
Singapore
1693 Km
1327 Km
Christmas Island
Cocos (Keeling) Islands
986 Km
2608 Km
2945 Km
Perth
MUTUALITY
SECURITY
PROSPERITY
Christmas Island-Singapore
STRATEGY
SHIRE OF
CHRISTMAS ISLAND
Sep 2023

Content

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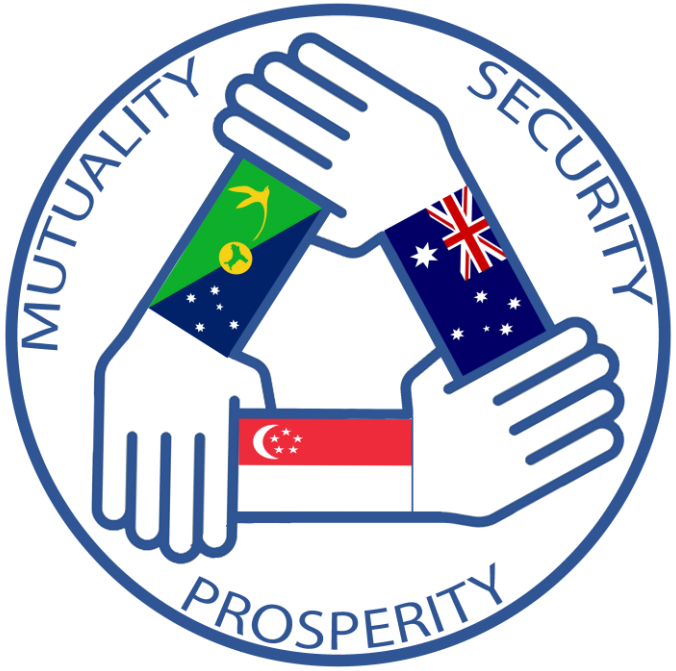
Shire of Christmas Island unless stated

1. Preamble Statement

The ***Christmas Island – Singapore Strategy*** (CISS) recognises the strong historic, cultural and social ties between Singapore and Christmas Island (CI) with the unique geographic location of CI between Australia and Singapore.

It focuses on the critically pressing effort to transition the CI economy from mining & immigration to agriculture, tourism, education and defence thus fitting within the November 2016 ***Australia-Singapore Comprehensive Strategic Partnership*** (ASCSP) which aims to bring the two national economies closer together.

The primary function of the CISS is to draw attention to the potential inclusion of CI within the ASCSP dialogue in order to promote new investment opportunities on CI, and possibly the Indian Ocean Territories (IOT) as a whole. As Singapore is south-east Asia's foremost financial hub and Australia's closest strategic and longstanding defence partner in the region, it is most appropriate that the Shire of Christmas Island develop programmes and relationships with Singapore that support our mutual interest in the social well-being and economic prosperity of our people.



2. Facts about Christmas Island

2.1 Location

Christmas Island is the summit of a submerged volcanic mountain, rising steeply from the abyssal plains of the Indian Ocean to a central plateau peaking at 361 meters above sea level. It covers a total area of 135 Km² being approximately 1/5.4 of the area of Singapore. Christmas Island is located 350 Km south of Java and some 1550 Km northwest of the closest point on the Western Australian coast. Christmas Island lies 986 Km east of the Cocos (Keeling) Islands, 1,327 Km south of Singapore, 2,608 Km from Perth and 5,184 Km from Canberra.

2.2 Unique History

The cultural diversity of Christmas Island originates from the late nineteenth and early twentieth century with the import of thousands of indentured Chinese, Malay and Sikh workers to service the phosphate mine. This Asian dominant demographic was, and still is, the norm on Christmas Island from the mid-century administration under the Colony of Singapore through to the transfer of sovereignty to Australia in 1958.

Mining phosphate c1925 reflecting the social make up of CI:
British management, Indian Jaeger or watchmen and Chinese labourers
National Archive of Australia

Facts about Christmas Island Cont.

2.3 Very Small Population

The 2001 Census conducted by the Australian Bureau of Statistics (ABS) recorded a population of 1,446. It peaked at the 2011 Census with 2,072 and came down to 1,692 at the 2021 Census mainly due to a decline in local mining jobs and a sharp reduction in immigration activities. The decline trend is on-going with the up-coming generation progressively migrating to the mainland for employment prospects. At the end of 2022 the estimated resident population was lower than two decades ago at around 1,250. This translates to a population density of 9.25 per Km² compared to a population density of approximately 7490 per Km² in Singapore.

Ritual at the Kampong Mosque

2.4 Ethnic diversity

The distinctive historic ethnic diversity of the island has similarities with Singapore. It somewhat perdured and remains a noticeable component of the overall cultural fabric of the island population. The 2021 ABS Census top responses for language used at home other than English was 18.4% Malay, 13.9% Mandarin, 3.7% Cantonese, 2.1% Min Nan or Hokkien and 1.1% Indonesian. The country of birth for individuals, mothers and fathers indicated that the ancestry top responses were 22.2% Chinese, 17% Australian, 16.1% Malay, 12.5% English and 3.8% Indonesian.

Ritual at the Poon Saan Buddhist Temple

Traditional Chinese ceremonial display

3. Economic Focus Overview

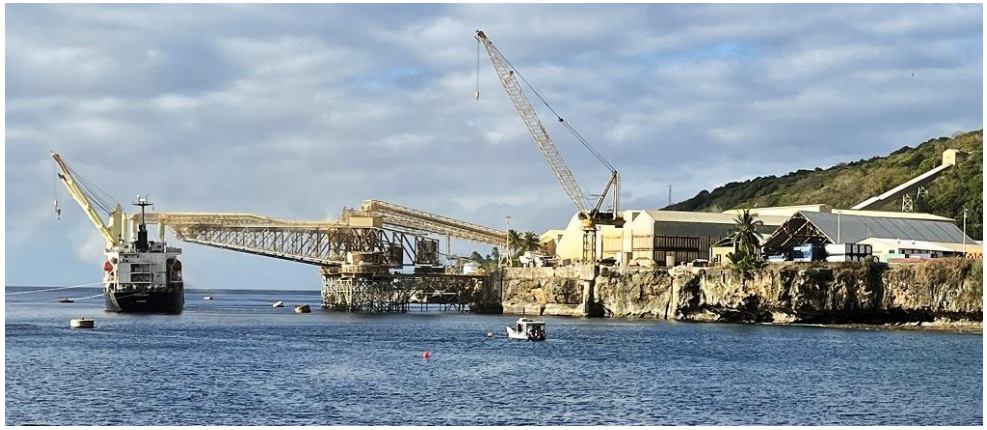
3.1 Local Planning Scheme Review

The Shire of Christmas Island (SOCI) ***2015 Local Planning Strategy*** (LPS) is progressively being adjusted as part of the mandatory and formal review of the **2016 *Town Planning Scheme No.2*** pursuant to *Part 6, Division 1 section 65 of the Western Australia Planning & Development Regulations 2015*. As part of this process this 2023 CISS supersedes the SoCI original 2018 CISS whilst it reinforces the urgent need to strengthen the Island's historic and special relationship with Singapore to bolster the Island's economy post mining.

3.2 Synergies with Cocos (Keeling) Islands

The CISS provides a strategic agenda to support the growth of the CI economy with a specific focus on attracting Singapore visitors and investors. This said many opportunities raised in the CISS could have economic synergies and or applications to the Cocos (Keeling) Islands (CKI). In this context, it is neither the role nor the intended ambition of the SOCI to influence the Shire of CKI in economic matters that can relate to Singapore and the IOT as a whole.

Aug. 2023 - Phosphate loaded at the Flying Fish cove cantilevers



3.3 Strategic Initiatives

For more than a century and to this day CI is the IOT's leading economy. With the cessation of immigration activities in October 2023, the standing down of the Immigration Detention Centre to contingency mode without occupants and phosphate mining to end in 2034, such leadership position is declining rapidly. This predictable downturn is and will continue to affect the well-being of Christmas Islanders and the Commonwealth's bottom line due to reduced revenue from reduced economic activity.

The CISS identifies a range of short to long term strategic initiatives that, if actioned, could serve the interest of CI, Australia and Singapore and ultimately deliver and secure a sustainable economic future for the Christmas Island community.

3.4 Singapore-Australia strengthened ties

The 2018 CISS outlined the economic prospects that the 2016 ASCSP **(ref. Appx. 1)** could open up in terms of: cultural relations; education; innovation & science; people movements and northern Australia agribusiness development, thus potentially mitigating CI's foreseeable decline, facilitate new joint business opportunities and hopefully secure CI's sought-after economic renewal.

The SOCI has been encouraged by the outcomes of the 8th Singapore-Australia Leaders' Meeting of 2 June 2023, where the acting Prime Minister of Singapore and the Prime Minister of Australia jointly committed to continue strengthening the ASCSP. In this context the CISS is designed as a modest but holistic enabling tool with specific targets to ensure that CI, and possibly the IOT, are firmly considered within the Northern Australia framework and at the next Annual Leaders' Meeting in Australia in 2024.

4. About the Strategic Initiatives

The following Strategic Initiatives described in this report replicate some of the themes of the SOCI 2023 Draft Local Planning Strategy.

These Initiatives could eventually translate in enabling actions and or be formulated as policies that would be ultimately incorporated in the Shire Town Planning Instruments.

The multiple contrasts as well as similarities between Singapore and Christmas Island imply a range of possibilities, and realistic reciprocal economic prospects captured in these Strategic Initiatives.

