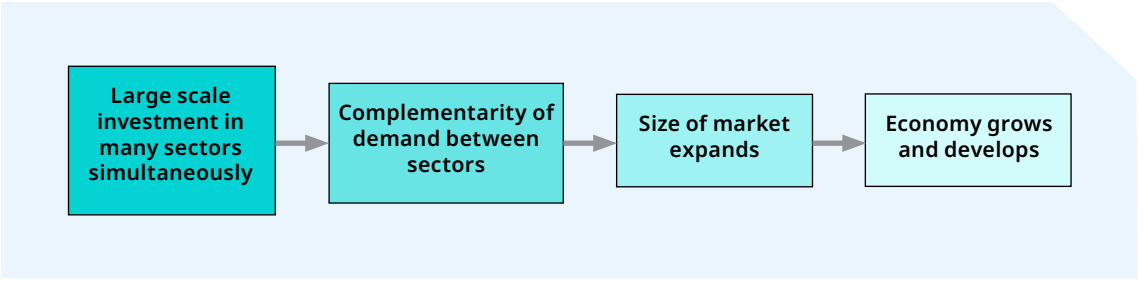
As will be discussed later in this report however, merely privatizing GUYSUCO will not turn around the industry (whether or not the closed estates are to be re-opened).

The Skeldon Estate Co- Generation Power Plant. | Photo compliments: DPI Guyana

6

Big-push green economy industrialization and the sugar industry

The *Skeldon Sugar Modernization Plan* and the industry as a whole were characterized by Increasing Returns to Scale (IRS) and therefore could not be profitable unless sugar prices were above marginal costs. This Chapter examines a possible strategy for the sugar industry, or at least for GUYSUCO, which draws heavily on a famous and important paper – Murphy, Shleifer, and Vishny (1989). This paper argues for coordinated, complementary, "big-push" investments across sectors in the spirit of Rosenstein-Rodan (1943) and the balanced growth ideas of Nurske (1953) and others. These ideas can be usefully represented in the following diagram:



These early writers recognized that the "inducement to invest" was limited by the size of the market and effective demand. As such, a set of large-scale investments undertaken simultaneously in mutually interdependent and complementary consumer and intermediate goods sectors would create the required aggregate demand and income, and by that token expand the overall size of the market to support the investments. The result will be the economic growth that had otherwise eluded developing countries that were caught in a vicious circle where each "underdeveloped country is poor because it has no industry; and...has no industry because it is poor." (Singer 1949, 5) In other words, there was potentially a positive feedback between the level of industrialization and incomes that implies multiple (industrialization) states of low incomes and a lack of successful industries on the one hand, and high incomes and successful industries on the other.

Murphy, Shleifer, and Vishny (1989) recognized this to be the case in underdeveloped countries with limited markets, and further pointed out that various states can be "Pareto-ranked", the state of high incomes and industrialization being the better one, in the sense that it would be preferred by the populations in these countries. The question then becomes the policies that would lead selection of the better equilibrium. This idea is particularly relevant to the discussion of the future prospects for the sugar industry in Guyana, and so it is discussed fairly extensively now.

6.1. Multiple equilibria, pecuniary externalities and market size

The answer begins with a recognition that the complementarity of (large-scale) investments hinges on demand complementarities, and especially the existence of demand spill-overs between sectors. Investments are said to be complementary and mutually interdependent when each one creates the incomes and the effective demand (spill-overs) that support the output of other sectors, which include both the final goods and the "jointly used intermediate" goods produced in other industrializing sectors. This is exactly what was emphasised by the early writers.

A further refinement of the big-push/balanced growth theories was based on the theory of coordination games, and in particular, super modular games.[18] A distinction was made between the actions and decisions about investment, and the outcomes – industrialization or no industrialization – of those decisions, which are made by individual investors acting independently and in a coordinated manner. The decision to pursue "big-push, coordinated" as against "piecemeal, uncoordinated" large-scale investments could also be classified as a 'higher' or 'greater' strategy as against a 'lower' one.[19] Hence, whether one is talking about the investment decisions or the industrialization and revenue outcomes, the essential idea is that it will be an equilibrium for each investor to pursue a greater strategy of large-scale investments if there are other complementary large-scale investments, because the investors will all benefit from increased market size (and the lower average costs of large-scale production). Alternatively, another lower equilibrium would exist if each investor were to choose not to invest because the market size would be too small if others did not invest also. This first refinement highlights the *strategic complementarity* of large-scale investment strategies or decisions, and it is clearly associated with multiple equilibria and Pareto-ranked outcomes.

In fact, it is the peculiar pecuniary externalities,[20] and particularly the demand spillovers associated with high-cost, large-scale, investments, which could lead to the multiple possible industrialization equilibria just discussed. These demand spillovers are not about the investment strategies themselves, but rather the interdependence of investment decisions, that is, the fact and more so the manner in which outcomes are affected by investment decisions taken by any particular individual, acting alone, when other investors decide to play greater or lesser strategies (Cooper and John 1988). *What is critical is that the demand spillovers must lead to an overall increase in the size of the markets, regardless of the profitability of individual investment activities*. Otherwise, even the strategic complementarity of investments would not guarantee the existence of multiple industrialization equilibria, but may instead deterministically lead to only the inferior, low industrialization-low-income outcome. Murphy, Shleifer, and Vishny (1989) make the important point that this overall increase in the market size cannot be achieved by only distributing the profits of a firm, though this would indeed raise aggregate income if the firm were profitable. If however the firm were not profitable, this very mechanism would reduce the overall effective demand and markets for other firms and, as with GUYSUCO, move the entire economy to the low industrial investment equilibrium. Moreover, it is in fact quite likely for an IRS firm to be unprofitable unless they can attract premium prices for their output, in which case the economy will be

18 A good discussion, with direct relevance to this application, is given in (Cooper and John 1988).

19 For a more technical discussion please see (Echenique 2004).

20 These demand spillovers are known as pecuniary externalities, which generally are costs or benefits generated within any one market that accrue to transactors in other markets and are fully absorbed in them without causing market failures.

stuck in a unique low industrial investment equilibrium. Once in this lower equilibrium, there will be a 'coordination failure' (Cooper and John 1988) as no one would be willing to start increasing investment unilaterally. This would prevent the achievement of the Pareto superior outcome unless, for example, there is some sort of industrialization policy and Government coordination of investment decisions.

What is clearly preferable however is for multiple equilibria to exist, then to move the economy to the preferred level of industrialization and income. Among the things that an industrial firm or sector can do to increase the overall size of markets is to pay their workers higher wages, thereby increasing effective income that is available to be spent in other sectors. The strategy of (say) paying higher wages may or may not increase effective demand sufficiently to support the other complementary investments, in which case there will be multiple possible states of either industrialization and high incomes or no industrialization and low incomes, respectively. As argued above, this latter equilibrium seemed to have been the case with GUYSUCO. Whatever is being contemplated for the sugar industry cannot however simply replicate the failures of GUYSUCO relative to the entire economy.

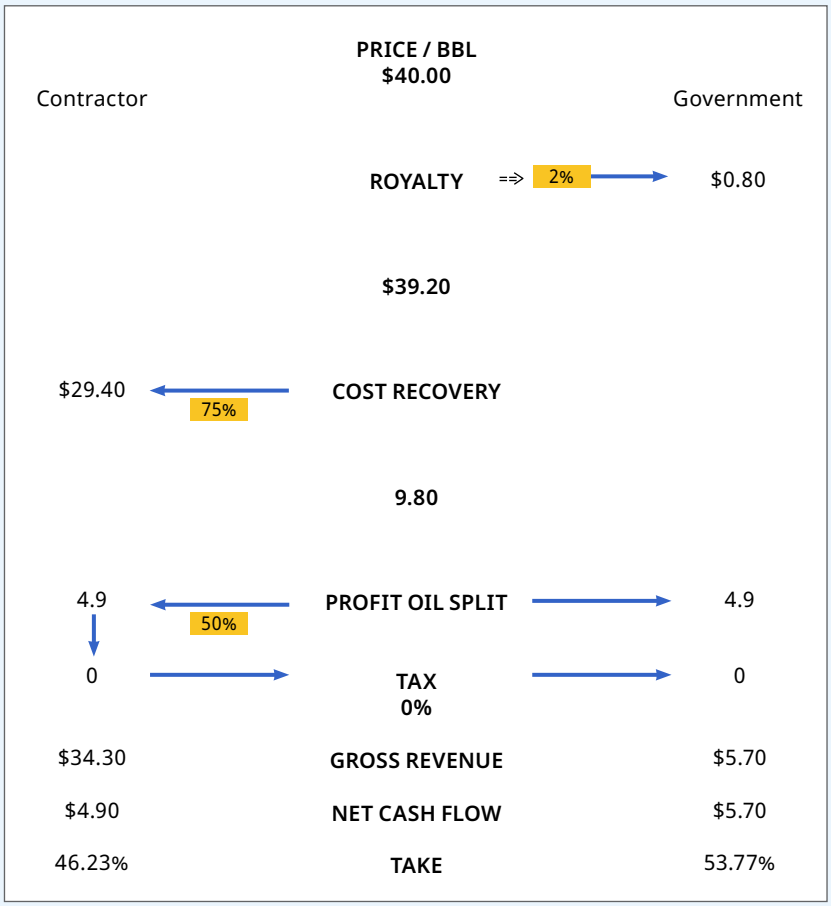
6.2. Implications of the oil discovery for market size and effective demand

A reasonable question at this stage is whether the oil discovery that has been made in the so-called Stabroek Block offshore Guyana[21] would address the concerns expressed above about market size. Any proposal for major investments to increase the scale of production and reduce unit costs must as a necessity also realistically address markets for the increased output. The Guyana domestic market is itself limited, with a total population of just about 750,000 and per capita GDP of about US$4,500 in 2019.

While it is easy to become optimistic that incomes will rise now that Guyana is an oil-producing country, there is good reason to believe that Guyana's domestic markets, and more particularly its 'effective demand' for large-scale production, will continue to be very limited especially in the short-run. For one thing, real incomes will not increase significantly in the short-run, despite the start of oil exportation in early 2020. First, the price of oil has recently been depressed, and at US$40/barrel, the Government take given the prevailing fiscal regime, will also be relatively low ($5.70/barrel) as shown below:

21 Guyana Project overview.

▶ **Figure. 6.1. The Government take from oil**



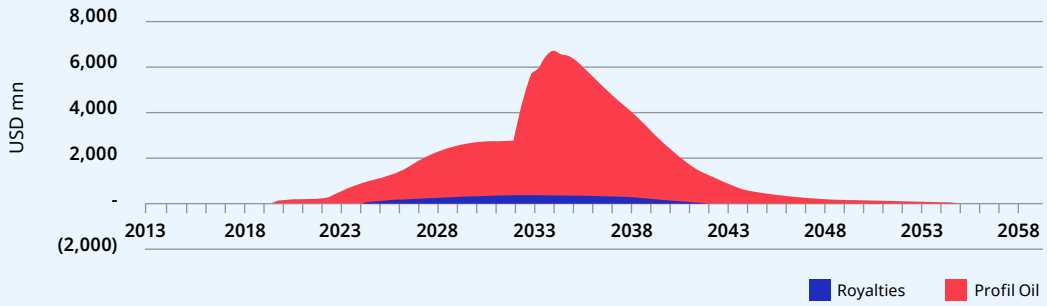
Source: Calculation based on (Bindemann 1999)

Because the entire operation is offshore and it is heavily capital intensive, this Government take, that is, the proportion of income that the Government will receive from the revenues from the sector, represents the main way in which oil revenues could increase the income and wealth of the country. Government revenue from the sector will however be at most US$195M for all of 2020 because of some start-up challenges and a collapse in oil prices just at the time that Guyana began production at a rate of 120,000 barrels/day. Increased production to 750,000 barrels per day by 2025, has the potential of adding US$1.2B per year, assuming the same $5.70/barrel Government take. These estimates are consistent with the projections made by (West 2020), as shown in Figure 6.2.

