Productivity Commission: Transitioning Regional Economies

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Introduction

James Cook University is pleased to provide comment on the Productivity Commission's study into Transitioning Regional Economies.

In this submission we outline the importance of 'place' as an organizing conceptual framework for driving regional development, and make some observations about successful regions applying effective regional planning that builds capacity, is highly connected among different interests, and is evidence-based (around knowledge/data/metrics). We particularly highlight factors important to Aboriginal and Torres Strait Islander (Indigenous) economic development, as well as to educational participation rates. We have provided references to research that may usefully inform the development of analytic frameworks, economic metrics and public policy.

James Cook University

JCU is committed to creating a brighter future for life in the tropics world-wide through graduates and discoveries that make a difference. The University has a demonstrated commitment to research of excellence and high impact, addressing opportunities and critical challenges facing regions within the tropics world-wide. We are due to celebrate our 50th anniversary in 2020. We have 22,146 individual students, 4,827 individual staff, and three main campuses in Cairns, Singapore and Townsville. Our Singapore campus is home to 3,130 students. International students make up 12.1 per cent of students at our Australian tropical campuses.

JCU is ranked in the top two per cent of universities worldwide in the 2016 Academic Ranking of World Universities (ARWU) and the top 300 universities in the Times Higher Education (THES) World University Rankings.

Sustainable development within the wider tropics but particularly within Northern Australia is underwritten by capacity-raising education and research, and the evidence delivered through research. Increasing participation rates in education is necessary if Queensland, and Australia, is to benefit from our geo-political location in the Tropical world.

JCU is committed to ensuring that the communities we serve in northern Queensland, and across the Tropics more broadly, are equipped to engage in a changing global economic context, and that they have real access to knowledge, skills and research to create sustainable and stable futures.

Study of Transitioning Regional Economies

JCU notes the Commission's Terms of Reference:

1. Identify regions which are likely, from an examination of economic and social data, to make a less successful transition from the resources boom than other parts of the country at a time when our economy is reconciling the impacts of globalization, technological and environmental change.

2. For each such region, identify the primary factors contributing to this performance. Identify distributional impacts as part of this analysis.
3. Establish an economic metric, combining a series of indicators to assess the degree of economic dislocation/engagement, transitional friction and local economic sustainability for regions across Australia and rank those regions to identify those most at risk of failing to adjust.
4. Devise an analytical framework for assessing the scope for economic and social development in regions which share similar economic characteristics, including dependency on interrelationships between regions.
5. Consider the relevance of geographic labour mobility including Fly-In/Fly-Out, Drive-In/Drive-Out and temporary migrant labour.
6. Examine the prospects for change to the structure of each region's economy and factors that may inhibit this or otherwise prevent a broad sharing of opportunity, consistent with the national growth outlook.

Methodological observations

JCU's Strategic Intent notes the starting point that *Place is Powerful*. *Place* provides a contextual platform for conceptually organizing and theorizing regional development; ensuring that material conditions of life, such as the environment, resources and capabilities are taken into account and integrated locally.

The geographic focus of the Commission's Terms of Reference goes part of the way to harnessing the power of place as an organizing concept. Considering specific regional geographic boundaries and their relative relationship to other places will usefully focus attention on particular trends and forecasts as a foundation to organizing regional development, however, it may also mask important distributional impacts within regions and locales. It is not just a matter of where economic transition occurs, but who gets to participate in, and shape, such transition.

Successful Regions – strong regional determinism and decision making:

Professor Allan Dale and colleagues have found that solutions for the problems facing regional Australia are best found *within* regional Australia.[1] Each region has its own culture, natural environment, climate, identity and a unique competitive advantage. The remote, Indigenous-led Arnhem Land, for example is a very different region from Queensland's sugar and tourism-driven Wet Tropics. There is no effective alternative to empowering individual (and generally self-defined) regions to set the direction for, manage and monitor progress towards their own economic destiny. Major change, however, is required with respect to the way that Australia supports planning and decision making to achieve regional progress and sustainability.

The following characteristics can be used to both assess and predict the scope for social and economic development in regions. Healthy endemic regionalism needs:

- *Strategy:* Is there a cohesive, holistic, integrated and adaptive regional strategy to set regional visions and goals, analyse opportunities, set and deliver strategies and to monitor and review progress;

1 Dale, A. (2014) *Beyond the North-South Culture Wars: Reconciling Northern Australia's Recent Past with its Future*. Springer

- *Capacity*: Is there support for individuals, communities and sectors within regions to develop their own decision making capacity. Institutions within a region need the capacity to innovate, and the opportunities to take social and economic risks.
- *Connectivity:* Are there efforts to build stronger institutional arrangements that facilitate negotiated decision making about objectives and strategies among these interests. The concept of connectivity can measure the relative isolation or connectedness of physical, digital and human resources. (Dieter Franz Kogler, for example, provides commentary on relatedness as a key driver of regional diversification)[2].
- *Knowledge, Data, Metrics:* Are there integrated systems to develop and facilitate better understandings of what is known about the social, economic and biophysical workings of regions. Data and analysis about levels of competiveness, and for example, the extent of economic leakage from an area are needed. Processes are needed that determine significant gaps in the available research and data.