Singapore and Christmas Island at the same scale

5. Settled Area Main Features

General view of the Kampong at Flying Fish Cove

6. Population Growth

Context

With the closure of the detention centre and the tangible contraction of the mine's workforce by 1/3, the current population is less than 1300 resulting in a dramatic contraction of the local economy. The forthcoming Local Planning Strategy is making land use provision to accommodate a population of 5000 permanent residents. This growth is predicated on the Commonwealth of Australia releasing Unallocated Crown land to develop new residential and tourism accommodations to lodge new residents and visitors. In this scenario CI would remain scarcely populated thus offering an attractive, relaxed and leafy lifestyle to Singapore investors in sharp contrast to the City State's dense urban setting.

Strategic Initiative 1

There has been no Crown land release on CI in the past 25 years. Continue to encourage the Commonwealth to specifically reform its Crown Land management approach in order to attract investments in new businesses together with new housing projects and increase the social and affordable segments in particular.

Strategic Initiative 2

Make the Singapore decision makers aware that CI has existing capacity to accommodate 250 visitors at any one time and CI existing essential services (water, sewer, power) could support in the short term up to 3000 new residents.

May 2023 - Singapore Newton Food Market

7. Cessation of Mining

Context

The prospect of accessing new phosphate deposits is in doubt given the Commonwealth Government's recent decision to "pause" the necessary environmental assessment process required to support the licensing of new mining areas. As a consequence, the operation of the mine will inevitably diminish until all mining activities cease upon the expiration of the mining lease in 2034. Existing and future exhausted mining areas, estimated at approximately 1200Ha, offer the best investment prospect to develop new agri-businesses and other ventures on CI.

Jul. 2019 - Inspection of an exhausted mining area by the MINTOPE team

Jul. 2016 – MINTOPE trials

Strategic Initiative 3

Ex-mining areas should be transformed for future productive agri-business related uses (hydroponic vegetables, fish, poultry and semi-enclosed fruit production) that could in part supplement Singapore's food supply, food resilience and ultimate food security

8. Food Security

Context

With the exception of a few vegetable gardens and a small licensed fishing take, CI imports the totality of its food. The supply of food is irregular due to shipping access limitations during the swell season, and costly owing to reliance on air service. This indicates that CI and Singapore have a shared food security agenda **(ref. Appx. 2)**.

Singapore currently imports more than 90% of its food (**ref. Appx.3**) from more than 170 countries and regions thus making Food Security **(ref. Appx. 4)** a foremost state priority.

Singapore is therefore vulnerable to emerging global trends.
This includes: population growth; demand for food projected to increase by 50% come 2050; pressures on food productions through rising temperatures & erratic weather patterns; loss of arable land and countries prioritising their needs over international trade.

To strengthen Singapore's Food Security, the Singapore Food Agency (SFA) is pursuing, under its 30-30 policy, three broad strategies called the **3 Food Baskets (ref. Appx. 5)**
:

Basket 1: Diversify import sources to reduce risk of reliance on any single food supply source

Basket 2: Grow local to provide buffer supply in event of overseas supply disruptions

Basket 3: Grow overseas to help local companies expand abroad

Strategic Initiative 4

Encourage the Commonwealth Government to facilitate the release of ex-mining areas for the production and export to Singapore of fresh food such as but not limited to fruits, vegetables, poultry and fish to accelerate the island's economic transition.

Strategic Initiative 5

Ensure that a proportion of these fresh food products are regularly made available to the CI market to lower local food costs.

Strategic Initiative 6

Facilitate a dialogue between the Commonwealth Government and the SFA to explore and facilitate investment on CI from Singapore based agri-businesses in line with the SFA's third "Food Basket".

Document produced for the SFA by Alpha Beta Strategy & Economics
Can be sourced at https://accesspartnership.com

9. Australia - Singapore Food Pact

Context

Australia and Singapore have had a long and trusted food partnership strengthened during the COVID-19 pandemic amid supply chain disruptions.

In effect Australian food products continued to reach Singapore, including Australian chilled and frozen poultry meat supplied under improved import conditions. This has been a catalyst for both governments supporting the trade of high-quality Australian food to and through Singapore and the region and generated closer collaboration on food safety, innovation and resilience in the respective national food systems through the Australia - Singapore Food Pact (ASFP) (**ref. Appx.6**)

Strategic Initiative 7

Encourage the Australian and Singapore governments to promote and develop a CI focused Food Pact initiative that could facilitate engagements between private sector agri-trade players with a specific focus on organic offerings, food innovation, future foods and based on commercial viability.

Mar. 2015 – MINTOPE successful trial with African Sorghum

10. Tourism Prospects

Context

There is significant potential for expansion of the tourism industry given CI's internationally recognised natural heritage values and the fact that the Christmas Island National Park comprises 63% of the island's 135 km².

The Christmas Island Tourist Association (CITA) *2013–2018 CI Destination Development Strategy* reflected the following vision:
"Imagine: Christmas Island in 2023 - A world class tourism destination providing visitors a rewarding and memorable experience based on a unique, rich and healthy environment, culture and way of life underpinned by a vibrant community, mixed economy, sustainable and effective infrastructure and services with strong governance arrangements minimising the ecological footprint through local food production, powered by renewable energy, effective waste management systems and strong communication and transport links".
This enduring CITA aspirational statement concisely identified the expectations and challenges before the community, ten years ago. They remain unfulfilled today.

In March 2018 the capacity to accommodate visitors was 284 rooms, 306 beds for a maximum of 519 visitors. On a weekly rotation at 80% occupancy, the island could accommodate 415 visitors per week or 21,580 per annum. At the peak of the resort activity in 1995 the island annual visitation reached 19,377.
In contrast the Australian Border Force visitors' arrivals data on CI from 2017 to 2021 shows an annual average of 2071 visitors equivalent to 40 visitors per week.

Strategic Initiative 8

Pursue with the Commonwealth Government the upgrade of the Christmas Island Airport with the necessary infrastructure and managerial arrangements for it to be able to accept international regular passenger transit flights.

Strategic Initiative 9

Promote in Singapore CI's specific natural attributes that could favourably support niche nature-based tourism.

Strategic Initiative 10

Develop a suitable approach to encourage Singapore investors to further develop CI's hospitality infrastructure.

Oct. 2016
Flying Fish cove

11. Construction Material Supply

Context

With the exception of chalk, CI is entirely reliant on the importation of all of its construction materials. This is impacting on construction cost considerably. Singapore has a similar material import challenge. Temasek Polytechnic (TP), partnering with industry, is at the forefront of the research and accreditation of light concrete products made with 30% recycled plastics in Singapore.

Strategic Initiative 11

Engage with TP and associated Singapore construction businesses to investigate and import to CI cost effective pre-fabricated construction products and systems to minimise in-situ construction time and reduce construction costs on the island.

Sheer stress testing press at the TP Research Laboratory

Recycled plastic feedstock samples on display at the TP Innovative Materials Research Laboratory

Concrete with 30% recycled plastic moulded into drain channels & footpath kerbs

12. Future Economic Activities

Context

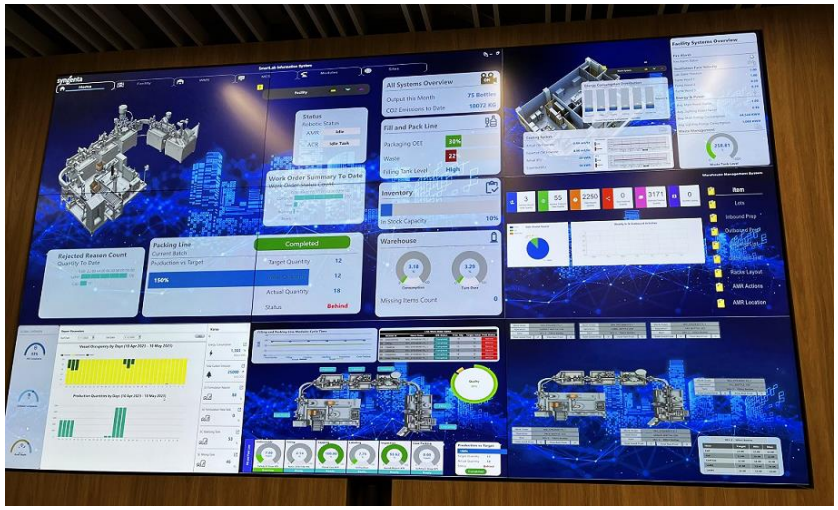
Christmas Island faces a number of significant challenges in developing an environmentally, socially and economically sustainable future for itself. The transformation of the island economy for the joint benefit of the Christmas Islanders and the Commonwealth was considered in 2013 *"vital to the sustainability of the Island"*. Ten years later, with an economy and a population clearly in decline, the need for an economic transformation has reached the highest level of importance now and for the coming decade.

Companies such as ArianeTech (**ref. Appx.7**) with advanced research & development capabilities in modern agricultural technology and equipment offer state of the art solutions and support to Singapore's urban farmers.

Strategic Initiative 12

Engage with the Commonwealth Government in order for CI (and the IOT) to be fittingly considered and actively involved within the framework of the ASSCP. Such development could stimulate economic activities in sectors such as finance, defence, logistics, tourism, education, research, innovation, environmental sciences, trade, socio-cultural advancement and cultural exchanges.

Jun. 2023 – GKE/ArianeTech - Singapore
Commercial scale green vegetables production under totally controlled environment



May 2023 – Syngenta Singapore experimental automated packaging facility (left) and Smartlab monitoring & management display (above)

13. Christmas Island Marine Park

Context

In March 2022 the Christmas Island Marine Park (CIMP) was established by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*. Like all Australian Marine Parks, the CIMP is managed by the Commonwealth Director of National Parks.

With the exception of the Port Area and taking into account the 1997 Australia – Indonesia Maritime Boundary Agreement, the CIMP extends from the island's shoreline to the limit of Australia's Exclusive Economic Zone, approximately 200 nautical miles from shore to the east, south and west and 40 nautical miles to the north. (**ref. Appx. 8**).