These considerations reinforce the view that Guyana's domestic markets, and more particularly its 'effective demand' for large-scale production are limited, despite the major oil discovery. There is the existence of a Natural Resource Fund (NRF) that limits withdrawals of any payments made to the Government by oil companies, and the potential occurrence of "Dutch Disease" that will add to the competitiveness challenges already confronting the non-oil sector. The NRF, which was created by an Act of Parliament [22] in 2019, was intended to limit the extent to which Government spending would fluctuate

22 See Natural Resource Fund Act, 2019.

▶ **Figure 6.2. Annual Government revenues from profit-sharing and royalties**



Source: From the fiscal model used by West (2020)

with oil revenues by sterilizing them outside of the country. Withdrawals from the fund, which will be used according to the planned Government budget in any year, would follow one of three rules,[23] all of which limit the amount that can be withdrawn from the Fund.[24] To the extent that the NRF is successful in limiting Government spending therefore, the domestic market and effective demand will not grow significantly even if oil prices were to rebound.

6.3. Towards an investment strategy: Complementarities and increasing returns to scale

The key consideration in thinking about the future of the sugar industry in Guyana is the presence of Increasing Returns to Scale (IRS), which would necessarily render the industry unprofitable at the market prices to which it is now exposed. The large fixed costs in sugar factories already confer IRS on that aspect of sugar production, and indeed on all aspects of the sugar industry (and the company), while the mechanization of the industry that is clearly required in any possible future for the industry will further increase the extent of IRS to field operations and therefore to the industry (and the company). It is assumed that there is a policy decision to re-open three of the four sugar estates that were closed, and consequently it is also assumed that field mechanization will occur. Drawing on the foregoing discussion of "big push" industrialization, the following ought to be considered to ensure that the sugar industry would become profitable in its commercial operations:

- Investment to keep estates open must occur as one element of an investment strategy that creates opportunities for an expanded market size based on complementary demands across activities. These complementarities would ensure that all investments taken together will be profitable even if particular activities (sugar production) are not. This is not however a simple call for coordinated as against piecemeal investment, though coordination may be required to have a portfolio of activities that taken together create the effective demand and market size that would support

23 These are specified as percentages of projected oil revenues, that is, 67 per cent or 50 per cent if production is less than 200,000 barrels/day or 400,000 barrels/day respectively, or 33 per cent if production is equal to or exceeds 400,000 barrels/day; 25 per cent of average past and projected non-oil revenues; and 3 per cent of the value of the value of the fund in any given fiscal year.

24 Admittedly, the Natural Resource Fund does not specify a limit on the amount that Government could borrow to finance planned expenditures, which itself are not subject to any rules. As such, the withdrawal rules could be observed strictly, but Government spending and therefore effective demand could still be very high. See Bauer, Mihalyi, and Patzy (2018).

all the investments. In addition to helping to ensure these demand complementarities, effective coordination may help identify the complementarities in competencies and know-how that would form the basis of a successful export diversification strategy, as proposed generally by Hausmann and Klinger (2007, 12) in the highly acclaimed work of the Growth Lab at Harvard University, and specifically for Guyana, by Mandle (2017).

Importantly though, this is not an argument for central planning of an investment strategy, or for wide-ranging public investments, tempting though this might be. Matsuyama (1995) advocates for an economic system as "a combination of highly complementary economic activities (that is, tasks, services, goods, etc.) which, when taken together make a coherent whole." He further notes that "[t]he development of a sophisticated economic system requires a high degree of coordination among these activities, performed by a diverse set of agents, each of whom may possess the unique knowledge and technical expertise concerning these activities." (Matsuyama 1995, 12).

How might policymakers in Guyana avoid the fate noted above, in Chapter 5, for the nationalized sugar industry? The first task is to remember the nature of the fundamental coordination problem associated with the strategy that is being suggested here. Because IRS investments tend to be individually unprofitable at marginal cost pricing, emphasis must be placed on the complementarities that would make them profitable as a whole set of activities. Such complementarities would only be realized after the investments have occurred. The fundamental problem is that private investors, knowing that the possibility of a loss is significant unless they are guaranteed prices higher than marginal costs, would only undertake their respective investments if others are also undertaking the complementary investments that are envisaged. Noting that such investments must therefore be simultaneous and coordinated, Milgrom and Roberts (1994) point to another risk, namely that it is more reasonable to expect piecemeal investment in particular activities, but that is precisely the approach that will result in failure. In describing some of the important features of Japanese economic organization (see Figure 6.3. below), they argue that close attention must be paid to capital structure and employment contracts and indeed to the entire economic system.

Exactly how analogous characteristics that would work in Guyana could be achieved is of course the matter of interest. The table below shows that there are indeed many practices that allow the Japanese economy in which complementarities pervade, to have exhibited good, indeed outstanding, economic performance. This is a formidable list of the things that all had to be in place, and it probably increases the temptation to go the route of central planning and a suite of public investments. Instead, the policy maker is being urged to develop a comprehensive investment strategy that indicates both the potential set of complementary investments, and also the supporting framework of institutions and practices that must be adopted to ensure the success of the strategy.

▶ Figure 6.3. Characteristic features of Japanese management

Human resource policies

- Permanent employment guarantees
- Recruiting only at the bottom
- Extensive training-general and specific
- Pay of skills
- Firm-wide group bonuses
- Seniority-based promotions
- Flexible work rules
- Limited pay differentials
- Absence of stock-based executive incentives
- Frequent transfers
- High status of the Personnel Department
- Early mandatory retirement

Governance and ownership

- Consensus decision making
- Firms run for the employees
- Insider Boards of Directors
- High debt-equity ratios
- Mochiai (Cross-holding of stock)
- Main-bank relations

Manufacturing operations

- " Modern" manufacturing strategy flexible equipment and workers frequent product improvements broad product lines increasing quality decreasing cost and price low inventories
- Use of workers' local knowledge
- Team organization
- Kaizen

Corporate strategy

- Growth and market share orientation
- Reinvestment of earnings
- Low dividends
- Long-term relations with suppliers and customers
- Keiretsu

External / social / governmental

- High saving rate
- Low cost of capital
- Pro-business attitudes and policies
- Social commitment to growth
- Rapid national economic growth
- Openness of world markets
- Closed domestic markets
- Flexible, competitive smaller firms

Source: (Milgrom and Roberts 1994)

- The investment must involve increasing returns to scale. In this regard, the strategy will have to elaborate on a number of things related to the source of IRS activities that are being considered, and the level (firm, industry, sector, even economy) at which IRS will operate. For example, the potential source of IRS could be technology, but for this to indeed be IRS it cannot be at the level of the firm, unless the firm is itself engaged in large-scale production to benefit from declining unit costs as output expands. If not, the technology will have to be in the nature of a fixed factor that is shared by an industry, a sector and even the economy. Murphy, Shleifer, and Vishny (1989 1006) refer to:

> ▶ **[I]nvestment in jointly used intermediate goods,** for example, infrastructure such as railroads and training facilities. To the extent that the cost of an infrastructure is largely fixed, each industrializing firm that uses it helps defray this fixed cost and so brings the building of the infrastructure closer to profitability. In this way, each user indirectly helps other users and hence makes their industrialization more likely. As a result, infrastructure develops only when many sectors industrialize and become its users. ... we associate the big push with the economy making large investments in a shared infrastructure. This approach has the advantage of being important even in a completely open economy.

- This very point however calls attention to another policy issue that will have to be addressed, namely the possibility and scope of privatization. Increasing returns that apply across all of GUYSUCO's activities are both within the firm and within the industry. Once there is privatization and the company is broken up, access to the sources of IRS may not be available in the same natural way. As IRS is so key to the big push, specific attention will have to be paid either to the protocols that would allow continued access, or different IRS investments such as shared infrastructure that allow all to access the benefits of IRS.

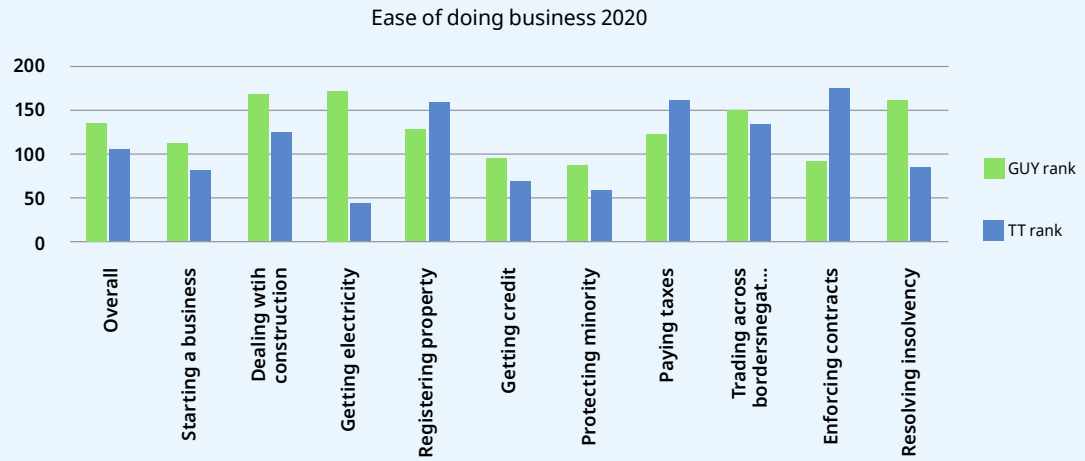
  If, however, access to IRS is only possible at the firm level, for example because each sugar factory has been privatized and is now owned and operated by a separate company, then, absent premium export prices, these companies will have to develop a portfolio of activities that would allow for demand complementarities with other factories, other industries and other sectors. A demand for product variety and a corresponding portfolio of activities would allow monopolistic firms to enjoy market power and an ability to charge higher-than-marginal-costs prices to cover the fixed costs of operating IRS technologies. This incidentally is a more focussed alternative to the more general suggestion of shared infrastructure and jointly used intermediate goods noted above, but both sets of recommendations involve ensuring that there is effective demand for big-push industrialization firms. Note however, that a GUYSUCO that continues to be both firm and industry may automatically create a significant amount of this effective demand internally, though the other problems with public enterprises, noted in Chapter 5 above will remain and could be the Achilles heel of any decision to continue with GUYSUCO as it is currently structured.

