

Business Case

Making Water Work in the Cook Shire

Delivering Economic Benefit from Agricultural Water and Value Chains



(IMAGE SOURCE: Cook Shire Council)



Communities in Transition

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Executive summary

The Cook Shire represents a diverse community seeking to build on its economic and social assets to create a stronger and more resilient economy, addressing Shire-wide unemployment levels as high as 26%. Adjoining the healthiest parts of the Great Barrier Reef (GBR), the Shire's environmental and cultural landscapes underpin these opportunities and are of international importance. The driving aspirations of the Traditional Owners include economic development combined with the protection of these significant cultural and environmental assets. Consequently, with significant agricultural potential now identified in the Lakeland, Laura and Mitchell Basins, that rare challenge of creating a strong and value-rich agricultural economy in a richly important multi-value landscape presents the Shire with one of its most important but challenging opportunities.

The new *Water Plan (Cape York) 2019* makes, for the first time, significant water available for agricultural use within the Peninsula. The Plan provides for existing and future water use, and was informed by comprehensive social, cultural, economic and ecological assessments. To implement the Plan, the Queensland Department of Natural Resources and Mines and Energy (QDNRME) has released a set of protocols under the Plan, a *Minister's Considerations Report*, and a *Water Entitlement Notice* under the *Queensland Water Act 2000* (QDNRME 2019a; 2019b; 2019c).

A new *Northern Australian Water Resources Audit* has also identified significant water development opportunities for three Federal Government priority regions in Northern Australia, including the Mitchell Catchment in Cape York and the northern Gulf. According to the Audit, large instream dams in the Mitchell Catchment could potentially support up to some 140,000 ha of year-round irrigation. Alternatively, strategic approaches to water harvesting could potentially enable up to 200,000 ha, growing one dry-season crop per year (CSIRO 2018).

Trials for major new varieties of pulses and other oilseeds are progressing in the Laura basin, potentially enabling some 40,000 hectares of additional dryland farming in the region. On the 30th of April 2019, the Federal Government also committed \$10 M towards progression of the construction of the Lakeland Dam as part of the *Palmer River Water Supply Scheme* and committed further funding for progression of dam construction through the National Water Infrastructure Fund and the Northern Australia Fund (The Nationals for Regional Australia 2019). This commitment was made possible through the completion of a detailed preliminary business case demonstrating the economic potential of the Lakeland agricultural lands (SMEC Australia Pty Ltd 2019).

The time is ripe to apply new thinking and technologies to shift towards a more circular economy in the irrigation and agricultural development sector. Focusing on strengthening all aspects of the supply and value chain (from production, transport, processing, value adding, retailing and export preparation) will deliver greater energy and nutrient use efficiency, less waste and an improved pollution and carbon emissions profile relative to the Region's GDP (CGCC 2019). Consequently, this *Making Water Work* pathway and business case will focus a combined Council, community and industry effort on identifying the opportunities, constraints and strategies to achieve this outcome.

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SECTION ONE – STRATEGIC CONTEXT

Options analysis

The *Making Water Work* initiative evolved from the *Communities in Transition* (CiT) Program, an active community development and capacity building process for strengthening regional resilience in dealing with economic, social and environmental change. The first stage of the program included the development of a *Community Resilience Framework* from which a community profile was created. Next came a series of community conversations asking stakeholders to describe pressures and opportunities facing their community. A desk-top study, together with information provided by the community conversations, led to broader consensus on a prioritised set of transition pathways and options for the future of the region. These are listed in the third column of Table 1.

Table 1: Linking regional pressures and opportunities with plausible pathways

Current pressures & future challenges	Current strengths & opportunities for the future	Some ideas for broad pathways
Economic Low recognition as an investment destination & small local market High unemployment - while geographically complex - is 25.3% c.w. 6.1% across Qld (QGSO 2017). Strong dependence on external labour Skills shortages High levels of welfare dependence in some areas Inconsistent energy policies & investment uncertainty Perceptions by some of 'imposed regulations' from metropolitan centres in the south International trading hampered by political and/or practical barriers affecting trade partnerships	Economic More/different visitors arriving with the sealing of the PDR Great natural assets for diverse economic activities – 2 World Heritage Areas, abundant solar energy - home to Australia's first utility scale, co-located solar and battery farm to be connected to the grid (Conergy's Lakeland solar farm) (ARENA 2018a). Container Refund Scheme (CRS) - economic opportunities, litter reduction (Boomerang Alliance 2018). Carbon Farming allows Indigenous groups and pastoralists to earn carbon credits by reducing emissions	Tourism Turbo - Natural, Indigenous & historic heritage, agritourism <i>Making Water work: Preparing the ground for low Reef impact agriculture & aquaculture</i> Energy Futures: off-grid expansion Fronting New Ecosystem Service Markets Dynamic Business ventures: ecoBiz & commerce, creative industries, new technologies New Circular Economy for SMEs
Education/career paths Below average literacy, numeracy & adult learning Lack of career pathways/opportunities for local youth	Education/career paths Rich Indigenous culture & knowledge base - local Traditional Owners hold key information about country/culture	Focused school to work transitions & career paths for next gen residents
Liveability/Quality of life High cost of living – e.g. food & fuel prices Prevalence of chronic diseases (e.g. renal failure, diabetes) Isolation/distance from major human services Intermittent mobile phones and poor internet services Road infrastructure beyond PDR is poor & flood prone. Waste - need better facilities/equipment Water - Equitable water allocation; security, reliability Lack of facilities/support for community organisations Complex land tenure & conflicting legislation Climate/ extreme weather conditions	Liveability/Quality of life Laid-back relaxed lifestyle and unique character Strong 'sense of community' across the Cape Outdoor lifestyle - pastoral, mining, sports and recreation Open space, sense of freedom Both Indigenous and non-Indigenous history adds to 'sense of place' Strong history of connected leadership and increasingly strong capacity within and across Council planning system. Strong governance associated with catchment and landscape planning	Improved telecommunications for triple bottom line outcomes New directions for Cape-wide waste management Local Food futures: Infrastructure to support local food production Regional collaboration – Mayors Alliance TICA – for regional planning Leading climate & disaster resilience Future of Weipa – including Defence & space port capability

Because of its potential to influence significant economic progression of a value-intense industry, one priority pathway, *Making Water Work* was prioritised through workshop discussions of several potential pathways. Factors leading to this prioritisation included a wide range of future regional pressures, challenges and opportunities. Specifically, agreement on this priority pathway was based on a number of considerations including:

- Recent completion of the Cape York Water Resource Plan and the Northern Australian Water Resources Audit;
- Completion of a positive Preliminary Business Case for the Lakeland Irrigation Project and the recent Federal Government commitment of \$10M to undertake a full business case and impact assessment for the project (The Nationals for Regional Australia 2019);
- Major new varietal trials for pulses and oilseeds in the Laura basin;
- Early thinking about the potential of new irrigation opportunities in Weipa;

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- Opportunities to shift towards a more circular economy in the wider agricultural sector (e.g. exploring new techniques in the design and management of new agricultural lands);
- Significant opportunities to expand commercial and recreation fishing; and
- The need to meet particular obligations to protect the Great Barrier Reef (GBR) and to achieve “no net decline” in GBR water quality under proposed new regulatory arrangements (Queensland Parliament 2019).

The second stage of the CiT program involved an online survey of stakeholders to elicit their preferences and priorities for components of what was originally cast as the *Local Food Futures* pathway. The prioritisation was completed through a second set of workshop discussions, based on the options and criteria shown in Appendix A. The options considered are shown in Figure 1.

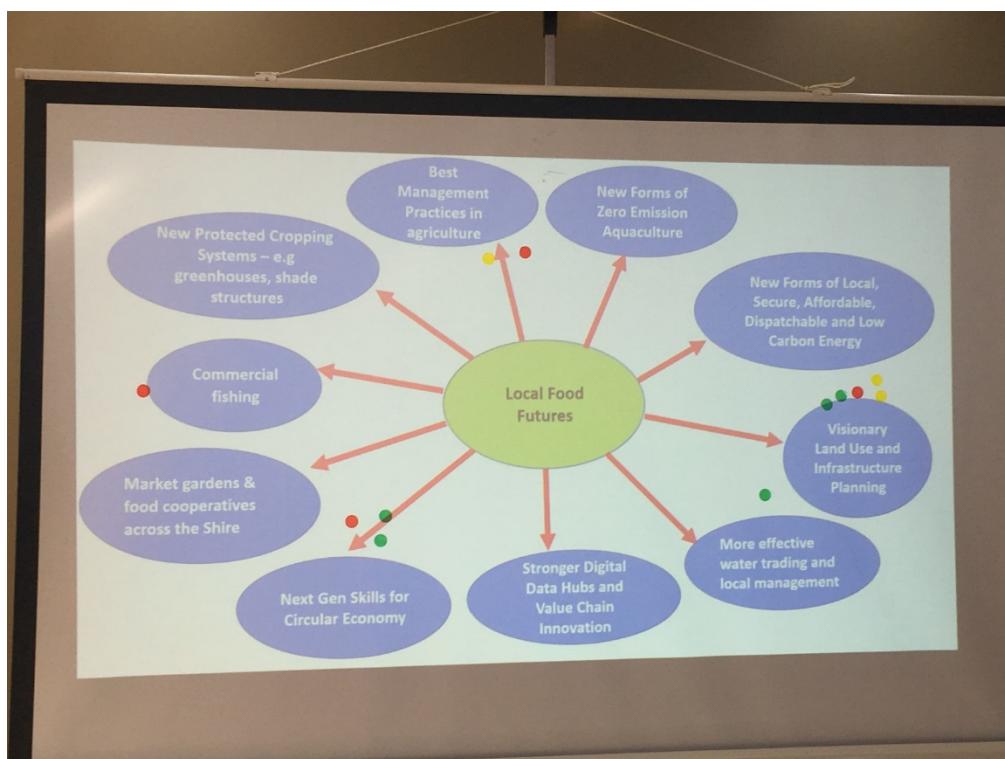


Figure 1: Priority options identified by the group. The dots indicate the number of votes for options discussed in the second workshop. There is a strong preference to further develop the role of more visionary approaches to supply chain, land use and infrastructure planning for agriculture that also protects other values.