The key objectives of the CIMP are:

- Protecting, managing and monitoring the marine park's natural environment;
- Communicating and promoting greater understanding and appreciation of the marine park for the community and visitors;
- Supporting sustainable use of the marine park by the community and tourists, including through high quality and safe natural and cultural tourism experiences; and
- Improving scientific knowledge and understanding of the marine park's natural environment, in both inshore and offshore waters.

The Saint John's Island National Marine Laboratory (SJINML)(**ref. Appx. 9**) hosts the Marine Environment Sensing Network (MESN) that has deployed monitoring buoys around Singapore and the south-east coast of Malaysia for the purpose of informing microplastics inventory, real time sea water data and chemistry profiling. The MESN aims to establish international collaborations to extend its network.

The Australian Integrated Marine Observing System program has similar objectives.

Strategic Initiative 13

Facilitate a dialogue between National Parks Australia and the National Parks Board of Singapore to identify potential synergies and exchanges associated with marine conservation programs, education undertakings, marine science research and public visitation activities.

Strategic Initiative 14

Invite Singapore and Australia to collaborate in establishing a marine monitoring buoy near Christmas Island and one near the Cocos (Keeling) Islands, to expand the international marine observation networks by covering the east-north-east area of the Indian Ocean.

The MESN-SJI Buoy deployed off the western coast of St. John's Island in November 2022

14. Marine Economic Province

Context

The establishment of the CIMP allows for in-shore use activities up to 12 nautical miles allowable under the International Union for Conservation of Nature category.

Foremost to this is marine aquaculture as it could:

- Appeal to marine scientists and researchers;
- Become a tourist attractor;
- Provide a desirable source of protein;
- Play a measurable role to reduce pressure on wild stock;
- Inform fish resource management and
- Create local employment.

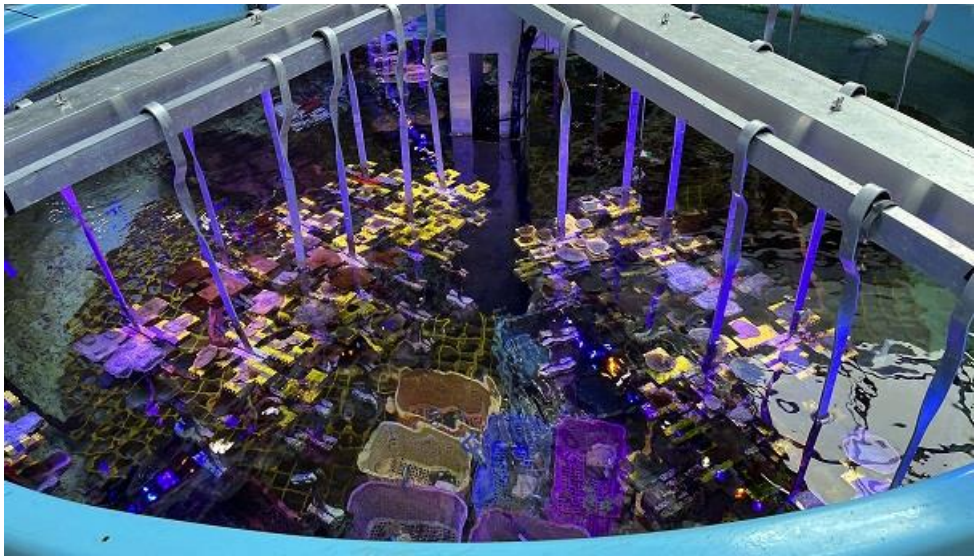
Strategic Initiative 15

Learn and collaborate with the Singapore Marine Aquaculture Centre (MAC) **(ref. Appx. 9)** to facilitate the establishment on CI of a land based marine aquaculture industry.

Strategic Initiative 16

Encourage the Singapore and Australian Governments to consider CI as a station for a pilot vessel to jointly research and test high sea commercial scale aquaculture methods.

Jun. 2023 - Microalgae farming at the Saint John Island Marine Aquaculture Centre



Jun. 2023 Experiment on coral reproduction at the Saint John Island National Marine Laboratory

15. Higher Education

Context

Education and Higher education are emerging as a possible component of CI's economic future. This view has been reinforced by the encouraging results of the Mining to Plant Enterprise (MINTOPE) agricultural and biological research partnership sponsored by Murdoch University, the Commonwealth Government and Phosphate Resources Ltd. between 2012 and 2019.

MINTOPE activities (**ref. Appx. 11**) together with the work done on CI under the auspices of the Australian Research Council has demonstrated and proven that, with appropriate ground preparation, agriculture and downstream agri-products such as, but not limited to, pulse legumes, cereals, stock feed, yams, coffee, peanuts, beer and gin are highly achievable and potentially economically viable on rehabilitated former mining areas.

In addition, the MINTOPE team has indicated that with the quality, diversity and uniqueness of its eco-systems, CI is ideally placed to be considered as a "*Living Laboratory*" for higher education and research.

Strategic Initiative 17

Support Murdoch University and Temasek Polytechnic partnership endeavours displayed in the Indian Ocean Learning Communities MOU (**ref. Appx,11**) that aspires to offer joint research and education programs on CI targeting Singaporean and Perth Students in the fields of Bio-security, Bio-prospecting, Intensive agriculture/urban farming, Brewing & distillation, Micro sustainable energy, Food security, Mining land rehabilitation, Sustainable mine closure, Small business development, Sociology and Eco-tourism.

May. 2023 - Temasek Polytechnic Horticulture Lab at its Center for Research & Opportunities in Plant Science

May. 2023 - Temasek Polytechnic Center of Innovation for Complementary Health Products Mass Spectrometry Facility

16. Climate Change

Context

The legally binding international treaty on climate change known as the *2015 Paris Agreement* was adopted by 196 parties. For the first time it brings all nations into a common cause to undertake ambitious efforts to combat climate change, adapt to its effects and charts a new course in the global climate effort.

In June 2022 the Australian government has committed to a 43% reduction of greenhouse gas emissions by 2030 below the 2005 level in an effort to improve its otherwise modest Climate Action Tracker rating.

At the start of the 2022 Cop27 in Sharm El-Sheikh Egypt, the UN secretary general Antonio Guterres expressed this sobering warning*: "the world is on the highway to climate hell with the foot still on the accelerator, we are in the fight of our lives, and we are losing".*

Strategic Initiative 18

Establish wind farms, solar arrays and storage on CI to power buildings and future electric motorcars with renewable energy in order to enhance the island's image as an environmentally responsible community surrounded by natural wonders.

Strategic Initiative 19

Engage with Singapore architects, engineers and researchers with proven and successful experience and knowledge in designing innovative low carbon footprint buildings in our equatorial environment and apply such knowledge to CI existing and future building infrastructure.

Combined Solar/Horticulture farming – Holland - Source GroenLeven

17. Airport

Context

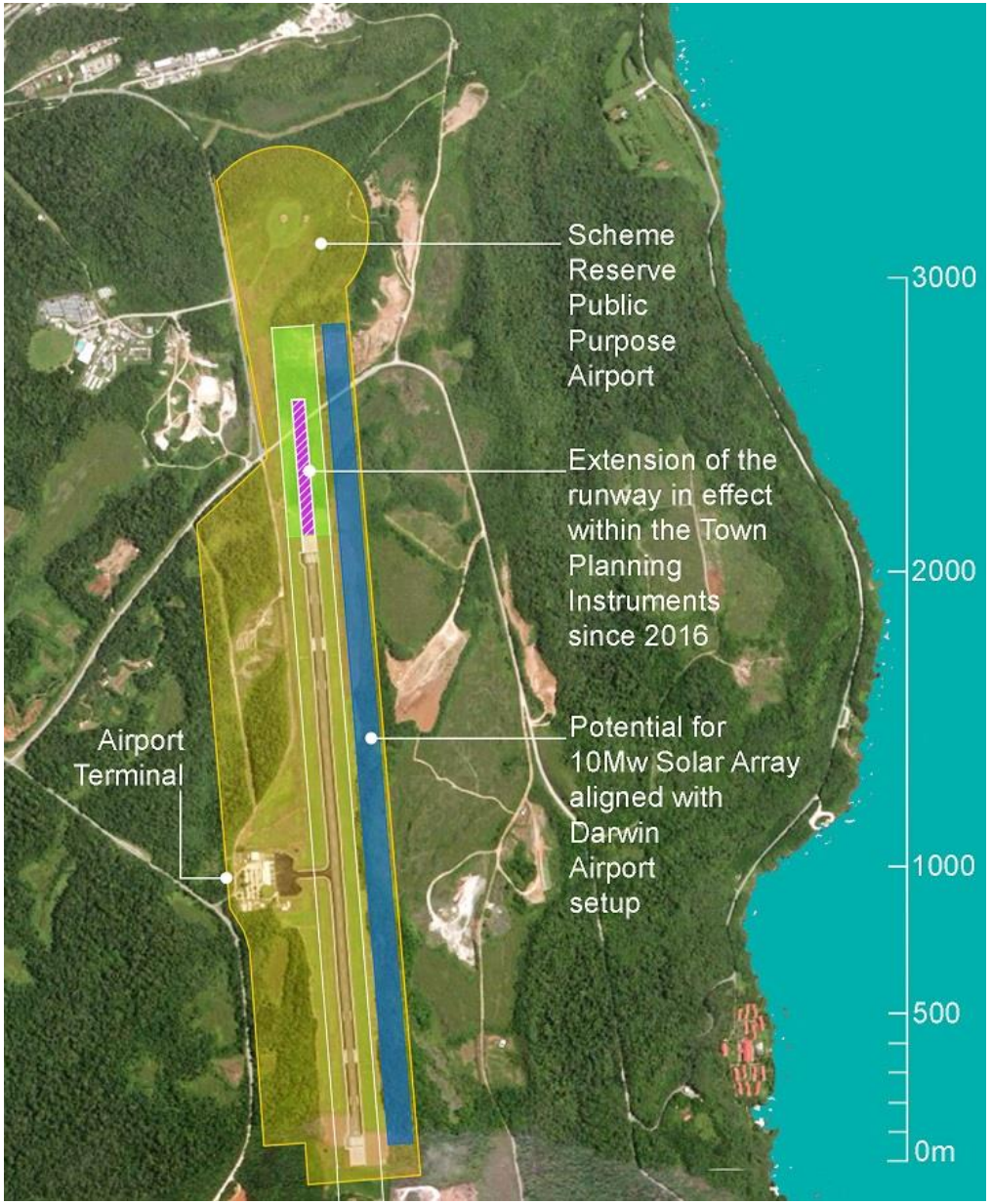
The transformation of the island economy is highly dependent on ease and frequency of people's movements. The opening of an air service to Singapore will greatly enhance external investment opportunities in tourism, land & marine food productions, and higher education & research.