- Many of the models that advocate coordinated big-push industrialization investments do not envisage IRS in all firms and industries, but there is no reason why there should not be several IRS investments. If so, the required effective demand will have to be larger however, and may have to involve both domestic and foreign markets. Thus, a strategy of non-singular IRS investments ought to include those investments that will reduce the cost of exporting, and more generally of making exports more competitive. In this regard it is useful to recall that VanGrasstek (2003) identified shipping costs as an even greater barrier to Guyana's exports than tariffs. Indeed, barriers of interest here are high shipping and energy costs because the solutions to these problems themselves involve IRS investments which would have generated the pecuniary externalities referred to above. Reducing non-tariff barriers therefore increases the size of the market, but

this comes as an additional benefit of big-push industrialization and an economy-wide set of coordinated IRS investments, which would have generated their own markets in a manner that mimics Say's Law (Weitzman 1982).

As can be seen from the "Ease of Doing Business" in Figure 6.4. below, Guyana can certainly benefit from other investments that would be required to be on par with Caribbean counterparts like Trinidad and Tobago. These include investments that would facilitate starting a business, getting credit, protecting minority investors, resolving insolvency and dealing with construction permits. They may themselves require economy-wide IRS investments in institutions, capabilities and awareness that together would significantly improve the ease of doing business and the ease of exporting.

▶ Figure 6.4. Showing the Ease of Doing Business 2020 ranking, comparing Guyana and Trinidad and Tobago



▶ Guyana has always been a resource rich, commodity producing, economy. Its resources were augmented significantly by a recent (major) oil discovery that was announced by ExxonMobil in May 2015. It is therefore natural for considerations of the future of the sugar industry to acknowledge the special role of resource booms due either to commodity price increases or resource discoveries. In particular, the Dutch Disease phenomenon, which refers to the loss of competitiveness of traditional export sectors due to an appreciation of the real exchange rate, would place enormous pressure on any of Guyana's traditional exports[25] and may lead to dire consequences for investments – especially public investments – in these sectors.

Apart from this, the very argument for a set of coordinated investments that have complementarities in demand and competencies must be evaluated in view of recent oil discovery. Sachs and Warner (1999) note that it is not sufficient to ask if the proposed IRS investments will take place in a (large) firm or will be available to all firms in an industry, but that it also matters whether they will be in the tradeable or the non-tradeable sector of the economy.

25 The Guyana economy has already begun to witness a reduction in revenues from the other (traditional) exports, and the closure of the sugar estates might even be seen as an early, perhaps policy-assisted, onset of the Dutch Disease phenomenon.

The distinction between tradeable and non-tradeable sectors is important for economies that experience resource booms. Corden and Neary (1982) in a paper that has become a classic, first noted that such economies will have different experiences in their export sectors, one booming and one lagging, that together make up the tradeable sectors. The non-tradeable sector, such as retail trade, the service industry, and construction, will also experience a boom following a resource discovery. Dutch Disease is what happens when there are windfall revenues that cause the booming export (that is, petroleum) and non-tradeable sectors crowd out the traditional export sector (for example, sugar). Exactly how this happens depends on the exchange rate regime that is followed, as shown below, but first it should be noted that changes in a country's international competitiveness is usually captured by the changes in its 'real exchange rate,[26] which refers to the amount of Guyana's exports that can be purchased by a unit of foreign exchange. As our interest is in the competitiveness of Guyana's exports, traditional or new, an appreciation of the real exchange rate means that a unit of foreign currency could purchase fewer of Guyana's exports than before, and Guyana's exports would have lost international competitiveness. This could happen either because of changes in domestic prices, or changes in the nominal exchange rate. The following table summarizes what happens when there are windfall revenues associated with a resource boom:

▶ Table 6.1. Summary of effects of windfall revenues associated with a resource boom

Exchange rate regime	Real exchange rate appreciation	Spending effect	Resource movement effect
Fixed: Central Bank increases the money supply to preserve the fixed rate.	Domestic prices increase, causing the real appreciation and loss in export competitiveness.	Sugar and rice exports could become unprofitable. Increased real incomes from the windfall leads to more spending on non-tradeables (and imports), which also experiences a boom, while the export sector declines.	Attracted by higher wages and better job prospects, labour moves to the booming export sector. The traditional export sector will have to pay higher wages to retain workers; it therefore declines.
Flexible: The foreign exchange market is flooded with foreign currency.	The Guyana dollar appreciates, causing the real appreciation, and a loss in export competitiveness.		

Source: Based on Ebrahim-zadeh (2003)

Sachs and Warner (1999) examined the idea of big-push, coordinated investments for resource-rich countries that experienced resource booms, and though they were unable to empirically test their result, they found that if the IRS investment occurs in the non-tradeable sector, which is supported entirely by domestic demand, a resource boom can indeed initiate a growth process unlike what would happen if the investment were in the tradeable manufacturing sector. Unless therefore there are significant complementary improvements that reduce energy and shipping costs, one might expect that IRS investments in the sugar industry – say bio-refineries – would be unable to export their products successfully. Not least among the reasons would be that workers will only remain in the sugar industry if they are paid higher wages, given the opportunities that will arise

26 Formally, the real exchange rate is defined as e×P*P, where e is the nominal exchange rate that gives the domestic currency price of a unit of foreign currency, P* is an index of foreign prices and P is an index of domestic prices. Hence, an American purchasing Guyana's goods would apply a nominal exchange rate of say 0.0047, this being the US$ price of a unit of $G; and would regard the price of say a barrel of Guyana's oil as P*= G$9,450. A real (exchange rate) appreciation would have occurred if either e increases (that is, the Guyana currency appreciates in nominal terms) or the price of Guyana's exports were to increase.

particularly in the sector producing non-tradeables. Economic diversification of the sugar industry along these lines will therefore require constant fiscal support.

- The final observation in this chapter is that a number of irreversible things are happening that must be considered when a set of complementary IRS investments including investments in the sugar industry, is contemplated. The first of these is climate change. The industry's costs can only be expected to rise on account of rising sea levels, and indeed, the simple matter of mechanization of field operations may become technically less feasible. Second, and related to climate change, is energy transition. While the production of raw sugar generally allows the industry to satisfy its energy demands internally and may even allow the industry to export excess power to the national grid, energy demand will increase significantly with any effort to create value-added products. What makes the sugar industry a particularly interesting one however is that it is now possible for the sugar industry itself to provide clean, renewable energy in large quantities, without affecting the production of sugar as a sweetener. The possibilities therefore for that energy to supply the needs of the industry for its value-added goods, as well as the needs of complementary investments in other sectors that utilize sugar, must therefore be considered in any discussion of the future of the industry.

Photo compliments: DPI Guyana

7

Review of Guyana's recent investment strategies and big-push industrialization

In this chapter, as a foil to the green industrialization strategy, we briefly review two other recent investment strategies that have been sanctioned by different governments. The first, which is more in the nature of a proposal, is related to the sugar industry alone, while the second is related to the economy as a whole.

The Sugar COI Proposal: The Commission of Inquiry into the Sugar Industry (2015) envisaged that by 2020.

- There would be a Holding Company controlling the assets of subsidiaries/business units/revenue streams, all of which will "have a mix of public and private ownership". The subsidiaries/business units/revenue streams will focus on:
  - Co-generation of electricity
  - Supply of business services (IT, tourism and recreation, and so on)
  - Agricultural equipment pools, including aircraft (for rental to farmers)
  - Molasses
  - Ethanol
  - Supply of drainage and irrigation to communities
  - Prime real estate and property holdings (selected GUYSUCO premium real estate)
  - Sugar refiner (plantation "whites" or refined sugar)
  - Alcohol
  - Special sugars
- There will only be a "selection of commercially viable estates" supplying mainly packaged and value-added sugars for local, regional, and "premium" export markets.
- There will be a mix of farmers and worker-managed cane cultivation, together with private investors (both local and foreign).

- The bulk sugar market, if it still exists, would be entirely focused on supplying restricted premium markets.
- Debt re-engineering (restructuring and recapitalization), the buyout of costly industrial relations, customs and practices, and 'participatory privatization' will reduce GUYSUCO's dependence on the National Budget.

This proposal is not clear about the ownership and capital structure of the sugar industry and it leaves enough room for the proposed holding company to be another public enterprise, with all the problems noted above for the nationalized sugar company (GUYSUCO) being still possible. While being supposedly done by 'subsidiaries', the activities envisaged for the company would not clearly involve demand complementarities among themselves, but will depend to a large extent on wider domestic demand. The problem is that the wider domestic demand will only be effective (Weitzman 1982) if there are sufficient income and employment opportunities outside of the company, as the latter itself will not provide all the aggregate demand that is required. Ultimately, the company would have to turn again to the Government for support and 'bailouts'.

The COI proposal did allow for the closure of sugar estates that were not commercially viable, participatory privatization, a mix of public and private ownership, and so forth. However, it did not address incentives that various categories of workers and management would require if they were to continue in the industry and perform well so as to ensure that the industry is profitable. This is particularly within the context of an economy that has had a significant oil discovery. Likewise, training was taken for granted, and most of all, there was little appreciation of the implications for the profitability of decreasing average costs in several of the proposed subsidiaries, if output had to be sold at marginal costs.

The LCDS Proposal: The Low Carbon Development Strategy (LCDS) was the most recent attempt at coordinated investments in Guyana. These investments included one major IRS project, a 160 megawatt hydroelectric power generation facility at Amaila Falls and a drainage and irrigation project for climate adaptation purposes. Clearly, cheaper and more reliable energy would have spillovers for all the other projects and the rest of the economy, but it is not clear whether the other projects presented pecuniary externalities that would either increase the overall market size or produce intermediate goods, including skills training, that could be used in other sectors.

The Canal Rehabilitation Project would have also been IRS and would be like shared infrastructure but it would have been simply provided by Government, with no view to having the cost shared by users, who could have been charged higher-than-marginal-cost prices. As with the Amaila Falls Hydroelectric Project, it is unclear whether this project would have itself created greater demand complementarities or whether it would have entailed taking advantage of complementarities in competencies in the economy. In other words, the LCDS investments clearly did not have the characteristics of a coordinated set of investments that would move the economy towards greater industrialization, let alone green industrialization.

A particularly important issue in this regard is that though the Amaila Falls Hydroelectric Project would have resulted in significantly

1. **Low Carbon Economic Infrastructure**
   a. *Amaila Falls*
2. **High Potential Low Carbon Sectors**
   a. *Micro and Small Enterprise*
3. **Hinterland Development**
   a. *Amerindian Development Fund*
   b. *Amerindian Land Titling*
4. **Human Capital**
   a. *Bio-Diversity Research Centre*
   b. *Institutional Strengthening*
5. **Adaptation**
   o *Canal Rehabilitation Project*

Source: Office of the President (2013)

lower generation costs, even after the investor had earned its required rate of return to recoup the capital outlays, there was no mechanism to ensure that the eventual cost to the consumer would have been significantly lower than the costs that prevailed then. The distribution system was, and remains, in dire need of rehabilitation and more disturbingly, it was owned by a monopoly utility company, the Guyana Power and Light Company Inc. (GPL). GPL would have been required and able to set tariffs that would cover the high cost of distribution and pay the Amaila Falls investors their required rate of return, and there was no guarantee that the cost and quality of the energy supply would have been significantly better than the status quo. In other words, the benefits of demand spillovers to other sectors from a large-scale investment were uncertain.

Finally, taken together the LCDS projects would have been a set of investments, admittedly including IRS ones, which would have been undertaken by a "central planning board", precisely as is not recommended for big-push industrialization.