Indigenous (Aboriginal and Torres Strait Islander) Economic Development:

In Northern Australia, Indigenous communities are by far the most economically and socially marginalized within the regional development system. One of the key opportunities economic transition offers is the enablement of Indigenous economic development. Aboriginality is most often seen as a barrier to economic development, but indigeneity should not be interpreted as an indicator of necessary vulnerability. Ms Janine Gertz's doctoral research is looking at social and economic development as part of a broader strategy of Indigenous self-determination through strengthening local level governance and decision making practices.[3] Dr Theresa Petray's related research project aims to build self-determination through Aboriginal business enterprise.[4] This work is underpinned by the nation-building approach articulated by Cornell et al.[5] Ms Janine Gertz, Dr Theresa Petray and others are working with the Gugu Badhun people[6] of the Upper Burdekin Region in North Queensland to build a strong economy and community.

The nation-building approach is supported by 30 years of research, focused mainly on the US but also including Canada, Australia and New Zealand. It finds that Indigenous nations are the most successful (by many measures including health, employment and education) when they possess five characteristics:

1. Self-determination – meaning autonomous decision-making, rather than self-management of programs designed elsewhere
2. Good governance
3. Cultural match – that governance be relevant (and thus specific, not one Australia-wide model)
4. Strategic thinking
5. Strong leadership

There are many international examples of first nations building strong economies, including within Northern Australia. The Yukaana Development Corporation in Alaska provides an

[2] Kogler, D. (2017) Relatedness as a driver of regional diversification: a research agenda – a commentary. *Regional Studies*. DOI: 10.1080/00343404.2016.1276282
[3] Gertz, J. (2015) Implementing the United Nations Declaration on the Rights of Indigenous Peoples at the local level – Gugu Badhun Self-Determination. *Proceedings of The Australian Sociological Association Conference*, Cairns, 23-26 November 2015.
[4] Petray, T. and Gertz, J. (2015) Business the Wuriba Way: Native Bee Hives as a Model for Aboriginal Economic Development, Paper presented at *The Australian Sociological Association Neoliberalism and Contemporary Challenges for the Asia-Pacific*, Cairns, 23-26 November 2015.
[5] Cornell, S. (2015) Processes of Native Nationhood: The Indigenous Politics of Self Government, *International Indigenous Policy Journal*, (6)4. http://ir.lib.uwo.ca/iipj/vol6/iss4/4/
[6] Sutton, P. (1973) Gugu Badhun and its neighbours: Linguistic Salvage Study, M.A. thesis, Macquarie University, Sydney.

international example of direct relevance to post-mining economies. The Louden Tribal Council set up the for-profit Corporation to provide environmental remediation services to clean up a contaminated US Air Force site. A grant made the initial training possible, and the Corporation have since worked on other remediation projects outside the immediate community.[7]

The *Our North, Our Future: White Paper on Developing Northern Australia* identified the following top actions that are relevant to Indigenous nation-building and economic transition:

- Land (native title and tenure reform)
- Water (water rights)
- Business, Trade and Investment (bio-security initiatives delivered through Indigenous Ranger programs, however the paper lacks initiatives to encourage Aboriginal people in agriculture)
- Infrastructure (employment in civil construction – roads, dams, railways)
- Workforce (Remote Jobs and Communities Programme reforms)
- Governance (Improving Indigenous governance)

The resolution and clarification of issues concerning land tenure is particularly a key issue for northern Australia. Work carried out by JCU and CSIRO as part of the Northern Australian Ministerial Forum outlines issues associated with tenure in detail. [8] They focus on key solutions such as the structured resolution of regional scale land use conflict, improved resourcing for the administration of land tenure, but most importantly, the investment in the governance and planning capacity of traditional owner-based land-holding institutions. The economic value of assets held by Indigenous Australians is presently unable to be fully realized given the lack of suitable financial and banking instruments. In addition, for investors looking to northern Australian projects, there is a lack of coherency in the legislative and regulatory regimes. Many Indigeneous people in Australia need to live away from their own country in order to have jobs, or suffer from underemployment in rural and remote areas. Enabling Aboriginal and Torres Strait Islander nations to build up local economies creates more opportunities for meaningful employment on country.