The immediate limiting technical factor to open up an air service to Singapore (and other destinations in South-east Asia) is the ability to provide the CI airfield with the appropriate aviation firefighting infrastructure and the necessary resource to train and deploy a CI based part-time firefighting crew to meet international aviation standards thus allowing international airline flights from the island's northern countries.

The runway itself should be improved in two key areas:

1. The Runway End Safety Areas are shorter than the 150m from the end of the runway required to meet the International Civil Aviation Organisation standard and

2. The CI runway is some 400m shorter than the CKI runway. The disparity between the 2,445m CKI runway and the 2,103m CI runway could limit the usage of larger aircraft by South East Asian aviation companies wanting to provide service to both CI and CKI from Asia and may also restrict Defence's abilities and operational flexibility in the IOT.



Strategic Initiative 20

Raise with the Australian government of the necessity to upgrade the CI airfield to international standards as an inescapable action to capture immediate external investment interests from Singapore and others to help secure the long-term economic viability and fortune of CI post mining.

18. Defence

Context

The August 2017 Joint Standing Committee on the National Capital and External Territories inquiry report into the ***Strategic Importance of Australia's Indian Ocean Territories*** indicates that defence is considering expanding its presence and activities in the IOT with a specific focus on CI:

"Christmas Island is a valuable location for supporting border protection operations, the replenishment of the Royal Australian Navy vessels, staging maritime patrol aircraft on Australia's northern approaches, supporting air operations in North-East Asia and further north and intelligence collection, including surveillance of submarines transiting the Java trench"

The Australian Government under the auspices of the Department of Defence has implemented the construction of the Perth-Singapore sub-sea high speed fibre optic cable with a spur connection to CI thus reinforcing de facto the intelligence capability of the Island.

The recent decision taken by Australia to boost the maritime surveillance of its northern approaches by upgrading the intelligence collection capability of its 14 P-8A Poseidon Maritime Patrol aircraft fleet with a renewed focus on submarine surveillance could induce a new supporting role for CI's airfield.

Sep. 2023 - 14 Australian Air Forces' P8 Poseidon earmarked to undergo maritime surveillance upgrade

Strategic Initiative 21

Invite the Australian and Singapore Governments to consider CI with its marine and topographic attributes as suitable for a variety of discrete and non-permanent Australian-Singapore Special Forces land and sea extreme training programs.

19. Culture & the Arts

Context

CI's lively culture and traditions can be boosted through further art & culture exchanges with Singapore. The best example is the hand over to CI of the Singapore "Christmas Red" exhibit.

Strategic Initiative 22

Existing cultural initiatives on CI could be energized and lifted to a higher level with the engagement and participation of Singaporean personalities & artists. These initiatives are but may not be limited to:

- Singaporean University Thesis collection
- Bust of George Fam duplication and display on CI
- Relationship building with the Lee Kong Chian natural history museum
- Robber Crabs at the Singapore Zoo
- Balik Kampong, 回家了, Time to Come Home
- Murals and Interactive Street art and
- Historical and contemporary photos exhibitions

Oct. 2010 – Lion's welcoming ceremony at the CI Airport

Apr. 2023 – Chinese Temple & Shrine at South Point

Aug. 2015 – Silat performance at the Kampong

20. Sports

Context

Sports such as Soccer, Cricket, Scuba-diving, Golf, Basket Ball, Volley Ball or Ping-Pong to name a few are sports practiced on CI as well as in Singapore. Sport is a well-known vehicle to bring people together and foster durable and fruitful international exchanges.

Strategic Initiative 23

Engage with the Singapore Sports Associations peak body to explore ways of promoting events and or tournaments on CI.

Strategic Initiative 24

Promote in Singapore CI's specific natural attributes that could favourably support niche sport activities such as Marathon, Rock Climbing, Trail Biking, Diving or Para-Gliding.

Christmas Island Marathon

Christmas Island Golf Course

Appendix 1

ASCSP Fact Sheet – Project 2025

The following fact sheet published by the Department of Foreign Affairs & Trade provides a summary of the key aspects of the **Australia Singapore Comprehensive Strategic Partnership** (ASCSP):

On the economic front, the partnership will mean, in practical terms:

a) *An early review of the Singapore-Australia Free Trade Agreement, unlocking new trade and investment opportunities and establishing a Closer Economic Relationship arrangement;*

b) *Exploring investment opportunities in sectors such as food, agribusiness and infrastructure, and in new growth areas including Northern Australia;*

c) *Increasing the flow of skilled labour and visitors;*

d) *joint tourism cooperation;*

e) *Reviewing Australia's Foreign Investment Review Board thresholds for Singapore's investments into Australia;*

f) *Better access to, and integration of, financial and capital markets, including cooperation on financial market infrastructure;*

g) *Expanding potential to increase two-way investment flows, including by working together in third markets in our region and beyond;*

h) *Building additional research and development partnerships, including by working on the commercialisation of research among our agencies, academic institutions and the private sector;*

i) *Enhancing our aviation and maritime connectivity;*

j) *Promoting trade and investment activities through more partnerships in the private sector, including through sharing information on infrastructure opportunities, collaborating on food and agribusiness opportunities (including in aquaculture and fisheries), and promoting mutual recognition of standards, conformance and qualifications.*

In the area of foreign affairs, defence and security, we will:

k) *Hold annual leaders' meetings, alternating between the two countries as host;*

l) *Increase consultations and cooperation between Ministers and officials on regional and global issues, including cooperation in regional institutions such as the East Asia Summit and Association of Southeast Asian Nations:*

m) *Launch short-term exchanges of Foreign Service Officers;*

n) *Increase intelligence sharing in areas of common interest, such as new security challenges in counter-terrorism and extremism;*

o) *Develop departmental and military exchanges and postings between Singapore's and Australia's defence organisations;*

p) *Increased access to, and enhancement of, training areas including joint development of military training facilities in Australia, consistent with the requirements of both countries, while respecting Australia's sovereignty and noting Australia's ownership;*

q) *Share expertise on cybercrime investigation techniques and digital forensic capabilities;*

r) *Collaborate on cybercrime in the region;*

s) *Develop operational collaboration and joint targeting of organised crime and money laundering groups emanating from either Australia or Singapore;*

t) *Attach Central Narcotics Bureau officers to the Australian Federal Police; and*

u) *Establish information exchange on bush fire operations and other disaster management issues, and explore short-term deployment of Singapore personnel to assist in tackling large fire operations.*

We share very strong people-to-people links, and have agreed to strengthen these further through:

v) *A New Colombo Plan business champions group;*

w) *More cooperation between our arts institutions, including facilitation of travelling exhibitions, loaning of artefacts and co-curation of exhibitions among heritage institutions and museums, and the establishment of new partnerships;*

x) *Deepening links between our educational, scientific and research institutions by enhancing dialogue and sharing information on policies and programmes to improve teaching quality and lift outcomes for all students;*

y) *Greater internship opportunities in Australia for Singaporean students studying in Singapore institutions;*

z) *The launch of a Joint Strategic Dialogue on Science and Innovation; and*

aa) *Short-term study visits for Singapore and Australian civil service officials across agencies which share areas of interest or policy responsibility.*

Appendix 2

Christmas Island Food Security

The almost complete reliance on imported foodstuff is a permanent reminder of Christmas Island's precarity with regard to food price, diversity, quantity and regular accessibility.

In earlier times food autonomy was equally preoccupying. Commodities such as rice, flour, sugar and tea were imported by the mine.
Pork, goats, poultry and a wide range of tropical fruits and vegetables were grown locally, fishing was omnipresent.

There is today a wide consensus of opinion suggesting that the lifestyle of the community and the island's economic stability would improve if the island was returning to the local production of food.

The 2012-2019 Mining to Plant Enterprise (MINTOPE) research project conducted through a partnership between the Commonwealth, Murdoch University and Phosphate Resources Limited concluded unambiguously:
"The MINTOPE team has demonstrated that agronomic endeavours on Christmas Island's disused mining areas are highly achievable where small family enterprises could succeed in particular with niche value adding activities such as beer, gin or coffee made from locally grown crops."