7.1. Coordinated investments and "green economy" big-push industrialization

Though it is tempting to think of a green economy as having only to do with environmentally sustainable activities, a green economy is in fact about inclusive, sustainable growth. As such, the green economy framing puts emphasis on the "three pillars" of inclusive, sustainable growth – the economy, the society and the environment.

The example set of green economy investments listed in this chapter is, first of all, just a set of examples. Secondly, it emphasises a set of investments that would, if undertaken in a manner that makes use of green technologies and construction protocols and natural infrastructure ideas, guarantee both the 'big-push' industrialization with complementarities in demand and competencies, and inclusive and sustainable growth. In the post-COVID-19 economic environment, this example set of investments will also address climate change, both by specific investments such as the advanced-biofuels one, and also on account of the emphasis on the use of green technologies and natural infrastructure.

Note that this is not a set of investments that are to be undertaken by a central planning board exclusively as a set of public investments, though the fact that they are IRS activities would imply that even partial private sector financing would not be forthcoming unless tariffs and prices are above marginal costs. Nor does one have to assume that a private monopoly structure, which would in fact allow tariffs and prices to be set above marginal costs, is an equally natural alternative, as was the case with the Berbice Harbour Bridge. [27] What is important in considering a capital structure that goes beyond the default of state or monopoly ownership is that subsets of the proposed set of examples, if not the entire set, could be profitably undertaken by even the private sector if done simultaneously. This is because, taken together, they will expand the domestic market size and also enhance access to overseas markets.

- Sugar and renewable energy – advanced, second-generation biofuels
- Agro-processing
- A gold refinery, and maybe a bauxite smelter
- Sustainably built shared road and physical infrastructure, including a deep-water harbour, a bridge across the Corentyne River
- Advanced health-care investments
- Secondary and tertiary education, wooing the diaspora using migrants and other groups to support the above-mentioned large-scale projects

27 The Berbice Bridge and its Lessons for Development Planning.

These complementary investments will create both demand spillovers and allow for sectors to use the output from other sectors as inputs in their own production processes, thereby increasing the size of the domestic market in such a fashion that the profitability concerns of each investment are attenuated when all the investments are undertaken together. The limited size of the domestic market would normally present a serious constraint for any investment that promises the benefits of economies of scale, for the obvious reason that the large output required before costs decline could be left unsold if firms cannot export due either to high transport costs, or in the case of services, high and unreliable energy costs, slow internet speeds, and so on. It is important to note though, that the deep-water harbour and bridge across the Corentyne River will give access to overseas markets as well.

The expansion of effective demand in domestic markets is however of special importance as there is no question that Guyana will have to contend with the loss of international competitiveness on account of the Dutch Disease, the NRF notwithstanding. This example set of IRS investments will clearly generate demand complementarities among several of the activities, and will even ensure that incomes will not collapse if international competitiveness is eroded.

Finally, it must be pointed out that these investments must not only be characterized by the use of green technologies and their commercial viability when properly coordinated, and they do not represent the totality of new activities that will emerge. As such, it will be important to think of all the other changes to the economic system that will have to be undertaken to guarantee the success of this big-push, green economy, investment strategy.

8

Cellulosic ethanol from sugar cane

Second-generation advanced biofuels are fuels that can be manufactured from non-food biomass. These are differentiated from first-generation biofuels which are produced from food crops themselves and are called "advanced" because of their low CO_2 emissions and land use impact. First-generation biofuels have fallen out of favour due to the sustainability issues associated with diverting portions of the food supply towards energy production. As a result, second-generation biofuels, including cellulosic ethanol/ lignocellulosic ethanol, have garnered significant interest globally.

The particular "advanced-biofuels" investment that is being proposed for the sugar industry could co-exist with any proposal to use natural gas to generate power, as the cellulosic ethanol that will be produced would be in the nature of "off-grid energy" that will be used largely by the transport sector that itself could be expected to grow as the economy expands. Additionally, consideration could be given to developing a biorefinery to produce ethanol and other high-value chemicals from lignocellulose, both as a strategy for reducing costs and also for further diversifying the industry.[28] Biorefineries would make use not only of bagasse but will also use other kinds of biomass including rice straw, saw-dust, and so forth. It will allow for the production of several commercial-scale, high-valued co-products that will enhance the profitability of the core cellulosic ethanol facility.

Apart from the economics and investment strategy, another basis for the cellulosic energy proposal is the Paris Agreement on Climate Change (United Nations Framework Convention on Climate Change 2015) and the UN's SDG 13 (United Nations General Assembly 2015). The former refers to the urgent need for a global response to climate change that is consistent with sustainable development and poverty eradication, while the latter makes "urgent action to combat climate change and its impacts" a goal of sustainable development. Renewable energy is, of course, related to both climate change mitigation and sustainable development. What is important here is that the Paris Agreement gives emphasis to the importance of technology transfer, climate finance, and provides a framework that will allow investors to get carbon credits for the reduction in carbon emissions that will in all likelihood result from the greater use of cellulosic ethanol. Table 8.1. gives details:

28 A Review on Commercial-Scale High-Value Products that Can be Produced Alongside Cellulosic Ethanol.

▶ Table 8.1. Summary of relevant articles of the Paris Agreement

Article	Summary
4	Requires each developed and developing country Party to prepare, communicate and maintain 5-year nationally determined contributions (NDCs) – voluntary pledges for which it alone will be responsible even if approved joint action at regional levels is envisaged, thereby making voluntary national pledges the basis of cooperation for climate change action. Successive NDCs (which can be made at any time) are to be more ambitious such that after global peaking of greenhouse gas (GHG) emissions there will be balance between emissions and removals, with developed country Parties providing support in finance, technology and capacity-building to allow for higher ambition in the actions of developing country Parties. Creates a public registry for NDC communications. Clarifies that mitigation benefits associated with adaptation and/or economic diversification can be included in the NDCs.
6	Provides for polycentric, multilevel, **carbon markets** and linkages across markets by specifying a mechanism for the cross-border trading of units of carbon emission reductions - internationally transferred mitigation outcomes (ITMOs) - to satisfy the voluntary pledges made by Parties under Article 4, if they so choose; Specifies accounting protocols such that ITMOs are used in meeting either host or third Party intended NDCs, but not by both, thereby precluding any double counting and ensuring additionality; Defines a framework for **non-market approaches** to sustainable development that incorporates mitigation according to intended NDCs, and adaptation across institutional arrangements.
7	Recognizes the importance of **adaptation** for several Parties and encourages Parties and UN organizations to provide support – climate finance, technology support and capacity-building – to those Parties that need it. This can be done by sharing information, knowledge and best practices related to adaption actions, institutional strengthening, policy making and climate change science and research. Requires parties to engage in formal national adaptation planning and implementation processes, and creates a public registry for adaption communications.
13	In order to "build mutual trust and confidence" among Parties, establishes an enhanced **transparency** framework that will report on emissions by source and removal, progress in achieving NDCs, and climate change impacts and adaptation issues, including support required. Allows developing countries flexibility in implementation, the manner of which shall be "facilitative, non-intrusive, non-punitive, respectful of national sovereignty", and not unduly burdensome.

Source: Based on Ebrahim-zadeh (2003)

In keeping with Article 4 of the Paris Agreement, Guyana identified several NDCs to the global effort to "[hold] the increase in average global temperature to well below 2oC above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5oC above pre-industrial levels." (Article 2(1)(a)) Among the NDCs were several that were specifically related to energy, as shown in Box 8.1.:

▶ Box 8.1. Guyana's energy Nationally Determined Contributions

Unconditional Contributions

- Develop a mix of wind, solar, biomass and hydropower to supply both the demand of the national grid and the energy requirements for towns and villages in Guyana's hinterland in support of the rapid expansion of a renewable energy supply.
- Construct and/or promote the construction of small hydro systems at suitable locations such as Moco Moco, Kato and Tumatumari.
- Power all of the six newly established townships, starting with Bartica, using renewable energy sources.
- Encourage independent power producers and suppliers to construct energy farms and sell energy to the national grid. Preliminary approvals given for a 26MW wind farm.
- Work closely with farmers in agricultural areas to encourage the use of bio-digesters to reduce waste, produce biogas and provide affordable, healthy and efficient cooking means at the household level.
- Remove import duty and tax barriers for the importation of renewable energy equipment, compact fluorescent lamps and LED lamps to incentivize and motivate energy efficient behavior.
- Conduct energy audits and replace inefficient lighting at public, residential and commercial buildings to reduce energy consumption.
- Using public education and awareness programmes, provide consumers with information and tools to reduce energy consumption and expenditure.
- Implement other policies (building codes and net-metering of residential renewable power) to encourage energy efficiency and the use of renewable energy.

Conditional Contributions

- Eliminate the near complete dependence on fossil fuels by developing a 100% renewable power (wind, solar, hydropower) supply by 2025.
- Assess the potential of the renewable power sources to determine the most cost effective and efficient means of developing this potential.

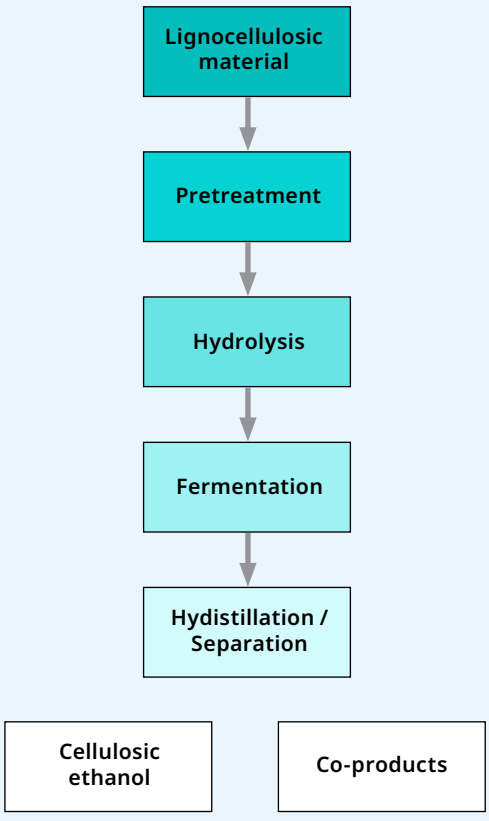
Source: (Government of Guyana 2015)

The first of the unconditional NDCs, requiring no support from the international community, and the second of the conditional NDCs, which would require support from the international community in the form of finance, technology transfer, technical capacity and so forth, provide a framework for Guyana to pursue cellulosic ethanol production as part of its commitments under the Paris Agreement, and not just part of the attempt to revitalize the sugar industry. In turn, the latter provides a very important framework and even the mandate for the international community to provide the technology and knowledge transfer that would be required if Guyana is to successfully implement the cellulosic ethanol proposal.