Factors impacting on the design of analytical frameworks and economic models:

Conceptual models of change, such as the resource community cycle,[9] may usefully inform the establishment of an economic metric (reference term 3) and analytical framework (reference term 4). The resource community cycle accounts for the interplay between economic growth and decline, workforce and infrastructure decision-making, population dynamics and social capital, in places where the main determinate of economic vitality is the life-cycle of major natural resource use industries and projects. Professor Stewart Lockie and colleagues conducted a longitudinal assessment of the Coppabella coal mine and found that social impact assessments that can inform resource community cycle play a useful role in anticipating the long term, cumulative and potentially less obvious impacts of resource development.[10]

[7] See case study at http://www.iser.uaa.alaska.edu/Publications/8%28a%29/Case%20studies/Yukaana%20Development%20Corp.pdf
[8] James Cook University and CSIRO. 2013, *Land tenure in Northern Australia: Opportunities and challenges for investment*. CSIRO, Brisbane
[9] Taylor N, Goodrich C, Fitzgerald G, McClintock W. Undertaking longitudinal research.In: Becker H, Vanclay F, editors. *The International Handbook of Social Impact Assessment: conceptual and methodological advances*. Cheltenham, UK: Edward Elgar; 2003. 13–25.
[10] Lockie, S., Franettovich, M., Petkova-Timmer, V., Rolfe, J., Ivanova, G. (2009) Coal mining and the resource community cycle: A longitudinal assessment of the social impacts of the Coppabella coal mine. *Environmental Impact Assessment Review*, 29, 330-339.
Dale, A. and Crisp, R. (2002). Institutionalising social assessment in Queensland: The Social Impact Assessment Unit 1993-1996. In Dale, A, Taylor, N. and Lane, M., 2002 (eds). *Social assessment in natural resource management institutions*. CSIRO Publishing, Melbourne.

A 'typologies' approach to identification and classification based on common characteristics of a region potentially enables inferences in data poor areas, however there is risk if incomplete or incorrect data leads to the 'wrong' typologies. Efficacy must be tested before justifying policy change. Professor Natalie Stoeckl and colleagues have conducted research to model tropical river regions in Northern Australia that included undertaking cluster analyses.[11] They found that it is possible to identify factors that characterise groups of catchments, implying that learnings might validly be transferred to similar regions, and could potentially identify opportunities. They also found that socioeconomically 'similar' catchments were not necessarily adjacent, a finding that suggests socioeconomic characteristics do not necessarily 'spill over'. It is therefore important to determine carefully when agglomeration of regions makes sense. In their study variables (data) that emerged as important – including the numbers of businesses or community organisations present – was not always readily available. Their analysis of socioeconomic data reveal several major data gaps, including those relating to mining activities. Stockle et al identify the lack of information on an industry with such significant impact as potentially a vitally important omission.

Educational Participation:

Policy decisions that limit access to education in regional areas have significant impact on regional development trajectories. We draw the Commission's attention to the recent reduction of the Higher Education Participation and Partnerships Program (reduced by 20 percent, $152m over four years in the 2015/16 Australian Government Budget), and the extremely low number of funded sub-degree places and enabling places allocated in Northern Queensland – in comparison to other areas of Australia.

JCU's *Access, Participation and Success Plan 2015 – 2017* sets out the strategies JCU has in place to meet the needs of our 22,784 students. Of our domestic students who commenced in 2014: 24 per cent are from low SES backgrounds, 20 per cent are from regional areas, 4 per cent are from remote areas, over 50 per cent are the first in their families to attend university, 5 per cent are Aboriginal and/or Torres Strait Islander, 6.9 per cent are from a non-English speaking background, and 4.5 per cent have a disability. Regional census data from the Australian Bureau of Statistics indicates up to 25 per cent of private dwellings do not have internet access. The Higher Education Participation and Partnerships Program, mentioned above, that is subject to significant cuts will disproportionately adversely impacts those universities who serve communities with higher rates of social disadvantage. Outreach, scholarships and a range of programs that support student success are currently supported by HEPP funds.

JCU has just 351 Commonwealth supported places for students who need to undertake a transitionary diploma before commencing their studies – and only 57 of these are linked to an enabling load totaling $177,000. This situation is the artefact of historical circumstances but sees the North disadvantaged in comparison to, for example, Newcastle, where the university has 1620 Commonwealth supported sub-degree places, with 1615 of these linked to an enabling load.

Table 1 sets out JCU's allocation in comparison to Newcastle University and University of Southern Queensland. Northern Queensland is doubly disadvantaged. Not only does the region have a great

[11] Larson, S., Stoeckl, N., & Blanco-Martin, B. (2013): On the use of socioeconomic typologies for improved integrated management of data-poor regions:explorations from the Australian north, Australasian Journal of Environmental Management,

unmet need for improved education levels, but there is much less funding for JCU to meet this demand.

Table 1: Sub-degree places: JCU, Newcastle, University of Southern Queensland.