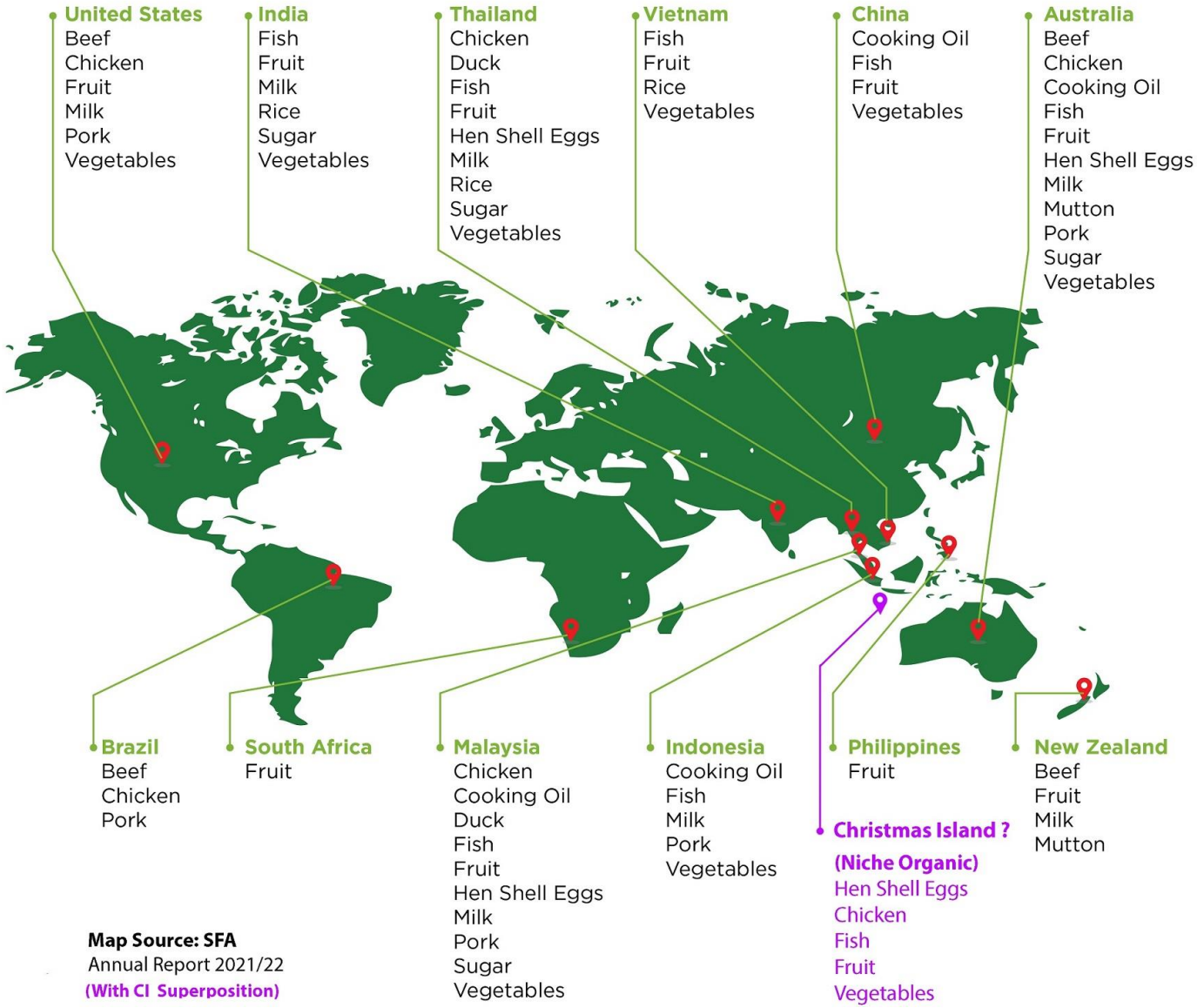
Modern techniques in land/ocean fish farming, hydroponics and aquaponics would not only sustain the local population but it could also develop into a profitable export industry in particular towards Singapore who imports 90% of its food from 170 countries and regions with only 1% or 7.28km² of the City-State land set aside for agri-businesses.

Christmas Island could credibly match that area if not double it by re-purposing exhausted mining sites outside the National Park for agri-business enterprises. In effect CI could, over time, become a reliable and lucrative organic food bowl servicing the City-State.

Appendix 3

SINGAPORE FOOD SUPLY (Jan-Dec 2021)

Major sources of supply of most commonly consumed food items



Map Source: SFA
Annual Report 2021/22
(With CI Superposition)

Appendix 4

Singapore Food Security (*2017)*

Dr Cecilia Tortajada is Senior Research Fellow at the Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore. Mr Thinesh Kumar S/O Paramasilvam is student in Geography at the same university.

In many parts of the world, food security is emerging as a serious threat. Increasing population, land and water constraints, changes in dietary habits with increasing affluence, the impact on global food production of floods and droughts in major food producing areas, falling food exports, and a rising number of importing countries – all are contributing to these uncertainties. The problem is likely to be compounded in the future by climate change.

In the years to come, food security in most countries will become more complex than ever. For Singapore, among the world's most open economies and one that is highly dependent on international trade, the situation is likely to be even more complex. The city-state's volume of external trade is about 3.5 times its annual gross domestic product. A decline in the economies of its major trading partners is therefore likely to have an impact on Singapore's own economy, including its food security.

Economist Intelligence Unit recently ranked Singapore as the second-most food secure country in the world, behind only the United States. The Unit's Global Food Security Index is based on three factors, affordability, availability, and quality and safety. Singapore ranks 1st, 11th and 13th on these three criteria, respectively. That puts it ahead of major food-producing countries like Malaysia (34), Brazil (36) and Australia (9). This achievement is largely attributable to the Agri-Food and Veterinary Authority (AVA), and comes despite a heavy dependency on food imports. At present, Singapore imports almost 90 percent of its food, and less than 1 percent of its land area is used for agriculture.

Through its Food Security Roadmap, AVA has diversified sources of food and optimization of local production. These policies, especially those that seek to diversify the source of food imports, are important as they help to spread the risks associated with Singapore's high levels of food imports.

The Sino-Singapore food zone established in Jilin Province, China, in 2010, is just one example of food diversification efforts. The Jilin food zone has been designed as a foot-and-mouth disease-free-zone so that it can be an important source of pork. Not without its challenges, it is meant to enhance the city-state's food security. This will provide further resilience against food supply disruptions.

AVA has also ensured increased local food production over time through the provision of the Food Fund. Investments in new farming techniques such as hydroponics have contributed to a 30 percent increase in local vegetable production over the past 10 years. By the end of 2014, some 40 percent of local farms had benefited from this Fund.

Singapore's net imports for food, beverages and alcohol (clustered in one group) are quite high, at approximately S$15.57 billion ($10.9 billion) in 2014. Some of Singapore's most important trade partners, like the United States and Australia, place great importance on the city-state's retail food market. The U.S. sees Singapore as diverse, dynamic, highly developed, extremely competitive, and very strict with its sanitary requirements. Customers in Singapore are considered to be open to a wide range of foreign concept foods, conscious of food safety and health, and aware of sustainable products. However, they are not necessarily willing to pay more for them.

In 2013, the U.S. exported retail food products to Singapore worth approximately $575 million, making tiny Singapore its 13th largest market. Exports were led by dairy, prepared foods, fresh fruits, and pork products. For Australia, Singapore was its 9th largest market for food, beverage and agribusiness products in 2014, with exports of A$1.1

billion ($760 million) the same year, principally animal fats, dairy products, red meats, sugars and sugar confectionery and pork.

Direct imports are not the only reason for Singapore's international relevance. Its location and trading hub status makes it a vital market for exporters. For example, the percentage of imported food that is re-exported to other countries is approximately 20-25 percent.

Resilience

From a policy perspective, Singapore has managed to accomplish the difficult task of becoming a food secure country by boosting the resilience of its food supply. Policy alternatives such as diversification of sources, the Food Fund, and facilitating food imports are all important components of a well-planned and coordinated strategy. Nonetheless, the next 50 years are likely to be more complex as alternative possibilities depend on external forces and are subject to global change over which the city-state will have no control.

Globally, increasing resilience has been acknowledged as an effective strategy against fluctuations in supplies. This encompasses partnerships, financing, trade, technology, and research and development, all of which are already part of Singapore's strategy.

What else can the city-state do? One alternative is to reduce food waste. Another would be to continue investing in innovative food science and emerging technologies. High-tech, visitor-friendly urban agriculture on the East Coast, or even in very fashionable 50-plus story buildings designed by the nation's most innovative architects could be very significant options.

Highly sophisticated greenhouses that control their environments (temperature, carbon dioxide levels, air flow and nutrients) and situated on ships adapted for this purpose could be another alternative. Projects as visionary as the Marina Reservoir (with a catchment that is about one-sixth the size of Singapore's total land area) or as innovative as Pulau Semakau (the world's first offshore landfill) for highly intensive agriculture could represent additional possibilities.

Agricultural investment or contract farming abroad – something that other countries, financial services, life insurance, and pension schemes have done – is a distinct possibility. Stable nations such as Australia, the United States, or Brazil may provide attractive business possibilities.

Singapore continues to develop its food security strategies, seeking opportunities and addressing risks in an increasingly complex environment. One relevant lesson that other Asian countries could learn from the city-state is the understanding that food security does not mean food self-sufficiency, since no country can be self-sufficient in all food products. National food security depends on both domestic production and imports, and requires effective distribution, in addition to diversification, partnerships, and good long-term planning. These are the reasons why Singapore, which imports most of its food, has become the second-most food secure country in the world.

Appendix 5

Singapore 3 Food Baskets

Basket 3: Grow Overseas

- **Overcome local constraints**
  - Limited land
  - High capital costs and operating costs
- **Open up new markets and forge stronger bilateral relationships**
  - Foreign investments overseas
  - Increase food production in partnering country
  - Potential to re-export back to Singapore

OUR SINGAPORE FOOD STORY

Singapore imports over 90% of our food. This makes our nation highly vulnerable to impacts brought about by climate changes, disease outbreaks and global food situations which may affect the availability of food in Singapore.

To strengthen our food security and ensure a secure supply of safe food for all, the Singapore Food Agency (SFA) is working towards growing our three 'food baskets'.

1. Diversify Import Sources

Importing food from many different countries reduces the risk of reliance on any single supply source. To date, Singapore has diversified our food sources to over 180 countries and regions.

2. Grow Local — 30 by 30

Local produce serves as a critical buffer during supply disruptions. SFA aims to develop the capability and capacity of the local agri-food industry to produce **30% of our nutritional needs by 2030.**

3. Grow Overseas

Singapore supports local companies to expand and grow overseas.