In the third workshop in Cooktown in August 2019, there was a strong community preference to explicitly develop the local food security and cooperative aspects of this pathway separately, but link to the broader issue of growing the region's broadacre agricultural economy. As a result, the original *Local Food Futures* pathway was broken into two separate but complementary pathways. The revamped *Local Food Futures Pathway* was to focus on food security, agricultural diversity, agricultural innovation/best practice and the concept of a food cooperative. The second, *Making Water Work*, was to focus on the growth of a sustainable agricultural sector within the context of the limited but defined water resources available within the region. Further detailed discussions with the Cook Shire Council and other key stakeholders have resulted in the full scoping and development of the key concept and components within this *Making Water Work* initiative.

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The key concept

On 30 April 2019, the Federal Government committed \$10M towards the final stage of the construction of the Lakeland Dam as part of the *Palmer River Supply Water Scheme* and committed further funding for potential dam construction through the National Water Infrastructure Fund and the Northern Australia Fund (The Nationals for Regional Australia 2019). This was made possible through the completion of a detailed business case demonstrating the economic potential of the Lakeland agricultural lands (SMEC Australia Pty Ltd 2019).

The Palmer River supply scheme includes a 195 GL dam on the Palmer River; a pump station and pressure main rising to an existing storage west of the Mulligan Highway; a pump station and pressure penstock dropping to a hydropower station at the base of the catchment divide, discharging to a small storage; and a pump station and booster pump stations distributing irrigation water north along the Mulligan Highway and west along the Peninsula Developmental Road targeting freehold land within the LIA closest to the water source. The capital cost of the scheme, including hydropower, has been estimated at approximately \$550M with a confidence level on the estimate of plus and minus 50 per cent (SMEC Australia Pty Ltd 2019, p. x).

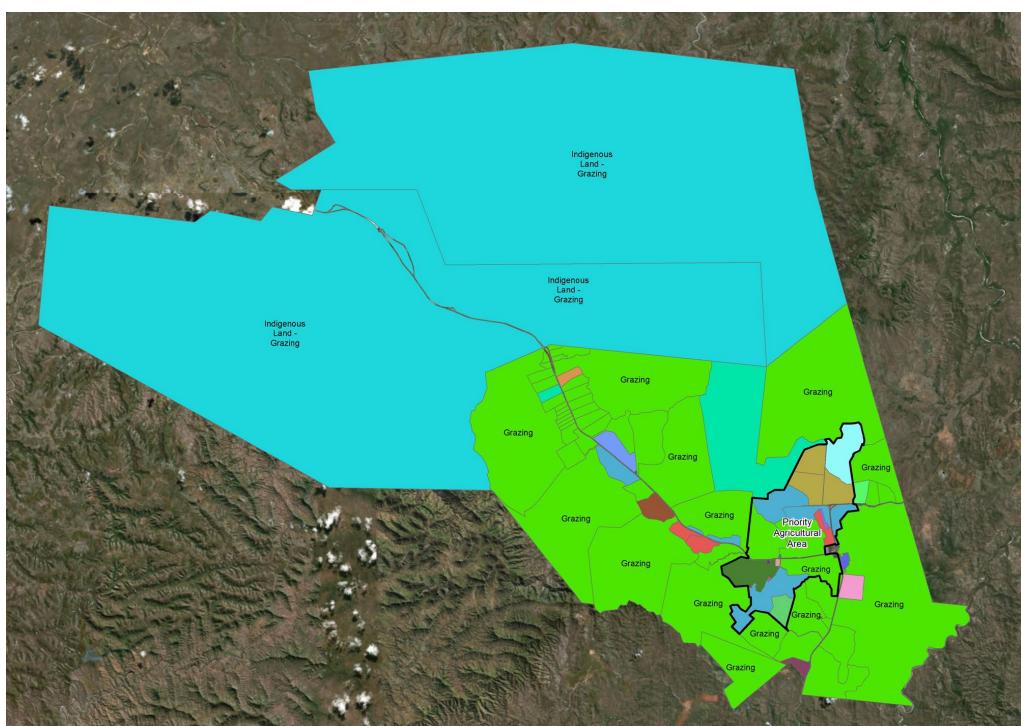


Figure 2 Lakeland Irrigation Area Land Use Map. Shows Freehold Land (green), Indigenous Land (pale blue) and the Lakeland Downs Priority Agricultural Area: SMEC. Source: SMEC Pty Ltd (2019).

The next stage of this development includes the procurement of accurate costings and detailed planning for the dam including infrastructure, workforce requirements, supply chain analysis for local and domestic markets, and a calculated return on investment. The development, however, represents a first step amid a range of boutique agricultural development options, including:

- The potential to encourage a diversity of innovative and high value agricultural crops in the Endeavour Valley linked to food security and food tourism;
- Potential growth in dryland cropping systems in the southern Cape and Laura Basin;
- Identified development opportunities in the Mitchell Catchment;

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- Early consideration of the potential for agriculture in the Weipa district; and
- The potential for expansion of the commercial and recreational fishing industries.

If properly resourced, the *Making Water Work* pathway will support the Shire to strengthen and expand existing tropical horticulture and production in the Lakeland district, and broadacre cropping in other key boutique locations. To be successful, however, consideration of existing and potential barriers and opportunities need to be explored. Significant considerations particularly relate to obligations under proposed new regulations to enhance GBR protection. These regulations are for land managers to achieve “no net decline” in GBR water quality (Queensland Parliament 2019).

An additional major obstacle is the currently limited transport infrastructure. Road infrastructure beyond the Peninsular Development Road, for example is poor and flood prone. Increasing infrastructure costs and general farming input costs are also problematic, occurring at the same time as consumers demand increasingly high product standards. Another potential obstacle is the lack of telecommunications services across the Cape, limiting business opportunities. For the Lakeland agricultural district, two major issues need to be addressed urgently, before expansion is possible. These are: (i) a lack of accommodation for agricultural labour, new residents and tourists and (ii) a lack of critical infrastructure, particularly water and sewerage, to support existing and new development (Reel Planning 2017). Reliable affordable energy is another barrier, although there are potentially good synergies between the Lakeland energy hub and Lakeland agricultural lands.

Other opportunities, however, include new techniques in the design and management of new agricultural lands, new techniques for nutrient extraction in aquaculture, and the potential for greater integration of feed production, soil enhancement and nutrient reuse between these two sectors. With the need to achieve high environmental standards, tighter supply and increased value in the supply chain, new thinking and technologies present great opportunities to shift towards a more circular economy in the wider agricultural sector.

To create and implement this *Making Water Work* pathway, the CiT pilot program has been working with the Council and the region’s wider stakeholders. The pilot program is funded by the Department of Environment and Science and supported by CSIRO, James Cook University (JCU), the University of Southern Queensland (USQ) and The Ecoefficiency Group (TEG). In effect, the vision for the concept was that new agricultural development would incorporate significant environmental efficiencies, highly efficient supply chains, and increasingly integrated and high-worth value chains that deliver social and economic resilience. It was considered that the key components needed to drive this vision included:

- Better defining supply chain visions and potential production system models for the Cape;
- Early and visionary land use planning, footprint development and design for priority areas;
- Enabling connected water infrastructure, ownership and water products;
- Integrated infrastructure, communications, services planning and coordination;
- Integrated, reliable, affordable and low impact energy; and
- Next generation practices to achieve GBR and EPBC outcomes.

These are detailed in Section Two of this business case.

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Justification, benefits and risks

Multiple major justifications underpin the *Making Water Work* initiative, unpacking the significant benefits from, and risks to be mitigated by, taking such an approach. The following key factors underpin the logic for progression of this business case.

1. Unlocking unmet agricultural potential and export and domestic demand

More than half of Queensland's food production is exported overseas, but Queensland is a small player on a global scale, with producers responding to market trends such as consumer demands for safe, ethical and sustainable produce (QDAF 2018). Due to Queensland's counter-seasonality to northern hemisphere producers, there is potential for increased exports to consumers wanting access to healthy food all year round. There is also increased overseas consumer demand for:

- Protein-rich products (e.g. beef, seafood, chickpeas);
- Horticultural products (including exotic fruits), and
- Healthy food products from a 'clean green' environment (QDAF 2018).

