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Economic Development in Tropical Queensland & Net Zero: A Review of Challenges & Opportunities

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Abstract

The Paper reviews the realities of the economy of the Tropical Queensland region and the pathways to achieving further economic development. It identifies the need to continue developing industries based on the region's mineral and biological resources and locational advantages that earn income from outside the region while pursuing opportunities to develop higher order manufacturing and services as population and the economy grows to replace goods and services currently imported into the area. Satellite mapping of carbon absorption as indicated by plant growth indicates that tropical Australia's absorption is roughly equivalent to southern Australia. But with only 5% of Australia's population living in the area, CO2 emissions generated in the area will be very much lower. However, the Paper provides evidence that the structure of the economy of the Tropical Queensland region results in it being very energy dependent on a per capita basis and the overwhelming majority of the energy consumed is currently from fossil fuels. On top of this, the economies of the Mackay and Central regions are heavily dependent on exports of fossil fuels overseas. Against this background, the Paper canvasses a number of major challenges net zero poses to future growth and development including the threat of higher energy costs to the competitiveness of the region's agricultural, fishing, mining and tourism industries' ability to compete in international markets, the threat that restrictions on tree clearing pose to the further realisation of the area's large underdeveloped agricultural potential, and the potential demise of fossil fuel exports. However, the Paper also explores some opportunities, pointing to the region's strong solar generation potential, the high potential role of tropical agriculture in biofuels and potential in hydro electricity generation.

Keywords: Regional development, Growth centre theory, Economic structure, Decentralised development, Southern Australia, Tropical northern Australia

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1. Introduction

In this Paper, we draw on many years of involvement in the promotion of economic development in Tropical Australia and particularly in the regions of Tropical Queensland to bring into perspective the realities of the economic structure and the directions in which future development can realistically be expected to take place. Against this background, the Paper explores the extent and type of challenges and opportunities the pursuit of global Net Zero presents to the continuing development of Tropical Queensland.

2. Early Development Challenges

To understand the current structure and prospects for the economy of Tropical Queensland, it is important to recognise that historically the continent's tropical areas represented a much greater challenge to a nation with most of its population and its technology drawn from temperate zone North-western Europe. New settlers brought with them a suite of highly developed plants and animals, building technology, clothing and seasonal social patterns relatively easily adapted to the climate of southern Australia but was largely unsuited to a tropical climate. Development of the area was late starting and experienced severe early setbacks. By the end of World War II, Tropical Queensland covering an area equivalent to the States of New South Wales, Victoria and Tasmania had a population of just 300,000 that is about the same as Tasmania.

3. Facing Realities

However, the reality was that the area faced a developmental paradox - that the high degree of dependence of the economy on primary industries and mining with relative lack of development of higher order manufacturing and services was not due to a lack of effort to develop these activities, it was due to the fact that the area had failed to develop enough population and economic activity based on biological and mineral resources on which to base further growth of higher order manufacturing and service industries. The reality was that the population and economic activity was so low and distant from major markets that it was hopeless as a location for manufacturing and service industries to cater for state wide, let alone national markets.

4. Four Underlying Factors

However, the biological and mineral resource base was there upon which to build up resource- based industries. It had just not been developed. There were four underlying factors that would see major realisation of potential that would then underpin growth of the regional cities:

1) A growing world economy, especially in nearby Asia, reaching out for previously underdeveloped resources;
2) Transport and communication developments that were breaking down old cost barriers of remoteness;
3) The development of technology suited to the tropics;
4) Success breeds success factors as population and infrastructure built up.

Against this background, as the area rapidly built up earnings from outside the area from resource based industries, Tropical Queensland's growth outpaced most regional areas of Australia. Mechanisation saw the sugar industry throw off the need for protection. New superior tropical breeds were introduced into beef cattle herds. Sealing of the last sections of the Bruce Highway saw a major new horticultural sector develop. New fishery resources were discovered and developed. Transport development saw the area's brilliant combination and quality of tourism resources burst on national and international markets. Development of bulk carriers saw the area's major sedimentary mineral deposits of coal, bauxite, and silica sand generate major exports. The strategic defence location saw the development of army, naval and air bases in the area. Importantly, relatively large numbers of smaller vessels and aircraft stimulated by the base industries earning outside income led to skills-based aircraft and maritime maintenance and repair clusters developing. Growing population saw university campuses established and higher order health and hospital services developed.