	Student EFTSL 2014	Commonwealth supported sub-degree places	Enabling Load
James Cook University	16,529	351	57
Newcastle University	26,097	1,620	1,615
University of Southern Queensland	14,388	1,733	739

JCU needs increased sub-degree places, and enabling load, in order to meet significant unmet demand for pathways programs in an ongoing and staged way. The demand for JCU's Diploma of Higher Education (introduced in 2015) cannot be met within current allocations. Although JCU has some students enrolled without any Commonwealth contribution in light of this clear need, this is not a sustainable solution. The student cohort undertaking the Diploma are almost 11 per cent Aboriginal and/or Torres Strait Islander, and 15 per cent of students have English as a second language and all deserve support. Student success rates as they transition from the program are strong, for example, Diploma students had a 75 per cent success rate in Bachelor subjects, and outperformed non-diploma students in some subjects (for example, Preparatory Chemistry 71% to 64%).

Table 2 below sets out the percentage of the population in Northern Queensland, JCU's catchment area, who have reached at least Year 11 or 12 (or equivalent); the percentage who have attained a non-school qualifications, as well as how many of these non-school qualifications are at Bachelor degree level or higher.

Table 2. Population: highest level of education, Queensland, 2011 Census.

	Percentage of population with Highest Level of Schooling Year 11 or 12 (or equivalent)	Percentage of population with a non-school qualification
North Queensland catchment[12]	49.2	51.9 (Of this: 11% Bachelor degree or higher)
Far North Queensland catchment[13]	49.7	54 (Of this: 11.8% Bachelor degree or higher)
Brisbane Metro catchment[14]	68.4	60.8 (Of this: 27.6% Bachelor degree or higher)

[12] North Queensland' comprises Bowen Basin-North; Charters Towers, Ayr, Ingham; Mackay; Outback North; Townsville; and Whitsunday. (Queensland Government Statistician Office Statistical level 3).
[13] 'Far North Queensland' comprises Cairns- North; Far North; Innisfail-Cassowary Coast; Port Douglas-Daintree; Tablelands (East) – Kuranda. (Queensland Government Statistician Office Statistical level 3).
[14] Brisbane Metro comprises Brisbane – East; Brisbane – North; Brisbane – South; Brisbane – West; Brisbane – Inner City. (Queensland Government Statistician Office Statistical level 4).

We know that students who study in the regions establish themselves in the regions,[15] 77 per cent of JCU's students come from our catchment area, and 75.2 per cent of those graduates stay and work in our region.[16]

The demand driven system has increased competition for students within the higher education sector, where inadequate research funding drives increasing student intake in order to cross subsidize costs as a limited mechanism of control open to institutions. Universities with well-established philanthropic sources are able to offer support for students that JCU is unable to match with our very limited philanthropic funded scholarship pool (although there is university commitment to grow philanthropic support). Universities with large philanthropic scholarship pools are able to scan northern Queensland for the highest achieving school leaver (low SES and otherwise) and provide scholarship incentives that JCU is unable to match. Whilst student mobility and choice plays an important part in educational journeys, uneven university playing fields results in a form of market failure with a drain of talented students away from the region. It also impacts on the ability of the region to take highly talented students through to postgraduate education and research careers. These students who leave the region to study in the South are likely to remain in capital-city work careers established through relationships during work-integrated learning or internships. This cohort may eventually return to northern Queensland much later in their careers – but systematic issues are set up against northern Queensland. This is emerging as a growing issue with complex, multiple contributing factors, including policy settings, family support arrangements and availability of accommodation, more work needs to be done to understand the drivers and impact.

The difficulty of covering living expenses remains a substantial barrier to university education for students from low SES backgrounds. Youth Allowance, Austudy and Abstudy remain critical to participation, as well as support for relocation costs. Recent changes to reduce the time in which a student needs to be employed under the self-supporting criteria from 18 months to 14 months for regional and remote students are welcome.

Relevant JCU Research

Research Online: http://researchonline.jcu.edu.au/

ResearchOnline@JCU is the online institutional repository for 33,407 items by JCU researchers. It contains a growing collection of publications and creative works which form the University's archive of research outputs of staff and higher degree research students. We invite the Commission to use the repository to find specific research of interest.

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[15] Sen Gupta, T., Murray, R., Hays, R., Woolley, T. (2013) "JCU MBBS graduate intentions & intern destinations: a comparative study with other Queensland and Australian medical schools". *Rural & Remote Health* 13: 2313. Available: http://www.rrh.org.au
Sen Gupta, T., Murray, R., Hays, R., Woolley, T. "Positive impacts on rural and regional workforce from the first seven cohorts of James Cook University medical graduates." *Rural & Remote Health*, 2014, 14: 2657. (Online). Available: http://www.rrh.org.au
Schauer A, Woolley T, Sen Gupta T. "Factors driving JCU MBBS graduates' choice of internship location and beyond." *Australian Journal of Rural Health*, 2013, (22) 2: 56–62.
Woolley, T., Sen Gupta, T., Murray, R., Hays, R. "Predictors of rural practice location for James Cook University MBBS graduates at postgraduate year 5." *Australian Journal of Rural Health* (2014) 22, 165–171.