A further one-fifth of food produced in Queensland is 'exported' to other states of Australia, leaving about one-quarter of Queensland's total food production to supply the agricultural, forestry and fishing products for more local, state-wide consumption (QDAF 2018). Recent related supply chain analysis in North Queensland suggests that demand for products typical of those produced in Central and North Queensland exists across the usual key markets including South East Asia, China and the Middle East. Of relevance to the Cook Shire, this work identified five priority products, including intensive beef cattle, on-shore aquaculture and pulses accounting for nearly \$3B of currently unmet demand in global markets (KPMG 2019). This analysis predicted that transitioning land use to the priority products was estimated to provide a positive benefit of between \$26.5M and \$271.1M Net Present Value (NPV), and generate numerous jobs (KPMG 2019). Lesser but similar trajectories could be possible in the Cook Shire.

Broader Cattle Interests and Weipa

Cattle grazing dominates the agricultural industry in the Cook Shire (CYNRM & SCYC 2016). Maintaining Australia's preferred status as a quality assured supplier of high value beef produced under environmentally sustainable systems from 'disease-free' cattle is increasingly competitive and expensive (Greenwood, Gardner & Ferguson 2018). With the potential for water resource development in the Weipa basin and completion of the PDR, an opportunity exists to potentially refresh and reconfigure the entire cattle-based supply and value chain in the Cape.

Lakeland Agricultural Development

The Lakeland Agricultural District with its rich soils, reliable rainfall, and all weather access to markets, was identified in the *Northern Australia Infrastructure Audit Report for Infrastructure Australia* as having increased potential for suitable agriculture (SMEC Australia Pty Ltd 2019). The District comprises one of the largest areas of more fertile soils for dryland production, cattle grazing and crop production in the Cook Shire. It supports ten horticultural producers and seven graziers within 20km of Lakeland township, a small community of approximately 115 people located about 80km from Cooktown. Intensive banana production has occurred in the area since Cyclones Larry (2006) and Yasi (2011) impacted banana production in Innisfail and Tully (Reel Planning 2017).

The *Cape York Regional Plan* identifies opportunities for Lakeland to develop specialised products and niche marketing and local/regional branding for low weight, high-value products. Crops on the Cape tend to ripen before their southern counterparts, providing a window of opportunity at the

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beginning of each season (Reel Planning 2017). Currently, local producers of passionfruit in the Endeavour Valley are able to achieve three to four times the price per bin of picked fruit during the “off” season (from around \$20-\$40 in season to approximately \$120-\$140 out of season), attracting more local growers to this market. At least one small earth moving business is moving over to this sector and combining with other growers to transport to market and increase profitability. At present, Lakeland farming properties are between 25ha to 5000ha in size. SMEC Australia Pty Ltd (2019) warns that there could be potential market price impacts with increased production (potentially up to 8,000ha) when the Lakeland Dam is constructed, for both new and existing producers, although the impacts are difficult to quantify. Further, full yields are unlikely to be achieved every year due to a variety of reasons including natural disasters, pests and disease. These factors need to be more carefully considered in later stages of the feasibility study (SMEC Australia Pty Ltd 2019).

The Mitchell Catchment

On the southern margins of the Cook Shire, the Mitchell Catchment has the potential to support 140,000 ha of year-round irrigated agricultural development, such as sugarcane. There are, however, many challenges to overcome, to make this development viable.

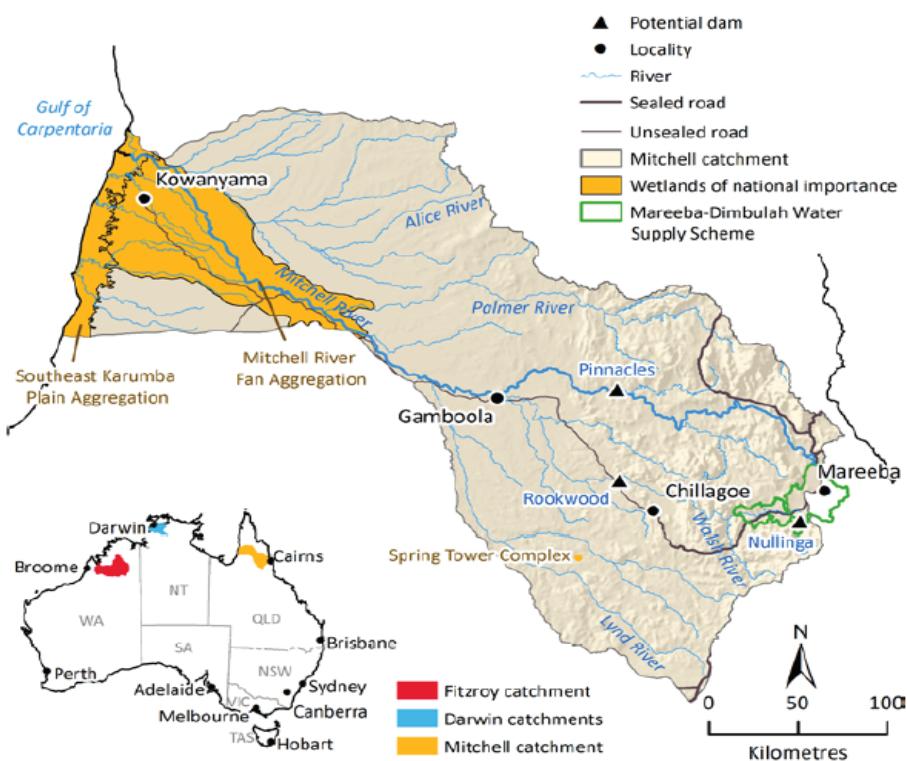


Figure 3: Mitchell River Catchment [SOURCE: CSIRO (2018)]

Irrigation on this scale would potentially need to be based on the construction of four large instream dams to release 2800 GL per annum for agriculture. Off-stream water harvesting could extract 2000 GL per annum, enough to irrigate 200,000ha of a single dry-season crop such as cotton (CSIRO 2018). Barriers to realising this potential include the capital cost of irrigation schemes and related infrastructure, high-productivity farms, management of a wide range of risks, and/or off-farm value adding. Vertical integration could add value (processed versus unprocessed goods) but could also increase risks. Processors need reliable, regular supplies and upfront commitments from producers,

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and this security could be affected by a number of factors such as water reliability, climate variability, price fluctuations and so on (Stokes & Jarvis 2018).

Justifying the costs of public investment in new water infrastructure in the Mitchell Catchment could depend on indirect benefits beyond the irrigation scheme. For example, during construction there could be an additional \$1.22M of indirect regional benefits. The ongoing production phase could yield an extra \$1M from increased agricultural activity in the area (gross revenue), depending on the type of agricultural industry (Stokes & Jarvis 2018). Additionally, as in other parts of the Cape, Indigenous people have continuously occupied and managed the Mitchell Catchment for tens of thousands of years and retain significant and growing rights and interests in land and water resources, including crucial roles that need to be negotiated in water and development planning and as co-investors in future development (CSIRO 2018).

The Laura Basin

Trails of major new varieties of pulses and other oilseeds are progressing in the Laura Basin, and this could lead to some 40,000 hectares of dryland and supplemented farming in the district.

Risks of Doing Nothing

Climatic and environmental constraints are major challenges for agricultural development in the Cape and other parts of tropical Australia. These, however, are small compared with the strategic resolution of other factors such as those associated with finances and investment planning, land tenure and property rights, management, skills, and supply chains (Ash & Watson 2018). The potential for environmental conflict with agricultural development also stresses the need for solid, proactive and professional land use planning. Finally, the cost of doing business in the Cape makes the focus on tight supply chains critical, while the lack of local food and job security drives the need for increased value in the chain.

2. Taking advantage of new and existing water resources

With significant agricultural potential now identified in the Lakeland, Laura and Mitchell Basins, that rare challenge of creating a strong and value-rich agricultural economy in an important multi-value landscape presents the Shire with the one of its most important but challenging opportunities.

For the first time, the new *Water Plan (Cape York) 2019* makes significant water available for agricultural use within the Peninsula. The Plan provides for existing and future water use, and was informed by comprehensive social, cultural, economic and ecological assessments. To implement the Plan, the Queensland Department of Natural Resources and Mines and Energy (QDNRME) have released a set of protocols, a *Minister's Considerations Report*, and a *Water Entitlement Notice* under the *Queensland Water Act 2000* (QDNRME 2019a; 2019b; 2019c).

A new *Northern Australian Water Resources Audit* also identified significant water development opportunities for three Federal Government priority regions in Northern Australia, including the Mitchell Catchment. According to the Audit, large instream dams in the Mitchell Catchment could potentially support 140,000 ha of year-round irrigation. Alternatively, water harvesting could potentially enable up to 200,000 ha, growing one dry-season crop per year (CSIRO 2018).

Demonstrating the value of even small amounts of water being made available in the Cook Shire economy, it is worth noting that about 1,300 ha of irrigated land within the Lakeland District

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currently produces bananas, water melons and other horticulture crops, however current demand for water far outweighs supply (SMEC Australia Pty Ltd 2019). At present, water is supplied from eight small irrigation supply dams with a combined storage capacity of 14,300 ML and a combined catchment area of 95 km². Groundwater is also used for town water and irrigation, although this water supply is limited. Even these limited water developments deliver significant benefit.

Risks of Doing Nothing

While these new opportunities exist and offer potential, without significant strategic planning and facilitation work that best and most efficiently match demand to supply and value, the Peninsula could end up with no water development benefit, or potentially, if water capture progresses, the evolution of stranded water assets, under-development and unnecessary environmental decline.