8.1. Overview of lignocellulosic ethanol, consolidated bioprocessing and co-production

Lignocellulosic ethanol, or cellulosic ethanol, is a second-generation advanced biofuel similar to traditional ethanol, or first-generation bioethanol. Both forms of ethanol can be derived from an array of food crops, including the locally produced sugar cane. In terms of sugar cane, first-generation bioethanol is produced through fermentation of the plant-derived sugars, which would otherwise be used in the production of table sugar (sucrose). On the other hand, lignocellulosic ethanol is derived from the cellulose of the sugar cane, which is typically discarded as waste (bagasse), or merely burnt. The sugar molecules can be freed from the cellulose using steam heating, enzymes or other pre-treatments, allowing for their fermentation, which creates the second-generation ethanol. This process results in the creation of the by-product lignin, an organic polymer. In short, waste material (bagasse) from sugar cane can be used to create ethanol, identical to first-generation bioethanol for all practical purposes, while generating minimal waste. The outline of the basic production process of second-generation ethanol is shown in schematic form, in Figure 8.1.:

▶ **Figure 8.1. The production process**



Source: (Padella, O'Connell, and Prussi 2019)

Fan (2014) specifies moreover that cellulase production precedes enzymatic hydrolysis and microbial fermentation.

8.2. Commercial production of cellulosic ethanol

Several companies operate second- and in the case of ExxonMobil, third-generation ethanol plants globally, using varying types of biomass to create ethanol. These include *GranBio* in Brazil, *Clairant Sunliquid* in many countries, and *Americanprocess* in the United States of America (USA). *ExxonMobil* is leading the research on the use of algae to produce third-generation biofuels, while *Royal Dutch Shell* is a joint venture partner with *Raizen*, a Brazilian company that has the lowest price per gallon (2.17 USD), as of February 2016. On the other end of the spectrum, the American company *Abengoa*, located in the state of Kansas, has the highest price per gallon (4.55 USD). The difference in prices can be attributed to the type of cellulosic feedstock used to produce the ethanol. *Abengoa* uses corn stover as their primary feedstock, whereas *Raizen* uses the aforementioned sugarcane bagasse, as it is significantly cheaper.

Table 8.2. below shows that cellulosic ethanol production is done in many of the regions of the world:

▶ **Table 8.2. Number of operating second generation biorefineries in the world, 2017**

Region	Pilot	Demonstration	Commercial	Total
Africa	5	0	3	8
Asia-Oceania	6	5	4	15
Europe	7	7	5	19
North America	5	6	9	20
South America	1	1	3	5
Total	**24**	**19**	**24**	**67**

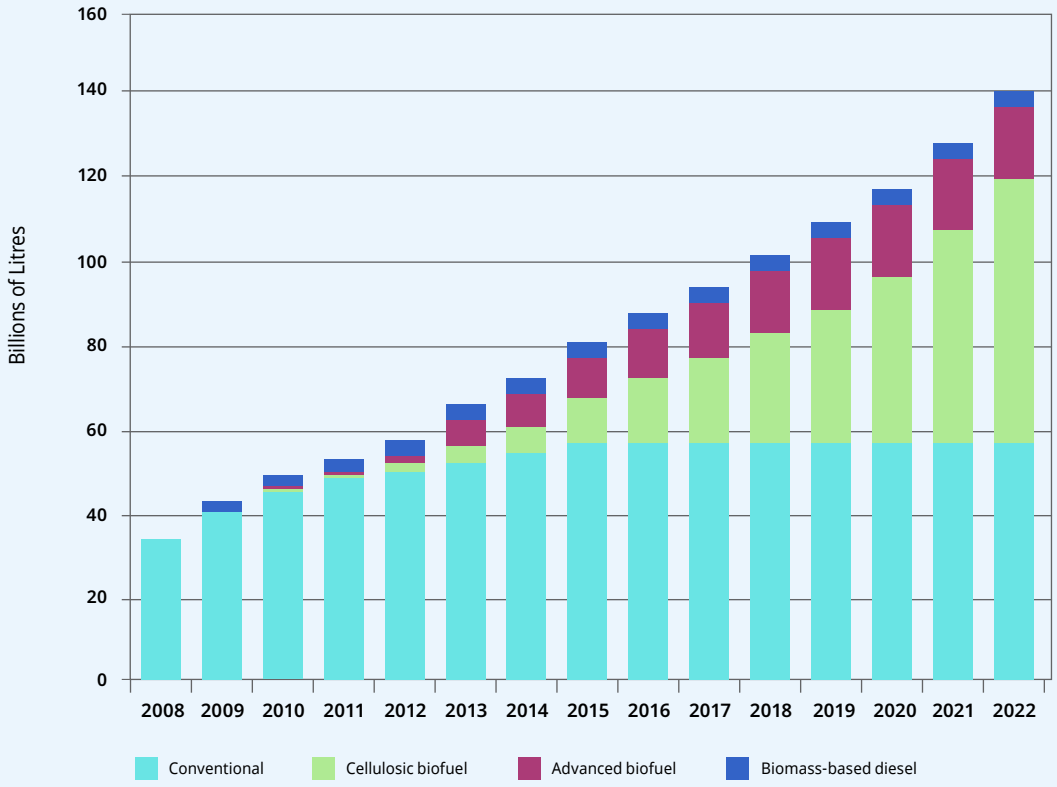
Source: Que et al. (2017)

8.3. Market prospects

The world is undoubtedly leaning towards second-generation biofuels, given the doubt and scrutiny enveloping first-generation biofuels. Companies like *Raizen* have proven that second-generation biofuels, and particularly second-generation ethanol, can in fact be commercially viable.

While the cost of producing cellulosic ethanol is still too high for it to be easily and unequivocally commercially viable, there is a great deal of research and development (R&D) activity on the technological and operations research solutions that could reduce costs of production. Lynd et al. (2017) point out that the high capital costs associated with the conversion of biomass into ethanol are the main costs in bioethanol production, as against the cost of the feedstock – a conclusion that would readily apply to Guyana. As such, each of the stages after the acquisition of the feedstock could be the subject of biotechnology and other kinds of R&D so that sources of cost reduction could be found. Lynd et al. (2017) propose a particular cost-reducing change in the current thermochemical pretreatment that is used to make the cellulosic biomass less "recalcitrant" or more amenable to subsequent biological conversion, suggesting instead that several of the stages from pretreatment onwards might be combined and subjected to "consolidated bioprocessing." In fact, the authors even claim that the process they recommend will radically improve the cost competitiveness and feasibility at a smaller scale than the currently employed technologies.

▶ **Figure 8.2. Renewable fuel standard volumes, by year**



While there is such rapid progress in R&D, Zhang (2019) notes that the key problems that must still be resolved in the quest for commercial viability are "(1) Effective and low-cost biomass pretreatment method that exposes polysaccharides to enzymes for efficient saccharification, (2) efficient fermentation of all sugars (pentoses and hexoses) released during the pretreatment and hydrolysis steps into ethanol, (3) development of enzymes that tolerate various inhibitors including monosaccharides (mainly glucose), and ethanol accumulation, and (4) heat-tolerant fermentation microbes and enzymes for efficient simultaneous saccharification and fermentation."

A second avenue for improving the commercial viability of second-generation biofuels involves the choice of "coproducts" that are produced with ethanol. Rosales-Calderon and Arantes (2019) show the range of coproducts that could be produced from biorefineries.

The prospects for the stand-alone commercial viability of cellulosic ethanol, either by consolidated bioprocessing and/or coproduct development in biorefineries, are steadily improving even if examples of particular plants that are now commercially feasible do not pervade this nascent industry. As was pointed out before, and will be pointed out again below, the argument for "big push" green industrialization rests precisely on the idea that a set of complementary investments might well be commercially viable even if the constituent investments are not, when considered on their own.

8.4. Decoupling development from resource depletion and enhancing diversification prospects

In an important publication, Green Industrial Policy: Concept, Policies and Country Experiences, Altenburg and Rodrik (2017) make the point that developing countries can indeed create wealth by ensuring that their technology and institutions are designed and developed to decouple development from the depletion of non-renewable resources, such as Guyana's new-found oil and its gold and other mineral resources. The cellulosic ethanol proposal is very much in the spirit of providing a nudge to a green industrial policy consisting of a number of potentially complementary IRS projects such as the example set discussed in Chapter 6.

One especially important spillover demand that would occur relates to "human capital" development and the technologies for both cellulosic ethanol itself and also the various co-products that might be produced in biorefineries. These technologies are still actively being developed, both by applied science and engineering researchers and practitioners, with a view to reducing productions costs. Were GUYSUCO or some other entity to proceed with cellulosic ethanol and its co-products, there would be great scope for developing relevant programmes of research and teaching at (say) the University of Guyana, both as a matter of supporting a cellulosic ethanol and biorefinery sector, and also as a matter of developing the University of Guyana itself. Needless to say, such complementary investments will give Guyana an opportunity to become involved in cutting-edge research that could be very attractive to global climate finance agencies that are prioritizing off-grid renewable energy initiatives (IRENA and CPI 2020) and other economic activities that create "green jobs".

The technology that will be used is clearly one that would enable Guyana to reduce its dependence on fossil fuels for energy and contribute to climate stabilization, but it will also be clean technology that would reduce waste and pollution associated with the production of sugar (alone). Moreover, it will allow Guyana to seriously begin to address diversification, not just because it will contribute to a higher quality and a more reliable supply of energy, but perhaps more importantly, because it will build on already existing knowledge about the growing of sugar cane. This is precisely the diversification of knowledge pools and the creation of institutions necessary to "facilitate continuous recombination of knowledge for the improvement of existing or the creation of new and better goods and services" (Altenburg and Rodrik 2017, 3), and it is precisely the strategy recommended by Hausmann and Klinger (2007).

What is more, the use of technology and appropriate institutions (such as the engineering of a capital infrastructure including the company that transfers the technology, the unions, the public via a public offering, and other strategic investors) would ensure that the reopening of the sugar estates will not be a return to "business as usual", which, as noted earlier, would likely be unprofitable and will face serious contention from labour shortages and higher wages, as Dutch Disease effects begin to affect the sector.

8.5. Backstop technologies, complementarities and financing

Whatever the prospects for cellulosic ethanol produced primarily from sugar cane biomass, it is clear that its commercial viability cannot be assured. In fact, cellulosic ethanol is very much in the nature of a backstop technology (Khanna 2009), or a renewable resource that could, technologically speaking, replace a relatively cheaper and more commercially feasible non-renewable one that is being used up. As the latter becomes more scarce, its cost of extraction rises. At the same time however the cost of the backstop technology decreases precisely because the increasing scarcity of the non-renewable stimulates investment in the former. At some point, the rising cost of the renewable resource renders the use of the backstop technology, which has all along been benefitting from R&D, commercially feasible.

What is important here is that the backstop technology is not usually commercially feasible at the outset, but it benefits from subsidies and other forms of funding that support investment in R&D until the threshold of commercial feasibility is reached. This, arguably, is precisely what is occurring in the biofuels sector, so that it would be short-sighted and even intertemporally inefficient to postpone or completely reject investment in something like cellulosic energy just because it might not now be commercially profitable. Moreover, evidence of the irreversibility of climate change strongly suggests that the high social cost of fossil fuels will have the twin effects of shifting investor resources into renewable energy stocks, raising financing costs for petroleum producers, and increasing the funding that will be available to conduct more R&D in bioenergy. Together, these effects will combine with changing preferences of consumers in favour of renewable energy, and will ensure that even if petroleum prices do not rebound, investment in biofuels in general, and cellulosic ethanol in particular, deserves serious consideration.