[16] Graduate Destination Survey 2015

In the section below we include some thematic references, but note that this list is indicative, not exhaustive. We have not provided particular comment about the inter-relatedness of each domain, or the central role that technology plays in connecting domains.

Different multiplier benefits:

Some businesses may increase Australia's GDP, but are not necessarily good for local economies. There are significant differences in the multiplier benefits of different industries. In some businesses, every $1m spent generates up to 30 jobs (the labour intensive industries, such as tourism). In other businesses, an equivalent $1m of expenditure generates only about eight jobs (capital intensive industries that have to import much of their equipment and machinery from overseas). Analyses need to consider more than just what is produced, instead considering how it is produced (the 'how' incorporating things such as numbers of local people employed, number of local businesses that are part of the supply chain, environmental and social impacts).[17]

Social Values:

Research indicates that people in northern Australia do not always place getting rich as their primary objective; indeed, northern Australian's consistently report the importance of lifestyle factors in their decision to locate and remain in the north. Looking after family/community is generally most important, and in most cases the environment is considered more important than industry alone. Development that sacrifices social and environmental values, may be uneconomic, in that the cost of earning the extra GDP outweighs the benefits.[18]

[17] Stoeckl, N. (forthcoming), "Economic equity and major development" in Gerritsen, R. (editor) *Northern Research Futures*, ANU Press.
Taylor, A., Larson, S., Stoeckl, N., and Carson, D. (2011), "The 'haves' and 'have nots' in Australia's Tropical North: new perspectives on a persisting problem". *Geographical Research*. 49(1):13–22.
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Stoeckl, N., Jackson, S., Pantus, F., Finn, M., Kennard, M., Pusey, B. (2013), "An integrated assessment of some of the financial, hydrological, ecological and social impacts of 'development' on Indigenous and non-Indigenous people in northern Australia". *Biological Conservation*, 159: 214-221.
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[18] Prayaga, P., Rolfe, J., and Stoeckl, N. (2010), "The value of recreational fishing in the Great Barrier Reef, Australia: A pooled revealed preference and contingent behaviour model*". Marine Policy* 34(2): 244 – 251.
Larson, S., Stoeckl, N., Neil, B., Welters, R. (2013), "Using resident perceptions of values associated with the Australian Tropical Rivers to identify policy and management priorities". *Ecological Economics*. 94: 9-18.http://dx.doi.org/10.1016/j.ecolecon.2013.07.005
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Esparon, M., Stoeckl, M., Larson, S., Farr, M., Schmider, J., (2014), "How 'valuable' are the ecosystem services of the Wet Tropics World Heritage Area to residents and tourists?" Report to the National Environmental Research Program. Reef and Rainforest Research Centre Limited, Cairns, pp. 112, available at http://www.nerptropical.edu.au/publication/project-123-final-report-how-%E2%80%98valuable%E2%80%99-are-ecosystem-services-wet-tropics-world
Stoeckl, N., Farr, M., Jarvis, D., Larson, S., Esparon, M., Sakata, H., Chaiechi, T., Lui, H., Brodie, J., Lewis, S., Mustika, P., Adams, V., Chacon, A., Bos, M., Pressey, B., Kubiszewski, I., Costanza, B. (2014), "The Great Barrier Reef World Heritage Area: its 'value' to residents and tourists, and the effect of world prices on it". Report to the National Environmental Research Program. Reef and Rainforest Research Centre Limited, Cairns, available at: http://www.nerptropical.edu.au/publication/project-102-final-report-great-barrier-reef-world-heritage-area-its-%E2%80%98value%E2%80%99-residents
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Trade Offs:

There will necessarily be sacrifices to raise regional incomes or employment, but it is possible to identify types of growth that do the least harm through modelling the connections between industries (growth in one can either crowd out, or encourage growth in another industry), and connections between industry and society and/or the environment (some industry is more/less harmful to society and the environment than other industries.[19] Additionally, there are insufficient institutional arrangements within Australian for negotiating the social and economic impact and benefit of development when major public and private sector developments occur.[20]

Fly in Fly Out workforces:

Mining is an important (although not only adopter) of long distance commuter recruitment practices. There is no data in Australia that can be exploited to know what share of the workforce in a region is non-local, and Mr Christopher Nicholas has devised a method to establish that share as part of his doctoral research. Mr Christopher Nicholas and A/ Professor Riccardo Welters have used the spatial panel modelling to examine 516 Local Government Areas over two census periods (2006 and 2011) to explore drivers of long distance commuting.[21] Their study is the first to control for time, space and spatial interaction simultaneously to explain the determinants of the extent of commuting in a region. They found local labour market characteristics had minimal influence on recruitment strategies of firms. Housing affordability does not impact on the decision of non-resident workers to either migrate or commute, however, local service provision and the availability of rental accommodation does encourage migration and reduce commuting. In addition, higher turnover of the resident population erodes social capital in host regions, which reduces the attractiveness of the local area and leads to increased commuting.