3. Benefits from building a more circular agricultural economy

A successful circular economy contributes to all the three dimensions of sustainable development, encompassing economic, environmental and social values (Korhonen, Honkasalo & Seppälä 2018). In agriculture, these shared values focus on improving growing techniques and strengthening the local cluster of supporting suppliers and other institutions in order to increase efficiency, yields, product quality, and sustainability (Porter & Kramer 2011). For example, connecting consumer preference to farm profitability is becoming increasingly important in maintaining farmer profitability, as demonstrated by the growing demand for organic food (Perry 2017). Digital technologies have the potential to enable consumers to precisely track food from the field to the pantry, thus informing decision-making. At the same time, commodity crop farmers will be able to match consumer demand for products, and produce a more valuable crop. The essential connection between agricultural practice and consumer preference will dramatically accelerate the adoption of new sustainable technologies in agriculture (Perry 2017). Key operational principles/options to create a circular economy (Suárez-Eiroa et al., 2019) include:

1. *Adjusting resource inputs to regeneration rates*
 - Reduce/eliminate non-renewable resources use;
 - Substitute non-renewable with renewable inputs (e.g., renewable energy); and
 - Adjust extraction rate of renewable resources to be within regeneration rate
2. *Adjusting waste and emission outputs to absorption rates*
 - Promote eco-efficiency and eco-effectiveness to reduce wastage and waste
3. *Closing or slowing the material use loops*
 - Promote the use of renewable resources (e.g. energy);
 - Connect waste management with resource recovery; and
 - Design products that are durable, repairable, easy to upgrade, and reuse recycle and/or recover
4. *Shifting production and consumption culture*
 - Shift business perspectives from producing products with rapid obsolescence; and
 - Shift consumer expectations about using disposables and acquisition of latest product
5. *Coordinating and collaborating*
 - Coordinate adjustments throughout the value chain including inputs and outputs;
 - Recover material and energy from waste for recirculation;
 - Establish new markets and value chains to facilitate transition to a circular economy; and
 - Enlist significant policy, regulatory and program support from governments

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6. Using digital innovation

- Digital technology such as big data, sensors, 3D printing will make reusing and recovering material energy efficient and effective, thus helping to decouple economic growth from natural resource depletion and environmental degradation (Murray et al. 2017).

Risks of Doing Nothing

There is significant international evidence suggesting that those economies that adopt more circular approaches to economic development will become much more resource use efficient and highly competitive (Dominish et al., 2017). Not moving in this direction also risks local agriculture not fulfilling growing market requirements, and high levels of awareness among consumers, distributors and producers about the potential for circular economy thinking to reduce wastage and provide economic, social and environmental benefits (Kirchherr et al. 2018). While the concept and its benefits are not widely discussed and accessible to practitioners and the wider public (Merli et al. 2018), the opportunity for the Cook Shire to take leadership in this area of thinking will also mean the services that emerge may have increasing global value.

4. Building resilience in the face of energy transitions

Strategic thinking about affordable, secure and low emission energy supply is needed in advance of the agricultural development front. Already, a feasibility study has been undertaken for the proposed *Palmer River water supply scheme* which includes the incorporation of a hydropower scheme. The study revealed that the project offset energy costs effectively, and on average, generating 23% to 73% more energy than is required for pumping (SMEC Australia Pty Ltd 2019). Stakeholders advised that they would be working towards zero emissions for the new irrigation development. The Queensland Renewable Energy Expert Panel (QREEP) Issues Paper, however, notes that additional policy intervention is needed for successful transition to renewables (QREEP 2016). This could be slow as there is a lack of cohesive federal policy on energy.

Change is happening though, with the establishment of Conergy's solar farm, on 23 hectares east of Lakeland township, which has the capacity to power more than 3000 homes. Windlab and Lyon are in the concept phases of a wind farm and second solar farm (Reel Planning 2017). As Fringe-of-Grid (FOG) communities, Cooktown and Lakeland are exposed to significantly higher electricity pricing compared with non-FOG areas in Australia. FOG areas are more likely to experience supply reliability and quality issues, including susceptibility to more frequent outages, higher transmission losses and increased electricity prices due to higher capital costs per unit of delivered energy (ARENA, 2019).

The region has enjoyed the successful commissioning of the first Australian utility-scale PV/ storage system in a FOG community with the 13.3 MW solar PV system and battery storage system now in place in the Lakeland District. Remote communities in the Cook Shire also commonly rely on costly and emissions intensive diesel-powered generators. A transition towards cleaner energy sources will reduce costs and improve energy security for such communities.

Australia's international and Federal obligations and Queensland's state energy targets are explained above. The framework for energy policy in Australia is to reduce carbon emissions and develop a resilient energy supply system that is affordable and provides security of supply during the transition from fossil fuels and increased uptake of renewables. Queensland's current energy strategy (the *Powering Queensland Plan*) provides support and investment in individual regions and communities to develop energy infrastructure that will contribute to the State's overall goals. In this wider national context, the Cook Shire is well placed to take advantage of federal and state programs,

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including the federal Emissions Reduction Fund, the Energy Efficient Communities and Business Program, the Clean Energy Innovation Fund and other Queensland based programs.

Australia's and Queensland's International, Federal and State Energy Policy Commitments

In 2016, Australia joined 170 countries to become a signatory to the United Nations Framework Convention on Climate Change (UNFCC) Paris Agreement. It has committed to reduce its emissions by 26 to 28 per cent from 2005 levels by 2030. However, since 2015, Australia's overall emissions have increased year on year (Stephanie March, 2019). Australia's current Renewable Energy Target (RET) requires that 20% of Australia's electricity (33,000 GWh) be produced from renewables by 2020 with the target remaining unchanged through to 2030. The Emissions Reduction Fund is the main federal program which provides incentives for organisations to voluntarily reduce their emissions. The Australian renewable energy industry will have installed more than 10 gigawatts of new solar and wind power during 2018 and 2019. If that rate is maintained, Australia will reach 50% renewables in 2025 (Baldwin *et al.* 2018). At a state level, Queensland has an overall target to achieve 50% renewable energy by 2030 with the goal to reduce emissions and act on climate change, create new jobs and diversify the state's economy. Specifically, the Powering Queensland Plan is designed to support the transition to a clean energy sector through stabilizing electricity prices, transitioning to a low-carbon energy sector, maintaining energy security and reliability and also investment in northern Queensland energy infrastructure. The transition to a low-carbon energy sector includes facilitating up to 400 MW of diversified renewable energy, including 100 MW of energy storage through a reverse auction. As part of the Powering Queensland Plan, the Government has also created a new publicly owned 'CleanCo' clean energy generator which will secure a cleaner, more affordable, sustainable and secure energy supply for Queensland.

Risks of Doing Nothing

Not planning for the effective integration of energy and agriculture now potentially locks agriculture into extremely high/insecure and highly emitting diesel based energy costs. Opportunities to value add between production and waste-based energy systems may also be lost. This work needs to be done at a time when the emerging global, federal and state policy context is driving the region towards the need for greater local energy resilience (affordability, security and transition).

5. Planning now to deliver on GBR and EPBC outcomes

The Northern Australian development agenda seeks to significantly expand agricultural production in northern Queensland. However, as much of the State's agricultural land is in GBR catchments, without careful management, agricultural growth and intensification could increase pollutant loads in coastal and marine waterways flowing to the GBR. Particular activities associated with water pollution in the GBR catchment include suspended sediment from soil erosion, nitrate run-off from fertiliser application on crop lands and herbicide run-off from various land uses (Brodie *et al.*, 2012).

Legislation for natural resource management is in place across all GBR catchments including the *Queensland Vegetation Management Act 1999*, the *Queensland Water Act 2000*, the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*, the *Queensland Land Act 1994*, the *Queensland Reef Protection Act 2010*, the *Commonwealth Great Barrier Reef Marine Park Act 1975*, and proposed new regulations in Queensland for land managers to achieve "no net decline" in GBR

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water quality (Dale et al 2018; Queensland Parliament 2019). The *Environmental Protection (Great Barrier Reef Protection Measures) and Other Legislation Amendment Bill 2019* was introduced into the Queensland Parliament, with the aim of amending the *Environmental Protection Act 1994* to strengthen GBR protection measures to improve water quality in GBR waterways (Queensland Parliament 2019). The Bill provides a regulatory framework that ensures:

- Reef water quality targets are taken into account in regulatory decision-making;
- Minimum standards to eliminate high risk practices that contribute to declining water quality in Reef catchments;
- Producer standards align with recognised benchmarks under the *Paddock to Reef Water Quality Risk Framework*;
- New development can occur without compromising water quality targets;
- Good performers are recognised and rewarded; and
- Industry-led best management practice (BMP) programs provide participants with an alternative pathway for meeting regulatory requirements (Queensland Parliament 2019).