It bears repeating that IRS technologies such as the cellulosic biofuels being proposed are not usually profitable at marginal cost prices. In Guyana's context, the high cost of electricity, the possibilities for complementarities with the University of Guyana that could even lead to the development of a world-class centre of biotechnology, the potential for biorefineries, the scope for the creation of green employment, and the prospect of economic diversification based on skills and knowledge of the sugar industry – all these things are arguments that would support serious consideration of cellulosic ethanol production. But this chapter will not be complete without some comments on capital structure and financing of the proposed industry. Both the economics and the finance literatures point out the importance of getting the capital structure and financing of companies "right", both in the sense of minimising expected costs, providing appropriate incentives, reducing the principal-agent problem, and ensuring profitability of ventures. In the case of what is being proposed, all of these issues assume great importance.

As discussed earlier, the sugar industry, which comprises cane-growing field operations as well as factories on a number of sugar estates, is entirely owned and operated by the State. Field operations at this stage are very labour intensive, with workers being represented by a dominant trade union. Factories that convert sugar cane into sugar are capital intensive, but even with greater investment to make them more technically efficient they might remain unprofitable. As mentioned earlier, the sugar industry in Guyana will, even under the best conditions, have particular difficulty being profitable at world market prices.

As such, all the arguments for a complementary set of investments considered, the question of the appropriate capital structure for the proposed cellulosic ethanol fuel production will have to follow some key principles. Even though cellulosic ethanol on its own will not necessarily be commercially viable – certainly not at this stage – it will not be appropriate for investment to be undertaken by a state-owned entity, GUYSUCO or otherwise. For the private equity to be attracted, financing at concessionary rates, along with some amount of sharing of the risks will have to be built into the capital structure. Financing at concessionary rates can be obtained from the several climate financing funds that are now available, including various forms of debt instruments such as green bonds that would actually lower the cost of capital for investors. Additionally, public sector equity financing, with reasonable dividend policies along with equity involvement by organized labour within the sugar industry, would reduce the financing cost of cellulosic ethanol production while also ensuring that there is appropriate risk-sharing among the various stakeholders. Finally, a system for the granting of credits for emissions reductions to investors, commensurate with their equity holdings, must be put in place. This will allow private sector firms, and especially the major investors, to earn valuable carbon credits.

Annex III of this report gives a set of resources that would be helpful in fully developing a proposal for cellulosic ethanol, along the lines suggested in the foregoing discussion.

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Annexes

Photo compliments: DPI Guyana

Annex I. Mapping of Sustainable Livelihoods Framework into questionnaire items

Questionnaire Items			
	Livelihoods (Affected workers as head of HH)	**Livelihood Sustainability:** Resilience to negative shocks	**Livelihood Security:** Coping with threats from resource curse
Capabilities		**Capabilities to handle closures**	**Household and community capabilties**
Background and beliefs	I.1, 1.2, I.3, III.1	III.3, IV.8	IV.3, IV.4
Individual educational attainments	NA	I.6	
Skills	I.7	II.9	
Access to opportunities	II.6, II.10, II.11, II.12	III.2 (b)	IV.2
Assets		**Assets**	**Household and community assets**
Natural capital	I.4	IV.1	
Human capital (experience, training)	II.1, II.8	III.2 (a)	
Financial capital	II.3, II.4	I.8, III.4, III.6	
Social capital	I.5, II.13	III.7, IV.6, IV.7	IV.5, V.1, V.2, V.3
Economic activities		**Economic Activities**	**Household/community economic activities**
Income earning jobs	I.9	II.7	
Other (self-emplayment, home food production, etc.)	II.5, III.5 (a)	III.5 (b)	
Evaluation	I.10	III.8	V.9

Individual's background		
1.1 - Age	1.5 - Union affiliation & duets	1.8 - Family worked with GUYSUCO?
1.2 - Marital status	1.6 - Educational attainment	1.9 - Currently employed?
1.3 - Religion	1.7 - Experience with GUYSUCO	1.10 - Better off now?
1.4 - Ethnicity		

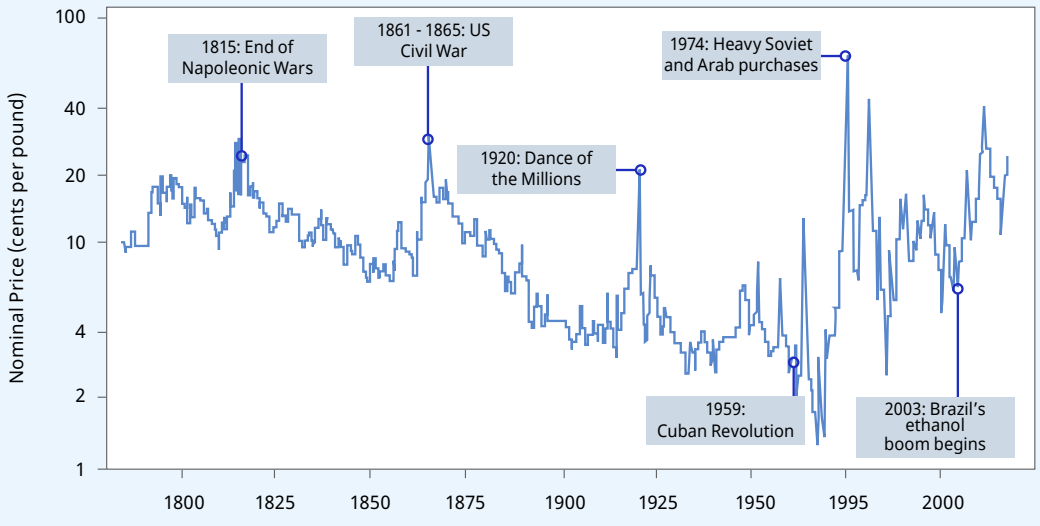
Questionnaire Items		
Individual's Work	**Individual's household**	
II.1 - Experience working with GUYSUCO	III.1 - Size of family	IV.4 - Community worried about the future?
II.2 - Date of termination	III.2 - Children work or attend school?	IV.5 - Did people have to leave community?
II.3 - Severance received	III.3 - Career aspirations of children	IV.6 - Incidence of alcoholism
II.4 - Severance paid on time?	III.4 - Main earners in household (HH)	IV.7 - Incidence of crime
II.5 - Non-household employment	III.5 - (a) Other HH economic activities before	IV.8 - Incidence of suicide
II.6 - Full-time or part-time?	III.5 - (b) Other HH economic activities after	**General**
II.7 - Current versus previous earnings	III.6 - HH income	V.1 - Satisfied with GUYSUCO's handling of closure?
II.8 - Skills similarity with GUYSUCO job	III.7 - Rent or own home?	V.2 - Satisfied with govern ment's handling of closures?
II.9 - New skills learnt	III.8 - HH better off now?	V.3 - Satisfied with union's handling of closure?
II.10 - Transportstion to new job?	**Individual's community**	V.4 - What could GUYSUCO have done better?
II.11 - GUYSUCO helped to find new job?	IV.1 - Services provided by GUYSUCO	V.5 - What could government have done better?
II.12 - Union helped to find new job?	IV.2 - Alternative jobs found by others?	V.6 - What could unions have done better?
II.13 - Family assistance after closures	IV.3 - Others thinking of oil & gas jobs?	

Annex II. Failure of nationalized sugar industry: Causes and consequences

End of Demand Complementarities: Nationalization ensured that the sugar industry was extracted from the common management of a group of companies, even though the various new companies that were created were placed under the supervision of a State Planning Secretariat. While the set of investments by the Booker Group was in the nature of "filling vacuums" (New York Times 1964), as against being carefully planned, the effect was to create the sort of overall domestic and foreign market size that would have supported the various commercial branches of the Group. The State Planning Secretariat however managed each of the newly created public enterprises as a separate one, each expected to contribute to national transformation.

End of Premium Prices: The sugar industry was profitable because of the premium prices it received under the Commonwealth Sugar Agreement (CSA) and the Sugar Protocol, but its structure and the particularities of production in Guyana were, even then, enough to make it unprofitable at the world market prices. The premium prices under the CSA were unsustainable even as far back as the 1970s, if not before. Low-cost producers and alternative sweeteners, especially beet sugar, had emerged and were placing increasing pressures on the world market price of sugar even in 1966, the year of Guyana's independence. Indeed, in its 1966 Annual Report, the Booker Group noted that "[s]ales at the negotiated price to Britain under the Commonwealth Sugar Agreement remain the foundation of the [Guyana sugar] industry." (The Booker Group 1966, 34) The value of the CSA to consumers in Britain was that it protected them from the price uncertainties, and the sometimes very high price, of world market sugar prices but

Figure II.1. The world market price of sugar (1784–2017)



Source: (Winton Group 2020)

the Booker Group also felt that its investments were at risk because of this uncertainty. Noting that the average world price of sugar had moved from GPB29/ton in 1958–1960 to GPB71/ton in 1963, the Booker Group Review of the Year 1963 observed that "the uncertainties of the world sugar price – which affects about a quarter of our sales – allow no respite." (The Booker Group 1963, 11)

In addition to these early issues, which would later become matters of strategic concern for the industry, there were even more issues that awaited the new management. When the eventual erosion of premium prices for Guyana's sugar was signalled by technological advances in alternative sweeteners and the additional erosion of those preferences in the regulatory framework of globalization (Hewitt 2001), (Mitchell 2005), sugar production by GUYSUCO had to become significantly more competitive if it wanted to be profitable. If this was not recognized soon after the commodity price boom of the seventies, it certainly was apparent by 1996, as shown in the table below. In this table, markets are listed by price, in descending order, and estates are listed by production cost on each estate, in ascending order. The last column on profit is therefore just a contrived calculation of profit by estate in 1996, and does not reflect the actual financial performance of each estate (though the overall industry performance would have been the same).

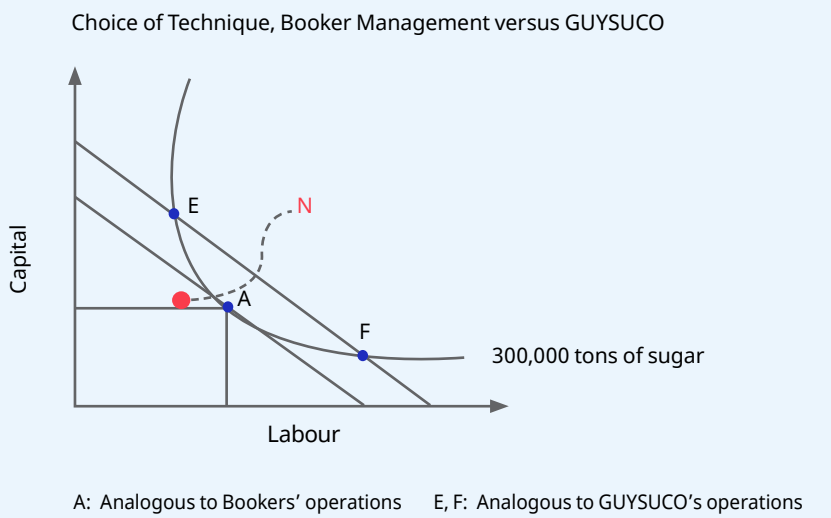
▶ Table II.1. Showing prices, production costs, and profits by market and estate, 1996