5. Realities Today

Although there has been a great deal of progress, the reality is that the area's economy is still very heavily dependent on sectors earning income from outside the region that are based on the area's biological and mineral resources – primary industries, tourism and mining. However, the four factors identified of growing global markets, falling transport costs, improving tropical technology and success are still there and it is vital that these opportunities for further resource-based industry development continue to be pursued. Realisation of opportunities in relation to strategic location and defence is currently important. The reality is also that although Tropical Queensland's population has reached one million and there are opportunities to develop higher order services and skills-based activities, the area's population and economy is still relatively small and off centre for the development of manufacturing and services catering for state wide and national markets. It also needs to be noted that in terms of competitiveness in world markets, Tropical Queensland along with the rest of Australia has very high wage costs and the area often relies on mechanisation and investment in highly efficient production and transport systems to be competitive.

6. Net Zero

The first aspect that needs to be recognised is that Tropical Queensland's economic structure leads to the area recording very high energy use per head of population and that currently most of this energy is derived from fossil fuel. On top of this, the area is a major exporter of fossil fuel especially the Mackay and Capricorn regions. Table 1 compares petroleum product imports through the area's ports of Gladstone, Mackay, Townsville, Cairns and Weipa on a per capita basis with the State of South Australia and at national level. It indicates that on a per capita basis, Tropical Queensland is consuming about double the national average and well over double that of South Australia.

Table 1- Indications of Petroleum Product Consumption Per Capita 2023, Tropical Queensland Compared.

Area	Indicated petroleum use (Tonnes)	Population (No.)	Petroleum use per capita (Tonnes)
Cairns Weipa TNQ Region	643,733	300,000	2.15
Townsville Northern Region	1,077,051	275,000	3.92
Mackay Region	1,710,000	181,000	9.45
Gladstone Central Region	1,162,850	240,000	4.85
Total Tropical QLD	**4,593,634**	**1,000,000**	**4.59**
South Australia	2,361,632	1,820,000	1.30
Australia	58,559,436	26,010,000	2.25

Sources: https://www.flindersportholdings.com.au/port-statistics/ https://www.energy.gov.au/publications/australian-petroleum-statistics-2023

Table 2 indicates that electricity consumption in Tropical Queensland is about double that of the rest of Queensland and the State of South Australia.

Table 2- Indications Electricity Consumption Per Capita 2020/21, Tropical Queensland Compared.

Area	Indicated electricity use (kWh)	Population (No.)	Electricity use per capita (kWh)
Total Tropical QLD	**11,376,000,000**	**1,000,000**	**11,376**
Total Remainder QLD	25,394,000,000	4,071,000	6,238
South Australia	11,614,000,000	1,820,000	6,381

Source: QLD Ergon, SA AEMO.

Table 3 gives figures for value of coal and gas exports through the ports of Abbott Point, Hay Point / Dalrymple Bay and Gladstone. It indicates that these exports total about $80 Bn a year.

Table 3- Volume & Estimated Value of Coal & Gas Exports 2023, Tropical Queensland.

Port	Commodity	Tonnes	Est. Value
Abbot Point	Coal	35,443,000	
Hay Point / Dalrymple Point	Coal	96,480,000	
Gladstone Port	Coal	64,454,000	
Total Coal	**Coal**	**196,378,000**	**$62 Bn**
Gladstone Port	LNG	22,970,000	$18 Bn
Total Tropical QLD		**219,348,000**	**$80 Bn**

Source: https://www.data.qld.gov.au/dataset/annual-coal-statistics https://gpcl.com.au/wp-content/uploads/2024/06/Annual-Report-2022-23-FINANCIALS.pdf

Clearly, the challenge of a policy of global Net Zero by 2050 to Tropical Queensland's continuing economic progress is high compared with most other areas of Australia. However, this is offset by some obvious opportunities.