Given the critical role of these legislative instruments in setting the limits for resource use, a clear business case for de-risking agricultural expansion will be needed to include explicit consideration of, and costings due to, environmental regulations. Significant investment is already being applied to improve water quality in the region, (a regulatory requirement under the *GBRMP Act*). The new regulations pose a high risk to the approval of non-compliant new agricultural activities. By thinking at an area-based level in advance of new agricultural development, serious new thinking can be applied in advance of the approval of individual agricultural activities on farm. This more area based approach, focussed around new water-based agricultural development areas, has the potential to significantly simplify the development approval process and deliver no net decline in water quality discharging into the GBR lagoon. Key activities would need to include:

- New investors thinking through, committing to and implementing very effective on farm agricultural practices in advance of new agricultural development;
- Exploring new approaches to the treatment of water run-off on farm; and
- Exploring more sub-catchment based and collaborative approaches to the capture and treatment of agricultural run-off from new agricultural development areas.

In addition to needing to achieve no net declines in the GBR catchments, it is also important to note that new agricultural development may be focussed in western catchments for the first time, relieving some pressure for agricultural development in the east. Early opportunities include:

- Palmer River Dam proposal itself requiring water storage in the western catchments;
- Weipa presenting a significant western catchments development opportunity; and
- Proposed Mitchell developments being entirely focused on western catchments.

Risks of Doing Nothing

Proposed changes to GBR regulations require landholders to move more urgently from common practice to improved practice and even aspirational practice, and without serious planning this could become financially prohibitive (van Grieken et al 2019). Early and proactive industry-based thinking about how new agricultural development can be best designed and managed to enable no net decline in GBR water quality is critical. This is to avoid a situation where new water infrastructure may be not be able to be used for its original intended application to agricultural development. Proactive thinking and planning may also increase profitability and maintain or increase market access into the future.

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SECTION TWO – KEY CONCEPT COMPONENTS AND RETURNS

This section unpacks the key tasks that need to be progressed to secure the best possible outcomes from the *Making Water Work* initiative.

1. Defining supply and value chain vision and production system model

What is the Current Context?

The current Lakeland cropping arrangement consists of approximately 1,300ha of irrigated land supporting bananas, water melons and other forms of horticulture. The Lakeland Irrigation Area Project highlights opportunity to expand to 9,500 ha (SMEC, 2019). Despite potential opportunities afforded by the construction of the Lakeland Dam and water developments in other locations, the region has not yet developed a clear vision of its most viable agricultural supply and value chain models as a basis for planning. A strong model could envision:

- A very clear focus on the development of a particular intensive horticultural industry in Lakeland, pulse-based cropping systems in the Laura Basin and a diversity of new cropping and food tourism opportunities in the Endeavour Valley and local communities; and
- For other targeted parts of the Cape, this could also include a mix of cattle export and processed product and a particular combination of feedlots and processing facilitates.

Attaining broad support for, and consensus about, the supply and value chain vision and model is a crucial foundation for the further steps required to ensure that the region really makes water work for its diverse food-based aspirations.

What Scope Is Required?

Agricultural supply chain viability poses significant challenges across Northern Australia in terms of investment in infrastructure, reliable water and energy sources, as well as access to markets or a port in a timely manner (Ash & Watson 2018). Ash & Watson (2018) found in their assessment of past agricultural developments in tropical Northern Australia, that failure was largely due to the desire to scale-up too rapidly without investing enough time and resources in developing viable, sustainable farming systems. A staged, measured approach is more likely to succeed.

However, with significant developments in place, the time has now come to ensure that strategic thinking to deliver new agricultural development builds upon a very clear, demand-driven *Supply and Value Chain Vision and Plan*. New and significant demand-led thinking is now needed to define the most economically, socially lucrative and environmentally responsible vision of the supply chain. Without much more visionary clarity about how a more demand-led supply and value chain could function, the proactive planning, infrastructure and servicing required will not emerge. Consequently, the critical tasks and outcomes required include:

Key Tasks	Outcomes
Deeper regional analysis of the most significant and securable agricultural markets.	Regional knowledge to inform proactive land use and infrastructure planning and new agricultural investment.
Based on deeper regional market analysis, building the deep sectoral engagement and collaboration required to forge a shared approach to industry and community-based visioning of future supply chain possibilities, options and priority strategic directions.	Stronger regional industry and supply chain consensus about priority land use planning and infrastructure investment decision making. Stronger governance arrangements surrounding critical decision making within the supply chain.

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<p>Exploring (quantifying) and envisaging (defining) the potential (demand-led and production enabled) supply and value chains possible to maximize economic and other benefits (from production through to value add and delivery).</p>	<p>Prioritisation of the most viable supply chain options and associated production systems, value-add and distribution system needs (land, infrastructure and servicing), translating into a very clear <i>Agricultural Development Model</i> as a basis for further planning.</p> <p>This vision-based thinking will need to include development of a view of enterprise diversity possible in the <i>Agricultural Development Model</i> (i.e. a model based on a reasonable mix between larger corporates and small to medium farming enterprises).</p>
<p>Exploring or identifying the key potential investors (or investor types) to lead investment and development in the sector, and prioritising future engagement and cooperation with those investors (including the potential for co-investment in development infrastructure).</p>	<p>Key agricultural development investors identified, engaged and supported.</p> <p>Key investment attraction and investment incentives identified and designed (e.g. linkages to concessional loans under the Clean Energy Finance Corporation (CEFC)).</p>
<p>Exploring potential barriers and enablers in the supply and value chain components.</p>	<p>Key land use planning and infrastructure priorities identified.</p> <p>Steps taken to ensure strong inter-operability between different supply chain options (e.g. between cattle and aquaculture).</p>

Within the context of this work, serious consideration should also be given to the potential role of more protected forms of agriculture within the region. If this is a significant opportunity, it is likely that a more diversified agricultural strategy may be possible, with broader scale agriculture and protected cropping not competing heavily for land and water resources, but potentially complimenting each other in terms of airport/port requirements. Protected cropping approaches present real opportunities in the progression of more circular forms of integrated cropping, particularly if also linked to more broad-scale cropping opportunities.

Timeframes, Investment and Costs

The way forward should build strongly on emerging supply chain work currently being progressed through Collaborative Research Centre on Northern Australia (CRCNA) investment, explore the particular relevance of that work to the Cook Shire, and facilitate a cohesive cross-sectoral vision of the most viable supply and value chain options and required strategic actions.

Package Item	Total In Kind	Total Cash Cost	Completion Timelines
Supply Chain Visioning			December 2021
Investment Contributors			
Potential Investors	In Kind	Cash	Notes
Possible State bid		\$150,000	
Council			
CQU/JCU/QUT			
CRCNA/CRCFFS			

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Who Needs to Be Involved?

The *Cook Shire Council* would be the appropriate project lead to ensure this work is coordinated and integrated with other key steps and processes, but it may seek to partner key support from OUT, CQU, JCU and the CiT team. Key players that need to be involved in this work include:

- Key participants in the most prospective agricultural sectors, including growers, financials, suppliers, the real estate industry, agricultural service providers, key infrastructure leaders;
- This work should build on the current QUT, JCU and CQU work on seeking to understand the collaboration necessary for building agricultural supply chains cooperatives and key price points along each of the key supply chains. This will help identify barriers in the supply chain system. Barriers might include trade access, biosecurity and information barriers.

[2. Visionary land use planning footprint and design](#)

What is the Current Context?

Ash and Watson (2018) noted that today's agriculture developments in Northern Australia need to recognise and act on:

- The interests and rights of Indigenous people in land and water resources; and
- Environmental, social and cultural impact assessments which are much more rigorous than in the past (Ash & Watson 2018).

Additionally, agricultural supply chain viability poses significant planning challenges in terms of investment in infrastructure, reliable water and energy sources, as well as access to markets or a port in a timely manner (Ash & Watson 2018). Ash & Watson (2018) found in their assessment of past agricultural developments in tropical Northern Australia that failure was largely due to the desire to scale-up too rapidly, without investing enough time and resources in developing viable, sustainable farming systems. A staged, measured approach is more likely to succeed. Another planning component required is the careful and detailed planning on logistics and transport to markets, including costs associated with flood-proofing roads, and access to port facilities. Finally, insights and responsiveness regarding the changing nature of markets and consumers is a critically important success factor (Ash & Watson 2018).

There is little proactive land use planning to pave the way for agriculture investment in the Peninsula. By way of example, the Lakeland District is the only Priority Agricultural Area on Cape York. The town is in a prime position to become a major agricultural services centre, being at the junction of the Peninsular Development Road and the Mulligan Highway (Reel Planning 2017). Seasonal workers place pressure on existing services, housing and infrastructure in the town and this is expected to worsen as agricultural activities expand, especially if irrigated water is secured. These assets will need to be upgraded and extended for Lakeland to thrive in the future. The town's expansion is constrained by the availability of suitable land for urban dwellings, lack of sufficient town water, lack of transport infrastructure and administrative services, and the lack of a sewerage treatment plant (Reel Planning 2017). There is one school but no recreation facilities aside from the school facilities; and a sport and recreation reserve is in need of repair. For the town to grow, adjacent landowners must be willing to offer their land for future development, and land has to be zoned accordingly. Further, accommodation needs to be affordable and family-friendly, to maintain community vitality. All of these factors may contribute to the current lack of urban development (Reel Planning 2017).

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In the context of building food security, Sea Swift is the only cargo vessel that provides delivery of goods including fuel, transport and fleet logistics as well as tourism adventure cruises. It travels from Cairns right up around the Cape with regular services to several ports, including Portland Roads, Cape Flattery and Weipa, Torres Straight and up to the Northern Territory. Sea Swift has a Market Connect program helping small business across the Cape to reach markets in their area. Its services would assist with all-weather transportation from Cooktown to the Cape and Cairns. The current land use planning blocks to Cooktown as a regular Sea Swift port however, are; (i) demand uncertainty due to a sealed road being only four hours from Cairns; the location of the barge ramp being impacted by tides and possible load restraints. Integrated land use and infrastructure problems restrict possibilities.