Dr Josephine Pryce and colleagues have conducted research on the FIFO workforce, labour markets, gender, the future of work, resident attitudes and social capital.[22]

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[19] Stoeckl, N., Chaiechi, T., Farr, M., Jarvis, D., Alvarez-Romero, J., Kennard, M., Hermoso, V., and Pressey, B. (2015) "Co-benefits and trade-offs between agriculture and conservation: a case study in northern Australia", *Biological Conservation*, 191: 478-494.
Drought and agriculture: Tran, L.T., Stoeckl, N., Esparon, M., and Jarvis, D. (2016) "If climate change means more intense and more frequent drought, what will that mean for agricultural production? A case study in Northern Australia", *Australasian Journal of Environmental Management*. DOI: 10.1080/14486563.2016.1152202
Van Oosterzee, P., Dale, A. and Preece, N. (2013). *Integrating agriculture and climate change mitigation at a landscape scale: Implications from an Australian case study. Global Environmental Change*. www .elsevier .com /locate/gloenvcha.
Floods and water quality (thus potentially impacting tourism): Chaiechi, T., Stoeckl, N., Jarvis, D., Lewis, S., & Brodie, J., (2016) "Assessing the impact of price changes and extreme climatic events on sediment loads in a large river catchment near the Great Barrier Reef", *Australian Journal of Environmental and Resource Economics*, 60(3): 386-406.
Climate change and fisheries: Stoeckl, N., Larson, Thomas, M., Hicks, C., Pascoe, S., Marsh, H. (forthcoming). Socioeconomic Impacts of changes to marine fisheries and aquaculture that are brought about through climate change Chapter 33 in Phillips, B and Ramirez, M (editors*) The Impact of Climate Change on Marine Fisheries and Aquaculture and their Adaptations*, Wiley.
Climate change in the wet tropics: Stoeckl, N., Farr, M., Reside, A., Curnock, M. Larson, M., Crowley, G., Turton, S., Prideaux, B., Marshall, N., Gillett, S. (2014), "Potential impacts of Climate Change on Industries" in Hilbert D. W., Hill R., Moran C., Turton, S. M., Bohnet I., Marshall N. A., Pert P. L., Stoeckl N., Murphy H. T., Reside A. E., Laurance S. G. W., Alamgir M., Coles R., Crowley G., Curnock M., Dale A., Duke N. C., Esparon M., Farr M., Gillet S., Gooch M., Fuentes M., Hamman M., James C. S., Kroon F. J., Larson S., Lyons P., Marsh H., Meyer Steiger D., Sheaves M. & Westcott D. A. 2014. Climate Change Issues and Impacts in the Wet Tropics NRM Cluster Region. James Cook University, Cairns, available at: https://publications.csiro.au/rpr/pub?list=ASE&pid=csiro:EP14913.
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[20] Dale, A, Taylor, N. and Lane, M., 2002 (eds). *Social assessment in natural resource management institutions.* CSIRO Publishing, Melbourne.

[21] Nicholas, C. & Welters, R. (2017) What drives long distance community into Australian regions? A spatial panel model approach. *Journal of Rural Studies* 49, p 140-150.

[22] Pryce, *J.,* Welters, R., Lynch, P., Blackman, A,, Murphy, L., Eagle, L., Case, P.,, and Low, D. (2014) *Mining through the talent pool of potential fly-in-fly-out (FIFO) workers.* Australian Bulletin of Labour, 40 (2). pp. 201-220.
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Mining creating room for other industries:

In some parts of Australia, the mining boom effectively crowded out other industries that were viable prior to the boom. This was related to the higher dollar (making it harder for other industries to export), higher wages (making it harder for other industries to attract staff) and, in some cases, to actual physical crowding out (as when, for example, miners occupied caravan parks, leaving little room for tourists, so some tourism operators suffered – since miners less likely than tourists to undertake tours). The demise of the mining boom may actually help some industries recover, over time, (lower dollar, lower wages), without there being a need to consider additional stimulus measures.