The following discusses three obvious challenges and three obvious opportunities.

Challenges

- Replacement of Fossil Fuel Export Income
- Avoidance of Sharp Increase in Energy Cost Impacts on Vulnerable Sectors
- Restraints Placed on Achieving Agricultural Potential

Opportunities

- Tropical Agriculture Biofuel Potential
- Harnessing Very Strong Solar Energy & Wind Resources
- Hydroelectricity Potential

Challenges

Replacement of Fossil Fuel Export Income

Value of coal and gas exports through the ports of Abbott Point, Hay Point / Dalrymple Bay and Gladstone are currently valued at about $80 billion per annum. If global Net Zero is achieved by 2050, this export income would presumably be lost with serious consequences, especially for the Capricorn and Mackay regions. In the short run, no restraints are being placed on fossil fuel exports. The use of gas as a transition fuel could see gas exports increase for some time. However, if these regions are not to go backwards, replacement activity would need to be developed.

Avoidance of Sharp Increase in Energy Cost Impacts on Vulnerable Sectors

This is especially important for the major sectors in the economy that earn income from outside the region and especially those that compete internationally, including mining, primary industries and tourism. As identified previously, falling transport costs have been a critical factor in the region being able to tap into increasing global demand for goods and services. If transport costs rise sharply, it will be detrimental to a number of sectors especially tourism and fisheries dependent on air transport. The Cairns region is already regarded as a high cost destination and it is important that local costs are kept under control. The tourism industry competes strongly with overseas destinations in the attraction of both domestic and international visitors, especially other tropical destinations, many of which are currently exempt from carbon emission reduction constraints. Fishery production has a high level of fuel consumption and also competes with imports from overseas.

While the sugar industry has opportunities as set out below, it needs to be recognised that it has a substantial fuel consumption in production and especially competes in overseas markets with sugar from Less Developed Countries (LDC) that are currently exempt from reaching carbon reduction targets. The beef industry involves heavy fuel consumption both in production and transport to markets. However, much of its competition in Asia comes from the United States. The horticultural sector mainly supplies to Australian markets but its growth has been very dependent on reducing transport costs between the northern and southern centres. Particularly vulnerable to higher electricity costs has been farmers dependent on pumping water for irrigation. Higher electricity costs have also been a major problem for the foundry operators who are facing competition from imports.

Restraints Placed On Achieving Agricultural Potential

The following CSIRO map shows the degree to which carbon is absorbed by plant growth in various parts of Australia, a measure referred to as NPP (Net Primary Productivity). It illustrates that plant growth potential per square meter across Tropical Australia is higher than southern Australia with Tropical Queensland leading the northern area. River basins' water runoff in Tropical Queensland accounts for about 32% of the nation's total. However, Tropical Queensland is currently producing only 9.6% of the nation's total in value of agricultural production.

Over recent decades, agriculture has been a strong growth sector and there is obvious potential for expansion, especially if heavy wet season water supply can be evened out over the year. However, one of the restraints that has come from Net Zero considerations has been restraints on tree clearing for transition to agriculture production, something that happened long ago in southern Australia. There is a need to develop land clearing techniques that can minimise carbon gas release. Once land is under agricultural production with fertilisers and water application promoting growth, it could be expected that carbon absorption can be superior to that of native forests. Land under agricultural production is not prone to annual fires.