What Scope Is Required?

With a much clearer vision of the future supply and value chain, and a stronger focus on supply chain efficiency, minimizing environmental harm, maximizing the quality of soils farmed, reducing agricultural runoff and reducing agricultural costs (transport, pumping), a much more refined set of land use planning data layers can be developed, overlaid, analysed and optimized. The Council has already undertaken significant overlay analysis, but more strategic effort is required to complete a more detailed and refined focus on tightening the supply chain costs, catering for value building opportunities and maximising circular economy outcomes from the system.

Much stronger agricultural area design is required to achieve significantly higher level supply chain and environmental efficiency. Consequently, required tasks and outcomes are:

Key Tasks	Outcomes
Drawing on the <i>Supply and Production System Vision</i> , the Council needs to further engage in developing the key opportunities and constraints layers for potential and staged agricultural development.	Clearly identified priority areas for agricultural investment and development, including associated value chain opportunities and associated infrastructure corridors/locations. Sufficient planning flexibility to enable alternative supply chain development models to be accommodated if needed. Sufficient planning flexibility to enable sufficient diversity in the enterprise mix that emerges, enabling an appropriate mix of larger and small/medium enterprises, enabling entrepreneurship in enterprise purpose. Sufficient planning effort to optimise required infrastructure development corridors.
Exploring the most appropriate planning instruments and provisions required to help facilitate development and investment in these contexts (e.g. State Development Area, Agriculture Development Precinct, etc.).	A planning and development approval framework that facilitates smooth and high quality development investment, appropriate public-private partnerships and identified suitable investment incentive packages.

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A good example of the quality of mapping required in this case, as already developed in northern Australia includes the following. Does the extract image below require a reference? Should it be a

Mapping Water Resources and Suitable Agriculture Use, NAWRA Example

The Northern Australia Water Resource Assessment (NAWRA) provides a comprehensive and integrated evaluation of the feasibility, economic viability and sustainability of water and agricultural development in three priority regions. The Assessment focused on the Fitzroy catchment in Western Australia, the Darwin catchments (Adelaide, Finniss, Mary and Wildman) in the Northern Territory and the Mitchell catchment in Queensland.

The Northern Australia Water Resource Assessment Explorer (NAWRA-explorer) enables the user to simultaneously integrate key datasets generated by the Northern Australia Water Resource Assessment. Datasets consider land suitability, soil type, water storage, surface water availability, groundwater, climate, ecology, Indigenous interests and design hydrology.

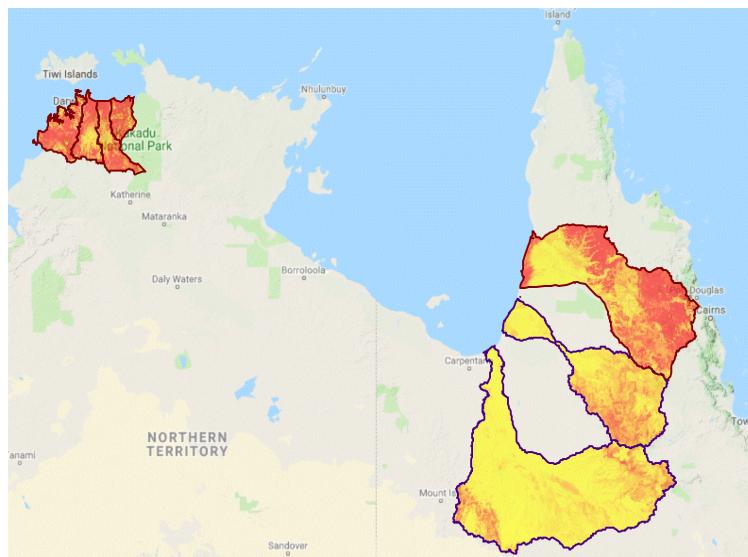


Figure 4: Land suitability for a variety of crops, planting seasons and irrigation management regimes

Key Process Steps, Timeframes and Costs?

The pathways forward on this particular piece of work should build strongly on the foundations mapping overlay work being undertaken by the Council, past Priority Agricultural Development area layers in the previous Cape York Regional Plan; and should facilitate a cohesive cross-sector input into the design of the tightest supply and value chains possible.

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Package Item	Total In Kind	Total Cash Cost	Completion Timelines
Mapping overlay development, Efficiency analytics and plan production			December 2021
Potential Investors	In Kind	Cash	Notes
Possible State bid		\$300,000	
Council	TBA, but includes existing mapping layers		

Who Needs to Be Involved?

Building on past work undertaken during the Cape York Land Use Strategy (CYPLUS) and State regional planning, the Cook Shire Council would be the appropriate project lead to ensure this work is coordinated and integrated with other key steps. Key players that need to be involved in this work include:

- Key participants in the most prospective agricultural sectors, including growers, financials, suppliers, the real estate industry, agricultural service providers, key infrastructure leaders;
- Strong skills in relation to the cost analysis of supply chain logistics (e.g. QUT); and
- Stronger designer-skills in the context of more circular agricultural systems.

3. Connected water infrastructure, ownership and water products

What is the Current Context?

Expansion of commercial cropping is currently constrained by limited access to irrigation. Lakeland is the only part of the system that is being substantially progressed. Early strategic thinking about new opportunities in the Mitchell, Laura and Weipa Basins need to be considered, as do local food security opportunities in small towns and the Endeavour Valley.

What Scope Is Required?

With the Palmer River Dam now explored for construction, and with growing agriculture in the Laura Basin and Endeavour Valley, significant effort is needed to define the emerging model of agricultural development, which will in itself define the scope and type of water governance, water products and delivery systems that will need to be made available. Irrigation distribution systems and their ability to contribute to the emergence of a more circular economy are also yet to be determined and designed. Finally, issues of various aspects of scheme ownership, and associated governance are yet to be determined. Consequently, required tasks and outcomes are:

Key Tasks	Outcomes
Feasibility of the preferred water products and distribution system developed for new agricultural development opportunities and full costings driven by the project planning.	A significant interplay between supply chain visioning, innovative land use planning and the final design, costing, funding and water governance, delivery of distribution systems. More cohesive distribution systems and innovative investment sharing principles. Opportunities for market arrangements that explore and enhance the potential for using existing under-used water systems/allocations.

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Early consideration of the most appropriate governance arrangements and ownership options need to be worked out between Sunwater, the Council and Industry.	Once established, there may be potential value in improving the operability of the market. The market is currently constrained by the trading rules and also needs some refinement. New approaches being explored in the MDIA may be worth exploring and adopting.
Identify and finalise any requirements to update the current Queensland Government Cape York Water Management (WMP).	All water allocations scientifically tested and legitimately allocated to enable security.

Key Process Steps, Timeframes and Costs

The pathways forward on this particular piece of work should build strongly on the foundations mapping overlay work being undertaken by the Council, and facilitate a cohesive sector wide input into the design of the tightest most effective water products possible.

Package Item	Total In Kind	Total Cash Cost	Completion Timelines
Consideration of water governance, ownership, distribution, water products and market arrangements.			December 2021
Investment Contributors			
Potential Investors	In Kind	Cash	Notes
Possible State bid		\$200,000	
Council			
Sunwater			
NRM&E			
RDA and Industry			

Who Needs to Be Involved?

Industry should lead the Palmer River proposal work. Overall though, the Cook Shire Council would be the appropriate project lead to ensure that this broader work across the Peninsula is coordinated and integrated with other key steps. In each development area, however, this work would need to be developed in strong partnership with Industry, Sunwater and the Queensland Department of Natural Resources Mines & Energy (QDNRME). Key players that need to be involved in this work include:

- Key participants in the agricultural sectors, including growers, financials, suppliers, the real estate industry, agricultural service providers, key infrastructure leaders;
- Council, Sunwater and QDNRME will need to work together in partnership with Industry; and
- Stronger designer-skills in new water product opportunities, power generation in water distribution and market trading skills will be required.

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4. Integrated infrastructure, communications and services planning and coordination

What is the Current Context?

To facilitate effective agricultural investment, more cohesive infrastructure and services planning will be required alongside water infrastructure planning and development. With agricultural expansion in Lakeland, the Laura Basin and Endeavour Valley coming on line, there are emerging changes in the infrastructure and communication systems needed in the region, and there will be a stronger need to ensure good telecommunications access, and a refreshed look at the integrated infrastructure needs of a more intensive/circular agricultural system.

What Scope Is Required?

Given the importance of infrastructure in ensuring a tight supply chain and enabling integrated linkages between sectors, it is essential that innovative infrastructure design precedes development. In this context, there will be a need for a focus on roads, the airport, port linkages and communications. At the same time, this work can also flag implications for human and commercial services linkages, though these will tend to be lagging rather than leading requirements.

Telecommunication services across the Shire are generally poor. Consequently, support behind big data management in the supply chain will again tend to be a lagging versus leading part of that thinking, though early approaches to big-data service innovators in the agricultural space will be important within this process to build and strengthen the agricultural support opportunity.