Health:

Across Australia, 50 per cent of men and 20 per cent of women will retire from full-time work before the age of 65 due to ill health. As a nation, labour force absence in just the 45 to 64-year-old age group reduces our GDP by around $14.7 billion per annum. Early research is showing that 27 per cent of people agreed between 15 and 64 in the northern Australia region are not in the workforce and ill health is a major contributor to this. The health conditions driving this absence are largely mental health related – which is in contrast to the rest of the Australia population. The scale of this impact makes early retirement due to poor health a highly significant issue for economic development - it is estimated, for example, that labour force absence due to depression in northern Australia costs the Australia economy $931 million per year. Ensuring people within regional areas have the capability to participate in the workforce is essential in any consideration of economic growth or development.[23]

Tourism:

Tourism as an industry has become concomitant with the economic development theories as tourism offers remarkable potential for regional economic growth through different channels, including investment and trade. For that reason, development of the tourism industry has become one of the central imperatives for most governments.[24]

Social, cultural and environmental quality are also vitally important to the tourism industry which brings in billions per annum to the north, and to Australia. There is a need to ensure key social and environmental assets relevant to that industry are protected. A tourism growth strategy could aim to improve social/community and environmental assets, thus simultaneously helping the tourism industry and also quality of life of residents. It is also important to ensure that developments that do occur in the tourism industry are those that maximise the opportunities of local people and local businesses to be part of the supply chain, thus increasing the share of benefits that accrue to the local economy.[25] Tourism is best seen as a linked option; it can and

Symposium: Contemporary issues in long-distance commute work in the extractive industries and other sectors, 8-10 July 2013, Vienna, Austria. (Unpublished)
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[24] Chaiechi, T,, Pryce, J., and Bhati, A. (2015) Macroeconomic impacts of the tourism industry and the contemporaneous feedback effect: an Australian case study. *Tourism Economics*, 21 (3). pp. 685-696.
25 Jarvis, D., Stoeckl, N., Liu, H., (2016), "The impact of economic, social and environmental factors on trip satisfaction and the likelihood of visitors returning". Tourism Management, 52: 1-18

should have ties to agriculture, Indigenous community aspirations, sustainable business (broadly conceived) and education. International Study Abroad companies have already built strong partnerships with regional tourism operators, and the tourism industry is working to expand these opportunities. These tours are often linked with 'service learning' opportunities, where international students volunteer on projects relevant to their studies for example, land care, citizen science, and community work.

Dr Taha Chaiechi and colleagues have analysed the dynamic impact of tourism (in particular, tourism expenditure) on macroeconomic indicators (such as investment and productivity) in tourist destinations of Australia, while allowing for simultaneity and contemporaneousness of economic variables and associations in modelling and estimation techniques.[26] They found that the growth benefits of an increase in tourist expenditure are positive and statistically significant, implying that policies which bring positive changes to tourism expenditure result in positive, substantial impacts on productivity (such as technology adoption) and investment decisions.

International self drive tourists represent a substantial opportunity for rural areas, particularly where those areas develop attractive drive routes. Professor Philip Pearce has investigated the new waves of Asian self-drive tourists.[27]

Agriculture:

JCU has a broad suite of Agricultural research,[28] spanning *Resource Management*, including soil health; water; biodiversity stewardship; biological invasions, biofertilisers, as well as *Production*, including climate impacts on food production; animal production; tropical rangeland production; veterinary tropical diseases and food biosecurity; and fertility in adverse environments. The trade-offs between types of agricultural development (including smaller scale, diversified and large scale – single product), and the impact on the economy and the environment have also been studied (see earlier section on Trade-offs).

Mustika, P., Stoeckl, N., and Farr, M. (2015), "The potential implications of environmental deterioration on business and non-business visitor expenditures in a natural setting: a case study of Australia's Great Barrier Reef". *Tourism Economics* DOI: http://dx.doi.org/10.5367/te.2014.0433

Farr, M., Stoeckl, N., Esparon, M., Larson, S., Jarvis, D. (2015),"The Importance Of Water Clarity To Tourists In The Great Barrier Reef And Their Willingness To Pay To Improve It". *Tourism Economics*. http://dx.doi.org/10.5367/te.2014.0426

Stoeckl, N, Birtles, A., Farr, M., Mangott, A., Curnock, M., and Valentine, P. (2010), "Live-aboard dive boats in the Great Barrier Reef: their regional economic impact and the relative values of their target marine species". *Tourism Economics*, 16 (4), 995–1018.

Esparon, M., Stoeckl, N., Farr, M., & Larson, S. (2015), "The significance of environmental values for destination competitiveness and sustainable tourism strategy making: insights from Australia's Great Barrier Reef World Heritage Area". *Journal of Sustainable Tourism*, (ahead-of-print), 1-20. DOI: 10.1080/09669582.2014.998678

Corrie, K., Stoeckl, N., and Chaiechi, T. (2013), "Tourism and Economic Growth in Australia: An empirical investigation of causal links". *Tourism Economics*, 19(6): 1317-1344.