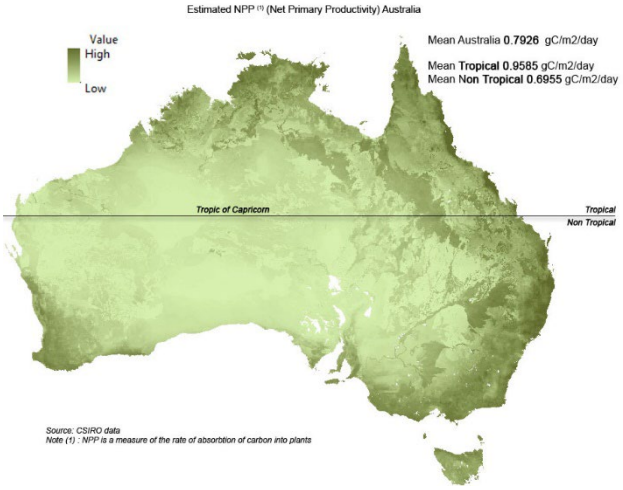

Figure 1- Map: Estimated Net Primary Productivity Australia

Opportunities

Tropical Agriculture Biofuel Potential

Tropical agriculture has been a leader in the production of biofuel especially the sugar industry in Brazil where the balance of production between sugar and ethanol can be affected by world oil prices in turn affecting world sugar prices. In Australia, the industry has long used bagasse fibre residue to power its mills and export 'green' electricity into the grid. The Sarina Mill has long produced 'power alcohol'. 10% ethanol fuel (E10) can be bought at petrol stations. There have long been plans to expand 'green' electricity production, produce ethanol and even bio plastics. However, by and large, these plans have not proved commercially viable enough to go ahead. One recent exception has been a new power plant at the Tablelands Mill but so far a further stage that envisaged ethanol production including growing a supplementary crop of 'blue agave', a crop grown widely in Mexico for Tequila production, has not proceeded.

Pongamia is a tree that produces pods that in India have been used since Vedic times as lamp oil and with little refining produces biodiesel. There have been various trial plantings and Rio Tinto has recently announced buying 3000 hectares of cleared land south of Townsville as part of a new biofuels pilot project. Palm oil and coconut oil widely produced nearby in Papua New Guinea could also be a source of biofuel.

Harnessing Very Strong Solar Energy And Wind Resources

Tropical Queensland has very high solar generation resources. Being in a tropical area, the solar resources are more evenly spread through the year without great variation in day length as occurs in areas further away from the equator. The annual wet season of greater cloud cover comes during the summer months when solar activity is at its peak. Wind resources are more limited but are still substantial in the Atherton and Evelyn Tablelands area and potentially the east coast of Cape York Peninsula. Solar and wind resources are currently being rapidly developed.

While there is a lot of activity that can be supported by electricity production from solar sources, there are many situations where energy needs to be 'portable'. One potential portable fuel is hydrogen. A benefit of plentiful solar capacity is the potential to produce 'green' hydrogen that is being currently explored at Townsville and Gladstone. One of the best and largest sources of silica sand used for solar glass production in Asia are the deposits north of Cooktown in the Cape Flattery area with further mines proposed.

One of the benefits for some of the area's economies is that past fossil fuel power generation has been heavily concentrated in the coalfield region of Central Queensland. The construction of new generating capacity is being spread more evenly throughout Tropical Queensland, however this is a further negative for the coal fields region.

Hydroelectricity Potential

The value of hydro generation in the mix has long been recognised with the Barron Falls Hydro Station going back to the 1930s and the Tully Scheme going back to the 1950s. Hydro schemes are particularly valuable for the generation of power during peak load periods when electricity prices are typically high. The intermittent power production of solar and wind has put an even higher premium on availability of power that can be relied upon when needed. Pumped Hydro schemes virtually act as a battery that is charged during low cost electricity periods. The typography and rainfall of the area leads to further potential hydro development with the Kidston Pumped Hydro scheme underway and proposals put forward in the Mackay / Pioneer area and in the Far North in the Tully area.

Conclusion

The current and likely future structure of the economy of the Tropical Queensland area is such that it is a heavy consumer of energy that is currently mainly supplied by fossil fuels. The area is also a major exporter of fossil fuels. The global transition to Net Zero represents challenges to its continuing economic progress, greater than those faced by most other parts of Australia that will need to be addressed. However, offsetting this, the area has potential opportunities for biofuel and solar energy production balanced by hydro electricity production.

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