Why Support Local Produce?

Boost food security & support local economy

Make Singapore more self-sufficient by ensuring a continuous supply of fresh & safe food.

Made in Singapore

Quality assurance is guaranteed as local produce can be easily traced to the farm source.

Protect our environment

Go green by lowering your carbon footprint.

It's fresh & nutritious

As farm-to-fork distance shortens, local produce can arrive fresher & retain more nutrients.

Did you know?

In 2022, Singapore farms produced the following:

28.9% of local consumption	3.9% of local consumption	7.6% of local consumption
609.1 million **Eggs**	19,900 tonnes **of Leafy Vegetables**	4,400 tonnes **of Seafood**

(Source: Singapore Food Statistics 2022)

How can you support?

Choose local produce by looking out for this logo:

What kind of local produce are available?

Cai Xin, Spinach Bayam, Kang Kong, Red Snapper, Abalone Mushroom, Hen Shell Eggs (and many more)

Where to buy?

Supermarkets: Cold Storage*, Giant*, Prime Supermarket*, NTUC FairPrice & Sheng Siong*

* At selected outlets

Online:

FairPrice Online, Redmart, Sheng Siong Online

Updated as at 4 August 2023

For more information, please visit www.sfa.gov.sg/sgfoodstory

Singapore Food Agency

Appendix 6
Australia - Singapore Food Pact

Singapore-Australia Supply Chains Working Group

Food Pact Guiding Principles

Singapore and Australia enjoy a longstanding friendship underpinned by the Comprehensive Strategic Partnership and the Singapore-Australia Free Trade Agreement. We continue to build on this foundation, undertaking innovative collaborations such as the Singapore-Australia Green Economy Agreement and the Singapore-Australia Supply Chains Working Group that reflect and deliver on our shared strategic and economic interests.

We have a long and trusted food partnership. This partnership was strengthened during the COVID-19 pandemic amid supply chain disruptions. Despite this, Australian food products continued to reach Singapore. This included Australian chilled and frozen poultry meat supplied under improved import conditions, which has been a catalyst for our continued cooperation. Both governments have supported the trade of high-quality Australian food to and through Singapore and the region. We are now partnering more closely on food safety and innovation to build resilience in our respective food systems.

Singapore and Australia have agreed to establish the Food Pact as a framework to strengthen our food partnership under the Supply Chains Working Group. It is a pragmatic response by both governments to ensure that our food partnership remains resilient in the face of global challenges, such as increased protectionism and challenges to longstanding trading rules, ongoing strains on freight, the redirection and reduction of investment flows and climate change.

Objectives

The Food Pact will have the following objectives:

1. Support our exporters, importers and consumers by increasing the trade of high-quality and reliable food products that are competitively priced and commercially viable.

2. Support Singapore as a transhipment hub for food products.

3. Cooperate on global food security issues, including food innovations and future foods, such as novel foods; technical work on animal diseases and plant pests; and sustainable agriculture and food systems principles.

Guiding Principles

The Food Pact is guided by the following key principles:

1. Considering our commitment to increase cooperation and contribute to the food supply resilience of our countries, to develop solutions that are context-specific and address the needs of each country;

2. Acknowledging that it is in our mutual interest to ensure that trade lines remain open, to avoid adopting restrictive measures including export controls or tariffs and non-tariff barriers with respect to our bilateral food trade;

Australian Government

3. Appreciating the broader impacts of climate change that both our experience and efforts towards achieving net zero emissions, to build sustainable and resilient agri-food systems;

4. Adopting transparent policies and decision-making based on risk and science;

5. Recognising that a favourable investment climate and business environment would foster increased investments and business partnerships, to promote Food Pact initiatives and facilitate engagements between our private sector agri-trade players, based on commercial viability;

6. Affirming our joint commitment to a rules-based trading systems, to adopt collaborative approaches and harmonised principles that enhance the multilateral trading system by adhering to international standards, guidelines and recommendations with regard to trade in food, food animals and their products, where appropriate; and

7. Consulting closely with Australian and Singaporean exporters, importers, manufacturers, innovators, investors, distributors, ground handling service providers, retailers, and consumers to understand pain points, opportunities and how the Food Pact can best meet objectives.

Workstreams

To achieve the objectives of the Food Pact, we will work in the following workstreams.

- **Recognition of systems**: Recognition of Australian inspection systems for protein, including for red meat, to support diversified supply of Australian protein to Singapore. This can be expanded to other food commodities as required.

- **Simplified Transhipment Model**: Establish a pilot transhipment hub, using Singapore as a distribution centre, drawing from Singapore's transport and logistics links with other regions. Both countries will approach this in phases, commencing with a Simplified Transhipment Model (STM) being piloted for red meat, with a potential to expand the model complexity.

- **Technical work on animal diseases:** To advance zoning (regionalisation) arrangements for various animal diseases to minimise trade disruptions.

- **Food innovations and future foods:** Research collaboration between the CSIRO (Australia) and A*STAR (Singapore) via the 5-year A*STAR-CSIRO 2+2 Partnership where Food (Alternative Proteins, Plant Genetics for Urban Food Production) is one of the thematic areas. together with cooperation in regulation of novel foods by the Food Standards Australia New Zealand and the Singapore Food Agency.

- **Trade missions, industry consultations and promotion:** Ensure business matching activities are aligned with industry demand and there is a feedback mechanism to capture any potential quick wins for industry.

- **International cooperation:** Building greater collaboration bilaterally and at international forums in promoting agreed principles on sustainable agri-food systems.

Workstreams will report biannually to the Supply Chain Working Group, which in turn will report annually to the Senior Officials Meeting. The Food Pact will not duplicate work under other streams of the Supply Chain Working Group, the Green Economy Agreement, and existing arrangements between Singapore and Australia.

Australian Government

Appendix 7

ArianeTech Pte Ltd

102E Pasir Panjang Road
#08-02 Citilink - Singapore 118529

Introduction

Town Planner Hervé Calmy, representing the **Shire of Christmas Island** (SOCI) and the **Indian Ocean Learning Communities** (IOLC) visited the headquarters of **Arianetech Pte Ltd** on the 14th of May 2023. The visit was hosted by Arianetech Founder / CEO **Ewin Ong** and **Dr. Mandar Godge** Partner / Director plant growth.

Arianetech was established in 2001. It specializes in the research & development of modern agricultural technology and equipment in order to offer total agricultural solutions and support to urban farmers. Arianetech has acquired expertise in building highly efficient, energy-saving, and technically **advanced vertical farms** that produce high quality crops with high productivity.

The purpose of the visit was to gather information and understanding of Arianetech's R&D infrastructure and business offerings in advanced indoor farming. The visit's discoveries may ultimately inform and refine the design concept developed for the **refurbishment** of the **Christmas Island Settlement Sports Hall** (CISSH) planned by the SOCI and where space has been allocated for the display of advance indoor farming technologies focusing on research and education.

the SOCI has also interest in facilitating the establishment, In the near future, of a **commercial scale indoor farm** on its own freehold land to promote and ultimately accelerate the transition of the island economy from mining to a range of agri-businesses on the island's disused mining areas. Collaboration and partnership with public and private Singapore entities associated with indoor farming is considered essential to achieve such goal.

Since its inception Arianetech has been working closely with universities and research labs of Singapore such as NUS, NTU, Temasek Polytechnic, Republic Polytechnic, Ngee Ann Polytechnic and Nanyang Polytechnic. Arianetech is also engaged attentively with the Singapore Food Agency (SFA) by making available the most advanced and innovative solutions to Singapore urban growers.

About the SFA and Arianetech's business model

The SFA was formed on the 1st of April 2019 to ensure Singapore's supply of safe food and to strengthen food security and safety **"from farm to fork".**

The SFA appreciates the real threat of the overseas food supply potential disruption as it was explicitly illustrated during the Covid 19 pandemic and has consequently launched its **30-by-30** policy aiming at lifting the current local food production capacity of **10% to 30% of Singapore nutritional needs by 2030.**

The aim of the SAF's **30-to-30** goal is to:

1. Ensure local food production **buffers** impacts of overseas food supply disruption;
2. Mitigate impact on **climate change** and **resources constraints** with environment-controlled highly productive technologies and
3. Strengthen **R&D and innovation** capable of increasing sustainable food production capabilities.

Arianetech's business model and technical knowhow are at the core of the 30-to-30 policy with commercial involvement to date with 18 indoor farms in Singapore. Arianetech activities are also supporting the SFA's food security objective of encouraging Singapore companies to invest and grow overseas so that their produce can be potentially exported to Singapore.

Aligned with this approach, Arianetech is developing partnership and exports its technologies and products to Countries such as Japan, Indonesia, Thailand, Malaysia, Philippines, Mongolia and the USA to consolidate urban farming outputs outside Singapore.

Arianetech products and services comprise but are not limited to:

- **One stop farming** comprising early-stage consultation services, urban farm area planning, cultivation methods & agri-technology consulting, productivity estimation proposals, payback period and estimated ROI analysis;
- **Customization production line** suitable for the customer's site, aiming to use less manpower, lower energy consumption, and achieve higher production capacity to improve the competitiveness of vertical farming vegetable products;
- **Improve & upgrade existing farms** such as upgrades LED Grow Light to energy-saving, high efficiency new generation EZYGRO LED & improve the quality of vegetables with core-Agri-Technology and
- **Turnkey farm solutions** including fully fitted racking hardware, reticulation and micro ventilation systems, water treatment to increase germination rate, soil substrate, high tech LED spectrums, smart automation and tailor made controls and follow-up consulting services.