Market	Price (US$/ton)	Total quality quality	Average production cost on estates	Estate	Profit (000US$)
EU, Protocol	652	39.6	344.8	Blairmont	12 165.1
EU, Protocol	652	99.8	350.4	Albion	18 156.3
EU, Protocol	652	146.2	360.4	Rose Hall	13 530.2
EU, Protocol	652	166.9	363.4	Skeldon	5 974.0
EU, SPS	544	180.9	363.4	Skeldon	2 528.4
EU, SPS	544	214.5	489.6	LBI	1 827.8
EU, SPS	544	219.9	494.3	Enmore	268.4
US	430	236.3	494.3	Enmore	(1 054.5)
US	430	240.9	503.1	Uitvlugt	(336.3)
Domestic	350	259.9	503.1	Uitvlugt	(2 908.9)
CARICOM	330	260.2	503.1	Uitvlugt	(51.9)
CARICOM	330	281.8	521.6	Wales	(4 138.6)
					45 960.2

Source: (Government of Guyana 2000)

Choice of technique after nationalization: First, the history of selling sugar in premium markets had, even before nationalization, made the objective of the company one of production to meet market quotas that were artificially profitable because of the agreements such as the aforementioned CSA and its successor agreements. Secondly, the company had, overnight, changed from being a production-oriented private one, to a state-owned/run company that had to be production-oriented as well. The following diagram represents both these features of the newly nationalized industry:

▶ **Figure A II.2. Choice of technique, Booker management versus GUYSUCO**



To simplify description of the illustration, we assume that sugar can be produced using two factors or inputs, labour and capital. Capital (the vertical axis) refers to field and factory equipment, while labour (the horizontal axis) refers to field and factory workers, at different skill levels. The curved line, known as an isoquant, indicates the various combinations of labour and capital that would produce a given amount of sugar (that is, 300,000 tons). Hence, all the combinations of inputs shown at points **E** (high capital intensity), **A**, and **F** (high labour intensity) or any other point on the curve can produce 300,000 tons of sugar. The two parallel diagonal lines represent the amount of capital and labour that can be purchased for a given total cost, with the line farther out representing a higher cost outlay. The input combination used at **A** was therefore less costly than the input combination at either **E** or **F**, but all three input combinations would have been associated with the production of the same amount of sugar, that is, 300,000 tons of sugar.

The situation at nationalization in 1976 was analogous to point **A** on the diagram, while the situation after nationalization is analogous to either points **F** or **E**. The Booker Group, the British conglomerate was itself production-oriented and it was able to be profitable only because of the premium prices it received but it was nonetheless a profit maximizing company. As such, it would have at the same time sought to minimize the cost of producing the 300,000 tons of sugar shown in the diagram. In particular, it would have chosen the optimal combination of labour and capital to produce the stated 300,000 tons of sugar at minimum cost, for the simple reason that any other combination than **A** would have been associated with higher costs and lower profits – for the same 300,000 tons of sugar.

While abstract and clearly contrived, the foregoing analytical framework represents precisely what occurred in the industry. As pointed out by the Ministry of Agriculture (2017), at the time of nationalization in 1976, GUYSUCO was producing 337,776 tonnes of sugar with a workforce of 28,406. If this corresponded generally to the point A in the diagram, by 1992, when the company produced 246,898 tonnes of sugar with a workforce of 28,081, the company was clearly operating at a point like **N**, through which an imaginary isoquant would pass to indicate a lower level of output.

At the point of nationalization, the sugar company was no longer the profit maximizing one it used to be, and therefore its decisions were not going to be cost minimizing ones. It did not help either that suddenly, *all risks associated with the 'choice of technique' would have been wholly underwritten by taxpayers upon nationalization*. The fact that this phenomenon manifested itself in the nationalized sugar industry has been exhaustively addressed in the field, factory and human resource sections of the Commission of Inquiry into the Sugar Industry (2015), which, at the risk of exaggeration, is essentially a catalogue of these instances.

Even so, a comment about the Skeldon Sugar Modernization Plan (SSMP) is in order in this regard. According to the Commission of Inquiry into the Sugar Industry (2015), GUYSUCO was insolvent, having racked up a debt of G$82.5B, and that insolvency had much to do with the SSMP. The authors of the COI Report were categorical, "... it seems, in retrospect, that from a business and economic standpoint, the decision to pursue the Skeldon modernization project may not have been logical and based on sound considerations". (p. 19) Certainly, the company might have considered that there was great risk in undertaking a large investment (amounting to about half of Guyana's 2006 international reserves) when:

- GUYSUCO's main market had been compromised;
- There was no guarantee of a CARICOM market;
- Cost of production was very high;
- The project itself was a technically risky one, and
- There were serious risks associated with management failures, climate uncertainty, labour market adjustments, increasing wage demands, and public sector inefficiencies.

These points were indeed made by Singh (2006), but the company and indeed the Government discounted these significant risks because a successful project alternatively had the potential of turning around the industry and even the economy.

Social, political and policy burdens after nationalization: Without prejudice to the potential importance and effectiveness of State-Owned Entities (SOEs), it might be pointed out that the pursuit of non-commercial social and political objectives had placed significant pressure on the profitability of GUYSUCO from the time of its incorporation. From the spending out of the *Sugar Levy Act* fund that started in 1974, to the use of company funds on non-sugar drainage and irrigation,[29] community health and recreational centres and so forth, the use of sugar industry revenues to pursue non-commercial, social objectives had the usual and expected effect of depriving the company of cash flow and retained earnings to finance depreciation and capital acquisitions, whenever the levy and other non-sugar outlays exceeded supernormal profits. What is more, some of these expenditures, such as those related to drainage and irrigation infrastructure, involved neither a correction for market failures due to GUYSUCO's operations nor distributional disagreements that would have made the industry feel obligated to bearing these added costs. In other words, significant amounts of these added costs were not really in the nature of a Corporate Social Responsibility (CSR) programme (Heal 2005).

29 From the inception (GUYSUCO in 1976), GUYSUCO was assisting with the drainage and irrigation of its surrounding communities to the tune of approximately 40 per cent of GUYSUCO's annual drainage and irrigation costs (Hanoman 2016).

This is in fact part of the more general problem noted by Willig (1994), that public enterprises remained vulnerable to 'arbitrary political and self-serving influences' that ultimately lead to decisions about the use and disposal of company assets, over and beyond what might be justifiable from a CSR perspective, and from which influences private enterprises are insulated. GUYSUCO, over the years, found itself using company resources for a range of activities outside of its core business of producing sugar.

Most recently, the decision to close the Wales, East Demerara, Rose Hall and Skeldon sugar estates was an example of the ability of the Government to dispose of state-owned assets, in this instance GUYSUCO assets, to serve the broader political objectives of the Administration. Despite there being no recommendation for closure of estates emanating from an elaborate Commission of Inquiry in 2015 nor contained in the State Paper on the Future of the Sugar Industry (2017) and despite repeated calls from GAWU for a socio-economic study of the potential impacts of closure of sugar estates, the Government proceeded to announce the closure of the aforementioned estates. This not to deny that closure of the estates was part of a plan to restructure the industry, however, for many decrying the Government's decision and subsequent actions, it was the swiftness of the closures and the lack of a clear or detailed plan to address issues such as jobs, job training and livelihoods of the dismissed workers that raised significant and worrisome questions about the motivations for the move. [30]

Soft budget constraint: Budget constraints represent relative scarcities, and to the extent that they are solid, give rational agents strong incentives to make optimal use of scarce resources. The tendency for public enterprises to choose sub-optimal input combinations and follow social and political objectives, reflects the absence of hard budget constraints because public enterprise inefficiencies and losses are fully reflected in the overall fiscal balance, unlike private enterprises that must bear the costs of their investment decisions.

Cost overruns, inefficiencies, poor decisions – all would have been easier, as any losses GUYSUCO made would have been absorbed by the Government. Beyond this, however, were the many agency problems that plagued the industry, as opportunities for pursuing private interests at the expense of the performance of the company and the industry were rife (Lin et al. 2020).

Increasing returns to scale: Often overlooked, the aggregate production technology in the sugar industry is an Increasing Returns to Scale (IRS) one that renders industry profitability nearly impossible after the erosion of premium prices.

A production technology is said to exhibit increasing returns or increasing returns to scale if increasing all inputs - which in the case of the sugar industry will include the acreage under cultivation, fertilizer, labour, plant and equipment – by a given factor leads to a more than proportionate increase in output. It is not straightforward to determine by simply observing changes in inputs and output that have occurred in the sugar industry, if a production technology exhibits increasing returns, because all inputs are never varied in the same proportion at the same time. [31] For example, in the case of the *Skeldon Sugar Modernization Plan*, there was a large change in both capacity and technology in the factory, but it was not matched by the planned increases in acreage. What usually happens instead is that inputs are varied piecemeal, and in different proportions, sometimes moving operations even further away from the cost-minimizing

30 The political motivations of the Administration emerged in an interview between the author and the then Minister of Agriculture, Noel Holder, of 5 December 2019. He pointed out that the Cabinet had decided that it could not continue to "bailout" GUYSUCO as the Government could have instead used the same money to pay salary increases to the public servants who had voted for it in 2015. Prior to this, the Chairman of the GUYSUCO Board had made the remark, in discussing GUYSUCO's "real time" circumstances, that 'business as usual' would entail "lay[ing] off workforce receiving wages significantly above the median for public service employees [my emphasis]." (Thomas 2016).

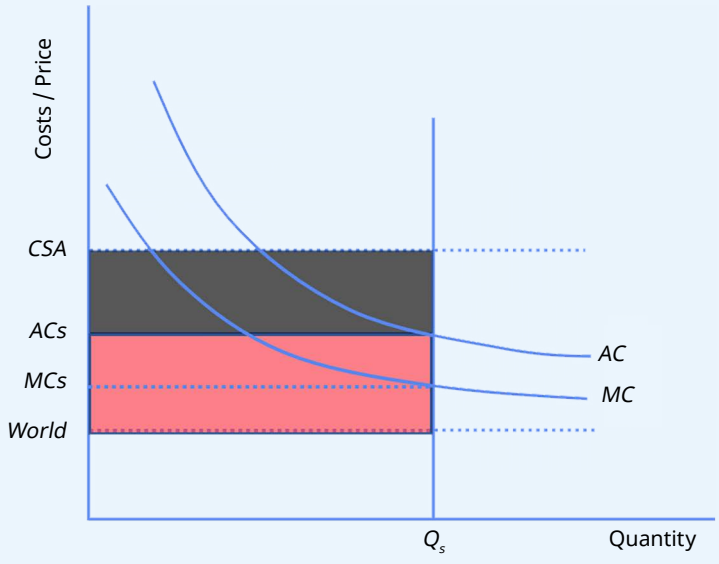
31 See Kim (1997) for an excellent discussion that includes an explicit recognition of market structure. The particular definition of IRS in this chapter in fact is a reference to one of two 'sources' of IRS at the firm level, the others being the existence of a fixed factor, such as the equipment in a sugar factory owned by GUYSUCO. IRS at the aggregate level involves some sort of fixed factor as well, such as technology (a process, an important software) that is available to all firms operating in a sector or country, or a preference for variety as in models of intra-industry trade, which allows firms to have market power to charge prices in excess of marginal costs, and in turn allows them all to use IRS technologies at the firm level, so that overall, the industry also exhibits IRS.

combination of inputs than the status quo, just to meet the requirements of production (Milgrom and Roberts 1994, 6). This latter issue has indeed been one of the challenges that has confronted GUYSUCO as it has tried to reform and restructure itself. Coordinated change is required, but the pace of change is not identical in all the dimensions that matter, with the result that, even if performance will improve when all the necessary changes have been made, it will deteriorate while the piecemeal adjustments are being made. In fact, the deterioration might be so dramatic that the reforms may have to be halted.