Consequently, required tasks and outcomes are:

Key Tasks	Outcomes
Reframing of the key infrastructure, communications and services requirements to deliver on the emerging supply chain vision and visionary land use planning.	Strong co-design in establishing a much tighter supply and value chain and greater circular economy opportunities. A clear understanding of the lagging human and commercial service requirements emerging from the proposed development trajectory. Facilitation and brokering of staged workforce development planning and coordinated response (linked to the <i>Dynamic Business and Sector Development</i> initiative).
The coordinated designing and prosecution of appropriate, coordinated and staged budgetary and investment responses for infrastructure (across Federal, State, Local and private sector requirements).	Timely delivery of infrastructure to secure high quality agricultural investment. Active facilitation of the required big data service supports to keep pace with emerging agricultural development.

Key Process Steps, Timeframes and Costs?

The pathways forward on this particular piece of work should build strongly on the foundational mapping and supply chain vision and visionary land use planning work undertaken by the Council, and facilitate a cohesive sector wide input into the design of the tightest most effective infrastructure planning and investment priorities possible.

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Package Item	Total In Kind	Total Cash Cost	Completion Timelines
Consideration of water governance, ownership, distribution, water products and market arrangements.			June 2021
Potential Investors	In Kind	Cash	Notes
Possible State bid		\$300,000	
Council			
TMR			
NQ bulk ports and ports north			
NBN Co			

Who Needs to Be Involved?

Cook Shire Council would be the appropriate project lead to ensure this work is coordinated and integrated with other key steps, but the work would need to be developed in strong partnership with the Department of Transport and Main Roads (TMR), the Port and Airport and the National Broadband Network Company (NBN Co.). Key players that need to be involved in this work include:

- Key participants in the agricultural sectors, including growers, financials, suppliers, the real estate industry, agricultural service providers, data service providers and key infrastructure leaders;
- Council, TMR, Airport Corporation, Queensland Bulk Ports, Cairns Port Authority, Rio Tinto and NBN Co will need to work closely together in partnership with Industry; and
- A stronger co-design approach is required to deliver tighter supply and value chain outcomes and stronger circular economy principles.

5. Integrated, reliable, affordable and low impact energy and waste management

What is the Current Context?

Despite policy instability over the last decade, a more stable national and state-wide policy framework is now emerging, seeking to achieve energy security (via the most cost-effective baseload opportunities), affordability (via enhanced generation investment) and transition (AER 2018). This means that, as a new agriculture development area, the region has the chance to rethink the design of the right energy mix to service new agricultural development in advance of the development front and in ways that achieve significant advances in all three energy-related objectives (security, affordability and transition). Additional energy priorities for Queensland (QDEWS 2017) include:

- Assessment of options for deploying hydro and pumped storage;
- Increasing the supply of gas into the Australian market;
- Reducing costs of energy storage and demand management (Arenawire 2019);
- Assessment of energy investment trends in Distributed Energy Resources (DER) and Virtual Power Plants (VPPs);
- Strengthening future power systems by addressing technical issues;
- Improved access to climate and extreme weather information for the electricity sector; and
- Tri-sector integration of electricity, gas, and transport in AEMO's co-optimisation model, based on the "zero emission vehicle" roadmap (AEMO 2019).

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Strategic thinking in this context within the region will also need to account for:

- New opportunities for agricultural-based waste to energy technologies that might also significantly contribute to circular economies and tighter supply chains;
- Integration between power generation options and regional waste management; and
- New emerging opportunities for hydrogen-based power options.

Similar to energy, the new agricultural development front presents an opportunity to rethink regional and more sustainable and cost effective approaches to waste management. Given several new policy and technology developments, there is a refreshed opportunity to explore the linkages between agriculture and waste management. These include: (i) the recent introduction of the waste level system; (ii) new thinking about regional organic waste management for supporting agricultural production (being undertaken by Shark Recyclers and Central Queensland University in the Lakeland area); and (iii) the Growcom agricultural waste use trial being developed by CSIRO.

In respect to the greater use of regional organic waste, Regional Development Australia Far North Queensland & Torres Strait (RDA FNQ&TS), in partnership with Shark Recyclers and CQU, have been awarded \$750 000 over three years from 2019 to undertake research/analysis and a feasibility study into the potential of compost in the region. Results from over a decade of earlier research indicate a 60% reduction in use of chemical fertiliser, a 35% increase in production, a nine-fold increase in organic matter, a 19% saving in energy costs and a 30% reduction in water consumption.

Comparative work done by Cape York NRM (Natural Resource Management) indicates a significant reduction in sediment and runoff after the application of compost and an increase in organic matter (CQU 2019). Cooktown, local industry and surrounding regions have experience in, and the opportunity to expand on, existing ventures as described below.

Circular Economy opportunities – Cooktown and Lakeland Region

An existing commercial composting business is located on Mulligan Highway, Biboohra, close to Lakeland. Shark Recyclers is owned and operated by banana farmer, Peter Inderbitzin (Red Valley Farm). Organic waste from the farm is turned into commercial compost which is used back on the banana farm and also for sale to other businesses. The use of the compost has allowed a 50% reduction in chemical fertilisers. See <http://redvalley.com.au/processes/>

Cook Shire Council has mulch and compost available for sale at the Cooktown Waste Transfer Station. Mulch is also available at Lakeland and Ayton waste transfer stations. Mulch is shredded as recycled green waste, while compost is green waste that has been shredded twice, aged for two years, and mixed with shredded cardboard (Cooktown Shire Council Website).

With respect to the Growcom-based work in Townsville, the Food Waste CRC is currently starting a 20 week process for engaging in opportunities for new approaches to food waste processing. In emerging agricultural domains, this might involve the development of a significant value add opportunity for agricultural products. The approach has the potential to be built into a modular model for expansion or duplication. In this context, the Cook Shire could have an appropriate horticultural mix all year round (with strong reference to the global health and welfare market). This emerging approach suggests that there is significant global investment interest in area-based food manufacturing models (by combining the skills of local entrepreneurs and attracting investors). Early figures are suggesting that a factory built at the cost of \$22 million could deliver some \$66 million revenue with a \$45 million return on investment to the community (give or take 30%).

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What Scope Is Required?

To achieve genuine affordability, security and transition outcomes, a unique opportunity exists to ensure every effort is taken to fully explore and compare the range of options now available, to enable regional decisions about the best option possible, and then to progress planning and implementation. As such, a structured approach to the conceptualization, comparison and more targeted design of the most effective options should at least include comparison of:

- Property-based solutions (solar or biomass) that additionally feed energy back into the grid;
- The potential contribution of innovative hydro within or from the distribution system;
- A regional approach to biomass-based development of a sub-regional microgrid, resulting in multiple circular economy products (e.g. oil/syngas, biochar)
- Potential regional waste-energy options;
- Potential hydrogen-based solutions (e.g. water plus power to create hydrogen with overflow power to reduce marginal costs); or
- An appropriate combination of these options.

While security, affordability and transition are the key objectives, additional benefits such as multiple product streams contributing to a more circular system need to be considered, as do additional value-added products that the region may be able to grow economically (e.g. power, biochar). In respect of energy's pivotal role in agricultural development, to achieve genuine affordability, security and transition outcomes, a unique opportunity exists to ensure every effort is taken to explore and compare the range of locally-based options now available, to enable regional decisions about the best options possible, and then to progress planning and implementation.

In consideration of the above possibilities, there is a need to explore whether these opportunities have something to contribute to the design of a more circular economy in the context of the new agricultural developments at Big Rocks and associated future water developments.

As such, a structured approach to the conceptualization, comparison and targeted design of the most effective energy and waste management options should include the following tasks and outcomes:

Key Tasks	Outcomes
In all potential development areas, a full criteria-based assessment and refinement of the range of energy generation and supply options possible, or a combined set of options that deliver significantly improved energy security, affordability and transition in the region in the context of emerging new agricultural developments.	Full exploration of: (i) property-based solutions (solar or biomass) that additionally feed energy back into the grid; (ii) the potential contribution of innovative hydro-power within or from the distribution system; (iii) a regional approach to biomass powered sub-regional microgrids, resulting in multiple circular economy products (e.g. oil/syngas, biochar); (iv) potential regional waste to energy options; (v) potential hydrogen-based solutions (e.g. water plus power to create hydrogen with overflow power to reduce marginal cost); or (vi) an appropriate combination of these and other options.
In all potential development areas, a full criteria-based assessment and refinement of the options possible, or a combined set of options that deliver significantly improved waste and pollution reduction, more intense	Full exploration of options that include: (i) management of municipal waste; (ii) agricultural waste biomass contributions to energy production; (iii) regional approaches to organic waste for compost production; and (iv)

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<p>supply chains and improved value chain opportunities.</p>	<p>greater consideration of potential wood waste and other value adding options and processes. Integrated consideration of biological wastes and nutrient pollution reduction emerging from new agricultural developments. Full review of the potential waste and pollution reduction technologies that could be applied in the agricultural development context and their associated benefits and product streams. Picks up from the finding of current assessment and viability testing of the Shark Recyclers regional waste management studies.</p>
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Timeframes, Investment and Costs

The pathways forward on this particular piece of work should build strongly on the foundations mapping overlay work being undertaken by the Council, and facilitate a cohesive sector wide input into the design of the tightest most effective water products possible.