More information about Arianetech can be accessed at https://www.arianetech-sg.com

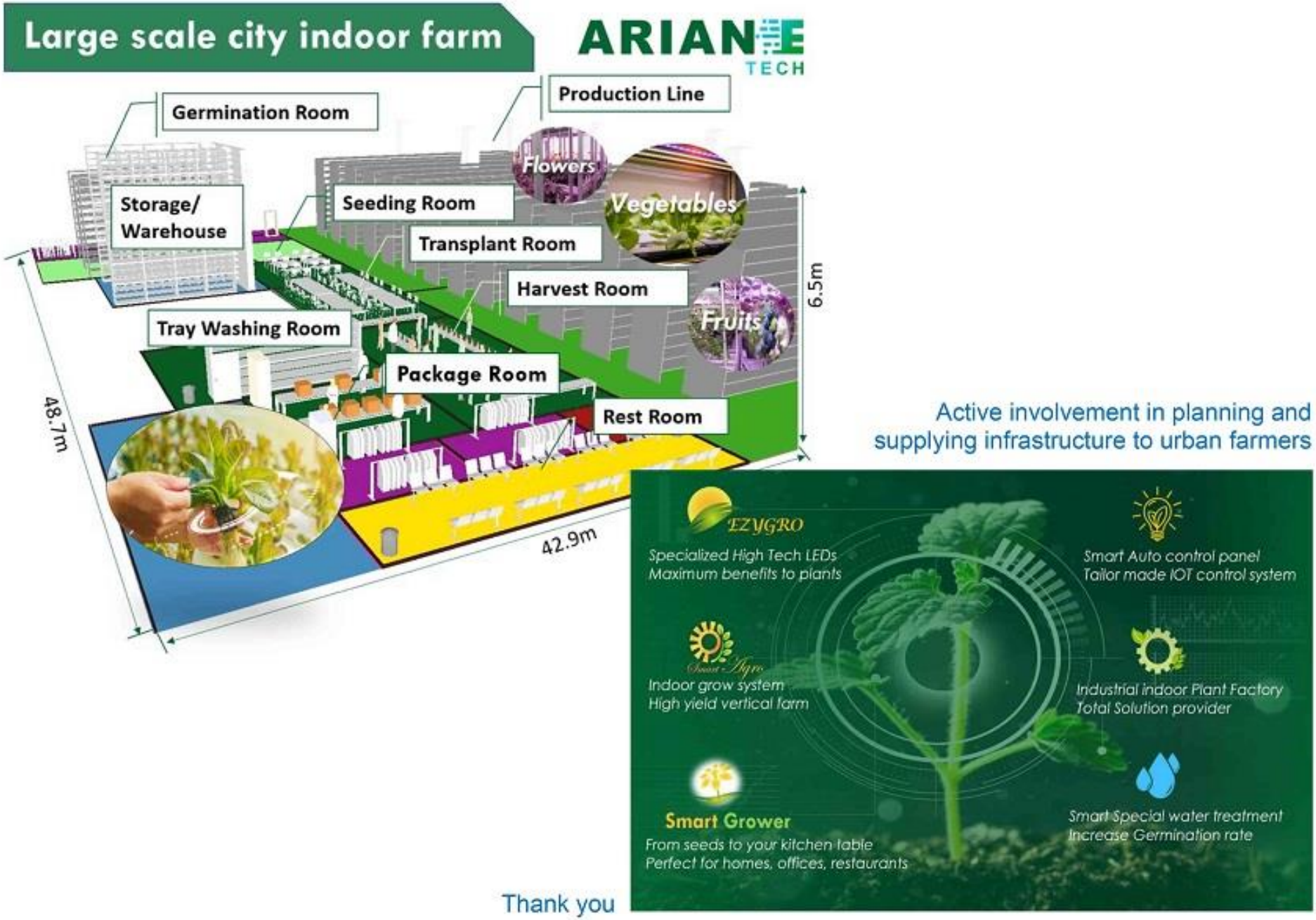
Arianetech HQ support infrastructure

From vertical space optimisation for specific plant species to …

…commercial scale vertical farming setup

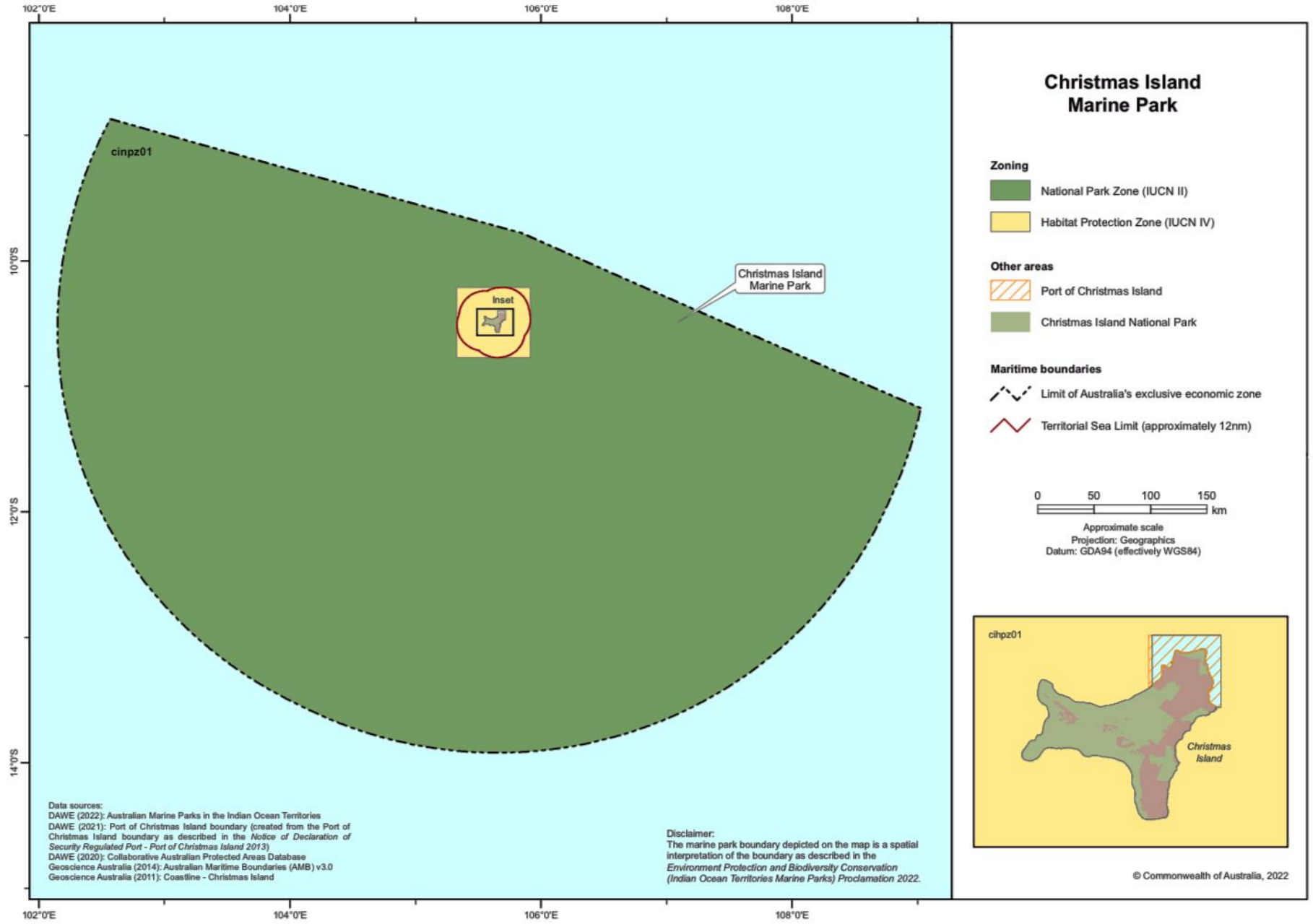
Measuring plant growth performance & yield under tailor made LED light spectrum

Arianetech's exhibit at the 4th industrial transformation Asia Pacific 2021 Singapore


Large scale city indoor farm
ARIANE TECH
Germination Room
Production Line
Storage/ Warehouse
Seeding Room
Transplant Room
Harvest Room
Tray Washing Room
Package Room
Rest Room
Flowers
Vegetables
Fruits
6.5m
48.7m
42.9m
Active involvement in planning and supplying infrastructure to urban farmers
EZYGRO
Specialized High Tech LEDs
Maximum benefits to plants
Smart Auto control panel
Tailor made IOT control system
Indoor grow system
High yield vertical farm
Industrial indoor Plant Factory
Total Solution provider
Smart Grower
From seeds to your kitchen table
Perfect for homes, offices, restaurants
Smart Special water treatment
Increase Germination rate
Thank you

Appendix 8

Christmas Island Marine Park



Appendix 9

Saint John's Island National Marine Laboratory Singapore

Introduction

Town Planner Hervé Calmy, representing the **Shire of Christmas Island** (SOCI) and the **Indian Ocean Learning Communities** (IOLC), visited the **Saint John's Island National Marine Laboratory** (SJINML) in Singapore on the 8th of June 2023.

The visit, facilitated through **Temasek Polytechnic** and the Singapore **Marine Aquaculture Centre,** was hosted by Dr. Serena Lay-Ming Teo, Principal Research Fellow SJINML, Deputy Director Tropical Marine Science Institute at the National University of Singapore (tmsteolm@nus.edu.sg)

The purpose of the visit was to gather information and understanding of the SJINML's infrastructure and associated managerial arrangements available to education providers, marine science researchers and visitors.

The visit's discoveries may ultimately inform and refine the design concept developed for the **refurbishment** of the **Christmas Island Settlement Sports Hall** (CISSH) planned by the SOCI as a sustainability hub focusing primarily on tourism, education/research in marine science and fisheries.

The SJINML lies adjacent to the **Singapore's Sisters' Island Marine Park** which was formed in 2014. The SJINML supports the visitors' centre for the marine park, and works closely with the National Parks Board of Singapore to conduct marine conservation outreach and education activities.