Stoeckl, N. (2008), "Enhancing the community benefits of tourism at the local level", in Moscardo (editor*) Community Capacity Building for Tourism*, CABI, U.K.

Thompson, M., Prideaux, B., McShane, C., Dale, A., Turnour, J., & Atkinson, M. (2016). Tourism development in agricultural landscapes: The case of the Atherton Tablelands, Australia. *Landscape Research*, August 2. doi: 10.1080/01426397.2016.1174839

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Wu, M., Pearce, P. (2014). Chinese recreational vehicle users in Australia: A netnographic study of tourist motivation. Tourism Management. 43, 22-35.

[28] Resource management, including

- Soil health, under Professor Paul Nelson Water, under Professor Damien Burrows
- Biodiversity Stewardship, under Professor Lin Schwarzkopf
- Biological Invasions, under Dr Lori Lach
- Biofertilisers, Under Adjunct Associate Professor Kirsten Heirmann

Production:

- Climate impacts on food production, Associate Professor Yvette Everingham
- Animal Production, Associate Professor John Cavalieri
- Tropical Rangeland Production: Mr Chris Gardiner / Dr Glen Walker
- Veterinary Tropical Diseases and Food Biosecurity, Professor Bruce Gummow
- Fertility in Adverse environments, Dr Damien Paris

Aquaculture:
Tropical northern Australia is the epicentre for some of Australia's biggest aquaculture industries, including farmed prawns, barramundi, pearls and crayfish, which collectively account for ~$300 million of aquaculture product annually.

JCU is recognised internationally as the world's leading institution for coral reef and tropical aquaculture research, home to the Australian Research Council's Centre of Excellence for Integrated Coral Reef Studies, and Industrial Transformation Research Hub for Advanced Prawn Breeding and Genomics, the Centre for Sustainable Tropical Fisheries and Aquaculture, and Australia's top-rated tourism research. With significant Commonwealth and State scientific assets including CSIRO, the Australian Institute of Marine Science (AIMS), the Great Barrier Reef Marine Park Authority (GBRMPA), and scientists located in the Department of Agriculture, Fisheries and Forestry - northern Queensland has a globally significant community of expertise. Northern Queensland's marine science, education, industry and tourism operators, and our focus on clean, safe and high quality product, means we are strongly positioned to be a global leader in this industry.

The development of sustainable aquaculture has the strong support of Industry partners (who have significantly invested in R&D and facilities at the JCU campus), the Federal Government (through research project and researcher funding) and locally the GBRMPA, Port of Townsville, AIMS and Reef HQ.

There is significant transformative capacity and economic potential for aquaculture industry in northern Queensland, leading to job creation and skilled workforce development, the ability to transfer knowledge and skills to the Asia Pacific region from northern Queensland, and potential flow on effects to tourism and edu-tourism. A focus on aquaculture holds in prospect the development of a new industrial focus - at scale - for the north

- Aquaculture is the fastest growing primary food production sector globally, with 50 per cent of seafood now consumed derived from farm production.
- Aquaculture production recently surpassed world beef production as a source of animal protein.
- Based on population projections and current growth in per capita fish consumption, aquaculture will be a 300,000 tonne+, $US2 trillion+ per year industry by 2050.
- Aquaculture (growing at current rate) will be the 2nd largest agri-food export in Australia by 2050 ($12.8 billion)
- Much of the future growth in demand will come from the developing economies of Asia, expected to support more than half of the world's middle class by 2020.
- Significant import replacement opportunity (30,000 tonne at $100million p/a)
- Growing concern over levels of contaminants in Asian cultured seafood products (antibiotics) and the demand for high quality Australian product
- Intensification of aquaculture production will require expertise associated with selective breeding, husbandry, sustainable diets, improved disease detection and management systems.

Particular types of aquaculture (including those focused on algae) provide opportunities to generate multiple 'products' (e.g. biocrude, cattle feed, omega-3) and additionally generate significant environmental benefits (e.g. clean water) while providing much opportunity for local employment (being low-tech, rather than capital intensive). These opportunities should be embraced.[29] [30]

[29] Paul, N., Esparon, E., Neveuz, N., Cole, A., de Nys, R., Stoeckl, N. (2015), *"Preliminary economic assessment of the production of macroalgal biomass and biocrude".* Report to the Australian Renewable Energy Agency (ARENA), James Cook University, Townsville.
[30] Particular JCU expertise:

- Aquatic Health and Disease, Associate Professor Ellen Ariel and Kate Hutson
- Aquaculture Production, Barramundi/ Aquaculture Genetics, Professor Dean Jerry
- Macroalgae, Professor Rocky DeNys
- Marine Ornamental Breeding, Associate Professor Chaoshu Zeng
- Fisheries Science/Sharks and Rays Professor Colin Simpfendorfer