Package Item	Total In Kind	Total Cash Cost	Completion Timelines
Circular integrated energy supply and waste management option comparisons and preliminary designs.			June 2021
Potential Investors	In Kind	Cash	Notes
Proposed State bid		\$250,000	
Council			
Energy Queensland			
DES and Queensland Waste Levy			
NRM&E			
Growcom			
Pacific Bio			
Industry partners			
CQU/JCU/CSIRO			

Who Needs to Be Involved?

The *Cook Shire Council* would be the appropriate project lead to ensure this work is coordinated and integrated with other key steps, but the work would need to be developed in strong partnership with Energy Queensland, DES and DNR&M. The Council's waste management team would be involved to ensure this work is coordinated and integrated with other key steps, but the work would need to be developed in strong partnership with groups like Pacific Bio, Shark Recyclers, Growcom and research institutions (JCU, CSIRO and CQU). Linkages would also need to be made to the FNQ Regional Organization of Councils' *Waste Management Strategy*. This work would be led by the Council through the integrated governance arrangements, but would need to involve key players including:

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- Key participants in the agricultural sectors, including growers, financials, suppliers, the real estate industry, agricultural service providers, key infrastructure leaders;
- Council, DES and DNRME will need to work closely together in partnership with Industry; and
- Strong designer-skills in new energy generation and circular economy opportunities.

6. Achieving regulated water quality outcomes for the GBR

What is the Current Context?

The bilaterally agreed *Reef 2050 Plan* sets a clear strategy for improving water quality outcomes for the Great Barrier Reef World Heritage Area. In this context, the Queensland Government introduced a Bill to Parliament in February 2019 to strengthen existing Reef protection regulations. The proposed regulations under the *Environmental Protection (Great Barrier Reef Protection Measures) and Other Legislation Amendment Bill 2019* reduce water pollution (nutrients and sediment) from agricultural and industrial land uses entering Reef waters while maintaining productivity and profitability through improved land management (Queensland Parliament 2019). Once passed by Parliament, the amended legislation supports the staged roll-out of strengthened GBR protection regulations to apply to all commercially produced cane, bananas, horticulture, grains and grazing, as well as direct sources of pollution from industrial land uses (e.g. sewage and water treatment plants, intensive animal industries) across all GBR regions. This, for the first time, will include requirements to ensure new agricultural development does not contribute further to the declining quality of waters running into the GBR lagoon. This has major significance for any new agricultural development on the eastern coast in the Cook Shire.

While there has been major progress in improving existing practices in the region, there has to date been no cohesive attempt to conceptualise and design how new agricultural development will meet the no net increase in pollution requirements. This detailed thinking is better managed with an area-based approach, rather than leaving every new farming enterprise to design a no-net-decline approach property by property. Additionally, some actions are actually better planned at multi-property (e.g. combined water reuse) or sub-catchment scale (sub-catchment monitoring).

What Scope Is Required?

Any planned expansion of agriculture must meet these new regulatory standards. Additionally, however, there is real scope to apply highly innovative and collaborative thinking in advance of the agricultural development curve, improving development approval and new development outcomes. Consequently, the required tasks and outcomes are:

Key Tasks	Outcomes
Building a strong and evidence-based collaborative alliance between Industry, researchers and Cape York NRM to co-design an area-based approach in association with the <i>Supply Chain Vision Building</i> and <i>Visionary Land Use Planning</i> phases.	All responsibilities for implementation are clearly defined and strong pathways in place to secure the investment required to implement. Highly innovative cross-sectoral, area-based approaches and traditional practice approaches are explored and assessed.
Building strong collaborative governance arrangements to ensure standards are maintained and continuously improved.	Whole of area monitoring alliances and outcomes established from the outset of the development cycle to minimize investment risk. Targeted concessional finance arrangements identified and linked to new agriculture development meeting scheme requirements.

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Timeframes, Investment and Costs

The pathways forward should build strongly on the foundations mapping supply chain vision and visionary land use planning work undertaken by Council and facilitate coordinated sector-wide input into the design of the most effective infrastructure planning and investment priorities possible.

Package Item	Total In Kind	Total Cash	Completion Timelines
Establishing innovation and delivery systems to meet No-Net-Decline in GBR outcomes			December 2021
Potential Investors	In Kind	Cash	Notes
GBRF		\$300,000	
OGBR			
Council			
FBA			
Industry Partners			
CQU/JCU/CSIRO			

Who Needs to Be Involved?

Cape York NRM (in collaboration with the Council) could be the appropriate project lead to ensure this work is coordinated and integrated with other key steps, but the work would need to be developed in strong partnership with Industry and investors.

Key players that need to be involved in this work include:

- Key participants in the agricultural sectors, including growers, financials, suppliers, agricultural service providers and data service providers;
- Council, GBRMPA, Cape York NRM and the appropriate water service providers; and
- A stronger co-design approach at appropriate area scale is required to deliver an area-based and cross-sectoral approach to achieving no-net-decline in water quality.

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SECTION THREE – GOVERNANCE, MANAGEMENT AND CAPACITY

Total project costs, investors and return on investment

The following outlines the foundational but incomplete ROI case behind the proposed \$1.4 million State budget investment in this proposal is envisaged over a five year period starting July 2020. The table below outlines the estimated returns and the assumptions underpinning these returns:

Project Impact Category	Assumptions For Additional Impact	Total Investment Return
Project Cash Leverage	<ul style="list-style-type: none">TBA following initiative budget finalization.	\$
Increased regional sector growth or business turnover	<ul style="list-style-type: none">Assume current Gross Regional Product from agriculture is \$29.6 millionAssume the project growth in agriculture from proposed new water development over 30 yearsAssume this investment delivers 25% of the value of the growth in the agricultural GRP over 30 years.	\$
New consequent and attributable private and public sector investment in region	<ul style="list-style-type: none">Target of \$500,000 Year 1 and \$1.5 million in each subsequent year to Year 5.	\$6,500,000
Total State Investment	Total Investment Return	Total ROI
\$1.4M	\$6.5	4.6:1

Governing for integrated effort and success

Project Governance Arrangements

Strong governance arrangements will be the key to the success of this initiative, particularly ones that are locally led, regionally coordinated and State supported. These would at least include:

- Some form of strong area-based governing structure that is inclusive of key partners;
- Strong stable and longer term initiative leadership based within the CSC;
- Strong project-focused delivery coordination (preferably third-party facilitated) involving CSC, the CiT team, the private sector and the State);
- Ongoing support partnerships with the original CiT partners and the Regional Economies Centre of Excellence (RECoE); and
- Ongoing formal networking across-CiT regions, potentially including the strategic consideration shared appointments and procurement approaches.

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Integrated Project Linkages

Key integrated linkages from this initiative and others will need to include:

- Integrated links and cooperation between the wider *Making Water Work Queensland* budget bid (Cooktown, Charters Towers, Rockhampton and Barcaldine);
- Strong linkages to the planning of the recently established Federal NQ Water Infrastructure Development Authority;
- Strategic links to key Queensland policy initiatives, including the new Innovation Strategy, Just Transition Strategy, Zero Net Emissions, the *Agricultural Strategy Paper*, etc.;
- Strategic linkages to the Office of the Great Barrier Reef (OGBR), the Great Barrier Reef Foundation (GBRF) and the Great Barrier Reef Marine Park Authority (GBRMPA); and
- Key research investments and linkages should be considered and maintained, including: (i) the Advanced Manufacturing Growth Centre; (ii) the CRC Northern Australia; (iii) the new Future Food Systems CRC; and the NESP Tropical Water Quality Hub (RRRC).

Monitoring for Success

A strong monitoring program should be established from the outset of this initiative to ensure that the key outcomes and projected ROI are achieved. This approach sets up the process for key partners to jointly monitor both the health of the partnerships and the progress of implementation. It also establishes a basis for monitoring the achievement of the predicted cost benefits as the project unfolds and becomes a reality.

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Appendix A: Criteria Sheet – Key options for Making Water Work

Select **ONE** Option and consider it when you answer the questions in the table.

1. **Best Management Practices**, Regional Composts and Credentialing in Nutrient Management and Monitoring
2. New Forms of **Zero Emission Aquaculture**, including macro algae to treat waste water
3. New Forms of Local, Secure, Affordable, Dispatchable and **Low Carbon Energy** to Drive Agricultural Growth
4. Visionary **Land Use and Infrastructure Planning** to Reduce Costs and Impacts and Strengthen Supply Chains
5. More **Effective Water Trading** and Local Management
6. Stronger Digital **Data Hubs and Value Chain** Resilience and Innovation
7. **Next Generation Skills** for a Circular Economy
8. New **Protected Cropping Systems** for Agriculture (e.g. greenhouses, shade structures)
9. **Engineering Solutions**, New Water Infrastructure and Enabling Substantive Water Recycling

Intervention Option Name:	Not sure	No	Yes	Comments
1. Is it essential for the pathway?	N S	N	Y	
2. Is it essential, but difficult to implement - i.e. lots of barriers	N S	N	Y	
3. Might the option foreclose other options?	N S	N	Y	
4. Might it open/benefit other options?	N S	N	Y	
5. Could it lead to irreversible negative changes?	N S	N	Y	
6. Will it be robust? (long-lasting & durable)	N S	N	Y	
7. Is it 'no regrets'?	N S	N	Y	
8. Other considerations				