This very problem, that one cannot by simply looking for instances where a proportionate increase in inputs yields a more than proportionate increase in output, allows for IRS to be discussed in terms of costs. The most common way of doing this is to divide costs into a fixed-cost element, such that average total costs decline with production; and a constant marginal production costs component such that total variable production costs increase in proportion to output. The consequence of this approach to modelling costs is that average costs of production decline as output expands.

Whatever its source, increasing returns to scale manifests itself as declining average costs as output increases, and therefore marginal costs that are everywhere lower than average costs. Volume 2 of the Commission of Inquiry into the Sugar Industry (2015, 17) points out that a Caribbean Development Bank (CDB) study of mechanization reported that the incremental (marginal) cost of producing sugar at GUYSUCO was indeed lower than the average cost. The intuition here would clearly be that, just as equipment in sugar factories confer IRS on factory conversion of cane to sugar, so too would mechanization confer IRS on field and agriculture operations, ensuring that overall, sugar production would certainly exhibit IRS, as illustrated in the diagram below:

▶ **Figure A II.3. Costs and prices of GUYSUCO's operations**



This is shown for a particular quantity of sugar Q_s, with which is associated average costs AC_s that are greater than MC_s. If this amount were sold at Commonwealth Sugar Agreement (CSA) prices, the profits, shown by the black rectangle, would have been significant as *CSA* prices were higher than unit costs, AC_s. Selling at marginal costs would have necessarily entailed a loss, as those prices would have been less than unit costs, while selling at world market (dump) prices would have entailed the even greater loss

shown by the red rectangle. The essential point is that *once the sugar preferences were lost, even selling at marginal costs would have been unprofitable, and selling at world market prices, which are generally perceived to be lower than marginal costs, would have been heavily loss-making*.

Earlier, reference was made to demand complementarities across the various firms in the Booker's Group, and it was noted that these complementarities had the effect of increasing the market size. The presence of increasing returns to scale in turn requires a large enough market for its output, and this in turn implies that there must be some form of imperfect competition, including monopolistic competition that allows firms to profitably sell all their profit-maximizing output at prices that are marked-up over marginal cost. While this discussion, though far more pertinent than most of the discussions that are based on partial equilibrium or industrial organization-type analyzes, was used to help explain the success of the Booker Group and the unavoidable realities of the nationalized entity, GUYSUCO, it will also prove extremely important for any consideration of the future of the sugar industry in Guyana. Among the several important discussions are (Matsuyama 1995), (Kim 1997), and (Murphy, Shleifer, and Vishny 1989).

It is useful to conclude this sub-section on increasing returns to scale pointed to some of the issues that were discussed earlier, in the sub-section on the (end of) demand complementarities, as the two issues are closely related. First, GUYSUCO's profits were not used to create effective demand and increase the markets for other IRS industries, as required by 'big-push' that Murphy, Shleifer, and Vishny (1989) discussed. As such, the policy of having GUYSUCO pursue other non-commercial objectives would have, on two counts, guaranteed de-industrialization once the company began to make losses. Firstly, only profits were being distributed to the rest of the economy, and secondly, those distributed profits were not being used to increase the overall size of the market (for complementary investments, which anyway were absent).

Finally, the literature on increasing returns to scale and big push industrialization usually points out that a company such as GUYSUCO that was earning supernormal profit at one stage, could have stimulated effective demand in the Guyana economy had there been a set of complementary IRS investments that would have allowed even a losing (other) firm to survive. Thus, the premium wages and salaries in the sugar industry, especially when it was selling at preferential prices, were not used to increase the size of the market as would have been the case had there been complementary investments.

In summary, this discussion of increasing returns has the important feature of 'cumulative causation' or feedback, with the implication that there are multiple possible industrialization equilibria for a country: GUYSUCO failed because other companies failed to support it, but other firms failed to support GUYSUCO because GUYSUCO failed to support them. GUYSUCO therefore, had to depend exclusively on the export market, but this was necessarily going to be unprofitable given the erosion of sugar preferences and prices.

Photo compliments: DPI Guyana

Annex III. Resources for the development of a proposal for cellulosic ethanol

Name	Category	Link
Agricultural Marketing Resource Center: Biofuels/Biorefining	Archive	https://www.agmrc.org/renewable-energy/biofuelsbiorefining-general
BioFuturePlatform Resources	Archive	http://www.biofutureplatform.org/resources
Cellulase production using natural medium and its application on enzymatic hydrolysis of thermo chemically pretreated biomass	Article	https://link.springer.com/article/10.1007/s13205-016-0465-z
Cellulosic Ethanol Feasibility Template	Article	https://www.agmrc.org/renewable-energy/ethanol/ethanol-related-web-sites-and-news-sources/cellulosic-ethanol/cellulosic-ethanol-feasibility-template
Energy in 2020: Assessing the Economic Effects of Commercialization of Cellulosic Ethanol	Article	https://archive.bio.org/articles/energy-2020-assessing-economic-effects-commercialization-cellulosic-ethanol#:~:text=The%20annual%20benefits%20to%20U.S
EPA: Economics of Biofuels	Article	https://www.epa.gov/environmental-economics/economics-biofuels
Food Technology & Biotechnology (Second Generation Bioethanol Production)	Article	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6117988/
Lignocellulosic ethanol production: Current practices and recent developments	Article	https://academicjournals.org/journal/BMBR/article-full-text-pdf/8D9C02C11840.pdf
Quartz: Next generation in technology is turning throwaway plant parts into biofuel	Article	https://qz.com/551245/next-generation-technology-is-turning-throwaway-plant-parts-into-biofuels/
Solid state fermentation process coupled biological pretreatment with cellulase production by Piptoporus betulinus for enhanced cellulose hydrolysis	Article	https://link.springer.com/article/10.1007/s10570-019-02359-3
Techno-economic Analysis of Cellulosic Ethanol in Indonesia using Palm Residues	Article	https://theicct.org/sites/default/files/publications/Indonesia-cellulosic-ethanol-EN-dec2020.pdf

U.S. Economic Impact of Advanced Biofuels Production	Article	https://archive.bio.org/articles/us-economic-impact-advanced-biofuels-production-1
World Economic Forum: How advanced biofuels could revolutionize clean energy	Article	https://www.weforum.org/agenda/2015/12/how-advanced-biofuels-could-revolutionize-clean-energy/
Advanced Biofuels Association	Bio Energy and Ethanol Industry Associations	http://advancedbiofuelsassociation.com/section.php?sid=2
American Coalition for Ethanol	Bio Energy and Ethanol Industry Associations	https://ethanol.org/
Energy Facot (ExxonMobil)	Bio Energy and Ethanol Industry Associations	https://energyfactor.exxonmobil.com/reducing-emissions/alternative-fuels/power-of-algae/
European Technology and Innovation Platform - Bioenergy	Bio Energy and Ethanol Industry Associations	https://www.etipbioenergy.eu/?option=com_content&view=article&id=178
International Renewable Energy Agency	Bio Energy and Ethanol Industry Associations	https://www.irena.org/
Renewable Fuels Association	Bio Energy and Ethanol Industry Associations	https://ethanolrfa.org/
Advances in Biochemical Engineering/Biotechnology	Book	https://link.springer.com/bookseries/10
Biorefineries: Integrated Biochemical Processes for Liquid Biofuels	Book	https://www.sciencedirect.com/book/9780444594983/biorefineries
Biotechnology in China III: Biofuels and Bioenergy	Book	https://link.springer.com/book/10.1007/978-3-642-28478-6
Sustainable Production of Second Generation Biofuels	Book	https://www.oecd.org/berlin/44567743.pdf
ExxonMobil: Advanced Biofuels	Company	https://corporate.exxonmobil.com/Energy-and-innovation/Advanced-biofuels
Shell: Energy and Innovation	Company	https://www.shell.com/energy-and-innovation/new-energies/biofuels.html#vanity-aHR0cHM6Ly93d3cuc2hlbGwuY29tL2VuZXJneS1hbmQtaW5ub3ZhdGlvbi90aGUtZW5lcmd5LWZ1dHVyZS9mdXR1cmUtdHJhbnNwb3J0L2Jpb2Z1ZWxzLmh0bWw=true&iframe=L3dlYmFwcHMvMjAxOV9CaW9mdWVsc19pbnRlcmFjdGl2ZV9tYXAv
SugarCane	Company	http://www.sugarcane.org/overview-video/
9th Annual Kingsman Asia Sugar Conference	Conference	https://www.spglobal.com/platts/en/events/apac/kingsman-asia-sugar/summary

International Biomass Conference and Expo	Conference	http://www.biomassconference.com/ema/DisplayPage.aspx?pageId=Home
International Fuel Ethanol Workshop and Expo	Conference	http://www.fuelethanolworkshop.com/ema/DisplayPage.aspx?pageId=Home
Biotechnology and Molecular Biology Reviews	Journal	https://academicjournals.org/journal/BMBR
Cellulose Volume 28 (January 2021)	Journal	https://www.springer.com/journal/10570
Energy for Sustainable Development	Journal	https://www.sciencedirect.com/journal/energy-for-sustainable-development
Energy for Sustainable Development Volume 60 (February 2021)	Journal	https://www.sciencedirect.com/journal/energy-for-sustainable-development/vol/60/suppl/C
Food Technology & Biotechnology Archive	Journal	https://www.ncbi.nlm.nih.gov/pmc/journals/3112/
Second Generation Biofuels: Economics and Policies	Journal	https://www.sciencedirect.com/science/article/abs/pii/S0301421511003193
Alternative Energy News	Newsletter	http://www.alternative-energy-news.info/technology/biofuels/
Biofuels International	Newsletter	https://biofuels-news.com/
Ethanol Producer Magazine	Newsletter	http://www.ethanolproducer.com/tag/cellulosic/
Purdue University BioEnergy	Newsletter	https://www.agmrc.org/media/cms/ID335_3689B7F4DC496.pdf
Borregaard: Funds for a Bioethanol Project	Project Development, Finance and Funding	https://www.borregaard.com/Sustainability/Green-Room/Funds-for-a-bioethanol-project
Green Climate Fund: Consideration of Funding Proposals	Project Development, Finance and Funding	https://www.greenclimate.fund/sites/default/files/document/gcf-b15-13-add02-rev01.pdf
Green Climate Fund: Funding Proposal	Project Development, Finance and Funding	https://www.greenclimate.fund/sites/default/files/document/funding-proposal-fp082-adb-china.pdf
EPA: Renewable Fuel Standard Program Regulatory Impact Analysis	Report	https://nepis.epa.gov/Exe/ZyPDF.cgi/P1006DXP.PDF?Dockey=P1006DXP.PDF
UNCTAD: Second Generation Biofuel Markets: State of Play, Trade and Developing Country Perspectives	Report	https://unctad.org/webflyer/second-generation-biofuel-markets-state-play-trade-and-developing-country-perspectives
Purdue Agriculture: Renewable Energy	University Department	https://ag.purdue.edu/extension/renewable-energy/Pages/Bioenergy.aspx

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