In March 2022 the **Christmas Island Marine Park** (CIMP) was established by the Australian Government under the Australian *Environment Protection and Biodiversity Conservation Act 1999*. The refurbishment planned by the SOCI for the CISSH is intended to incorporate areas with specific infrastructure pertinent to the objectives and activities of the CIMP and the IOLC.

About the SJINML

The SJINML is a research facility of the **National University of Singapore**. In 2016, the facility was adopted under the **National Research Infrastructure (NRI)** scheme of the **National Research Foundation** (Singapore Prime Minister's Office). As a NRI, it operates as a national resource open to educators as well as public and private researchers.

The NRI is defined as a collaborative platform available to inter-disciplinary research among local and **international public or private participants**.

The facility operates with a **Cost Recovery Plan** (CRP) for the users with a target cost recovery of 30% of the SJINML operating cost. The SJINML also connects researchers to assist various stakeholders with research needs. These include research for private and public sector organisations such as the **Maritime Port Authority** (currently focusing on "green shipping" and emission reduction targets for port support vessels).

The Marine Laboratory supports real time **lab-to-field research**, hosting a multi-discipline community of scholars and bring marine science into the community. This is feasible through access to quality seawater, proximity to valuable marine habitats and quality laboratory support.

The SJINML operates two **research vessels**:

- 12m, inboard engine, enclosed cockpit, lifting and towing winch, 12 pers max Including 3 crew, training & safety, technical support for field sampling & collections, suitable for diving.
- 5.5m, shallow draft, outboard engine, open cockpit, 6 pers max including 2 crew, suitable for reef/shore landing and shallow water projects.

Within the NRI framework, the SJINML hosts **Outreach & Education** programs.
These include marine science skills training, education for capacity building, open classroom teaching, field courses, local and international packages and field exploration. Activities of the SJINML are publicised through its newsletter, seminars and social platforms such as Instagram and Facebook.

An important aim of the outreach and education activities is also to **"keep marine science in the public eye"** in particular with young students advocating and marketing marine ecology awareness back into families and the community.

The SJINML hosts the **Marine Environment Sensing Network** (MESN) research project designed to expand Singapore's marine monitoring network for research, education and international collaborations.

The network seeks to advance Singapore's climate change monitoring capabilities, and its pursuit of national & international ocean-oriented endeavours in R&D. The program includes marine microplastics inventory, real time sensing of sea water profiling and chemistry etc. The MESN deploys monitoring buoys around Singapore, and aims to establish collaborations with regional marine laboratories to extend its network.

Given Australia's Integrated Marine Observing System (IMOS) program, there may an opportunity for Singapore and Australia to collaborate to establish a monitoring buoy near **Christmas Island** and one near the **Cocos (Keeling) Islands,** to collaboratively expand our respective networks to cover the northern area of the Indian Ocean.

Marine Environment Sensing Network

SAKIJANG TIMES

A Quarterly Bulletin of the
St John's Island National Marine Laboratory

May 2023

CONTENTS

FEATURED RESEARCH:
Data can empower us to protect our oceans!

The MESN-SJI Buoy deployed off the western coast of St. John's Island in November 2022.

Real-time data from the MESN buoys and other spot sampling efforts will be accessible via the MESN data platform "Ombak" (Malay for 'wave'). Ombak aims to serve as a resource repository for the growing web of ocean observatories. It currently features cloud computing capabilities and a user-friendly interface with visualisation tools, simple analytics, and data download functions. Real-time data of water and air temperatures, air pressure and wind speed are now available on the Ombak landing page. To access other MESN parameters and historical data available for preview, sign up now on Ombak.

1

One off
30 Students Capacity Classroom
Equipped for discreate hands on studies
and lectures

Indoor research area
Individual racks available on a rental basis
to accommodate specific research project

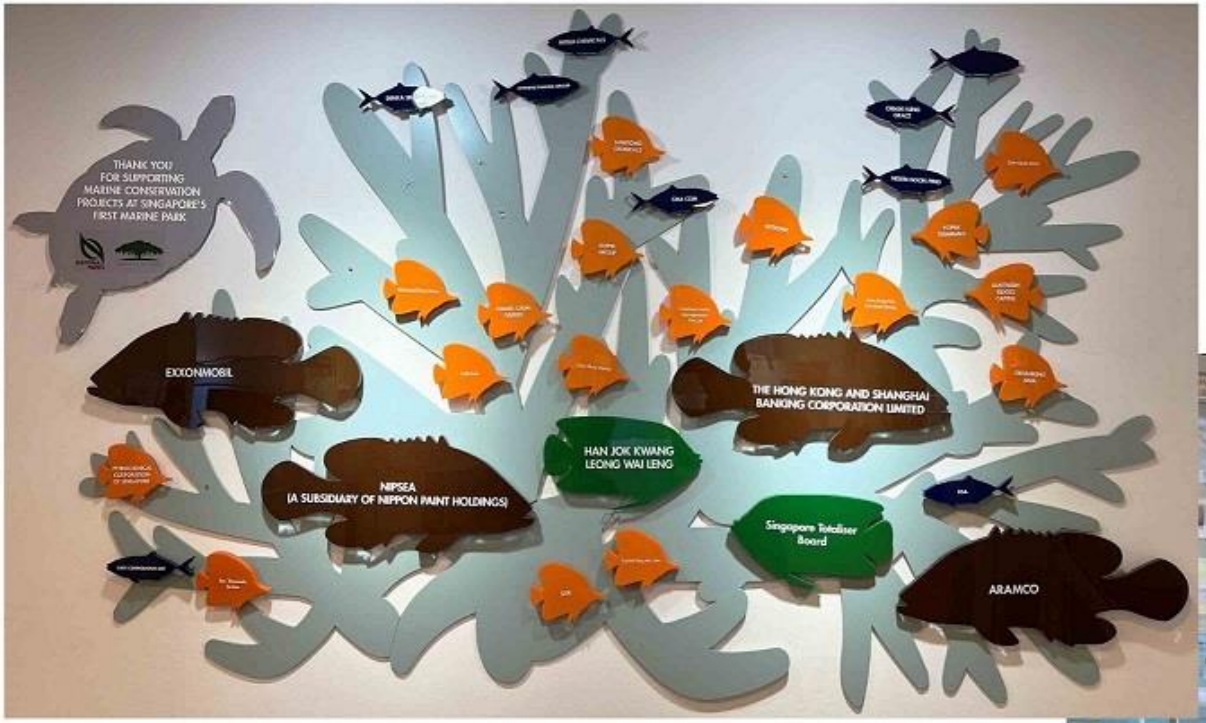
Filtered sea water reticulation and drainage is
provided at each working bench

Room dedicated to nutrient research under tailored LED light spectrum, temperature & other variables

Marine Laboratory accessible on a hire basis consistent with the objectives of the NRI

Research on coral reproduction, behaviour & adaptation involving some 20 species

Outdoor benches with filtered light
& continuous sea water supply



Part of the SJINML visitors display area

Thank You

Appendix 10

Saint John's Island - Marine Aquaculture Centre Singapore

Introduction

Town Planner Hervé Calmy, representing the **Shire of Christmas Island** (SOCI) and the **Indian Ocean Learning Communities** (IOLC), **Temasek Polytechnic's** representatives Dr. Lay Beng Goh, Director of the School of Applied Science and Mr Jiang Fengli, Head of the centre for Aquaculture & Veterinary Science, visited the **Saint John's Island Marine Aquaculture Centre** (MAC) in Singapore on the 11th of May 2023.

The visit was hosted by MAC's Dr. Woei Chang Liew, Assistant Director Aquaculture Department / Urban Food Solutions Division and Mr Kirby Chen, Manager Aquaculture Department / Urban Food Solutions Division.

The purpose of the visit was to gather information and understanding of the MAC's infrastructure and associated managerial arrangements available to education providers, marine scientists and the Singapore marine aquaculture industry. The visit's discoveries may ultimately inform and refine the design concept developed for the **refurbishment** of the **Christmas Island Settlement Sports Hall** (CISSH) planned by the SOCI as a sustainability hub focusing primarily on tourism, education/research in marine science, marine aquaculture and fisheries.

The MAC was opened in 2003 by the then **Agri-food and Veterinary Authority of Singapore**. Since 2019 the MAC operates under the responsibility of the **Singapore Food Agency** (SFA) and remains assigned to deepen Singapore's expertise in the areas of aquaculture genetics, nutrition and health. The MAC is adjacent to the **Saint John's Island National Marine Laboratory,**

In March 2022 the **Christmas Island Marine Park** (CIMP) was established by the Australian Government under the Australian *Environment Protection and Biodiversity Conservation Act 1999*. The refurbishment planned by the SOCI for the CISSH is intended to incorporate areas with specific infrastructure pertinent to the objectives and activities of the CIMP, the IOLC and the MAC.

About the SFA and the MAC

The SFA was formed on the 1st of April 2019 to ensure Singapore's supply of safe food and to strengthen food security and safety **"from farm to fork".**

The SFA's approach to ensure Singapore has a sustained supply of safe food comprises 3 "food baskets":

1. **Grow Local** to help mitigate reliance on imports, increase productivity and climate-resilience of the agri-food industry;
2. **Diversify import sources** to reduce risk of reliance on any one supply source and
3. **Grow overseas** by supporting companies to invest and grow overseas so that their produce can be potentially exported to Singapore

The SFA appreciates the real threat of the overseas food supply potential disruption as it was explicitly illustrated during the Covid 19 pandemic. To this end the SAF has launched its **30-by-30** policy aiming at lifting the current local food production capacity of **10% to 30% of Singapore nutritional needs by 2030.**

The aim of the SAF's **30-to-30** goal is to:

1. Ensure local food production **buffers** impacts of overseas food supply disruption;
2. Mitigate impact on **climate change** and **resources constraints** with environment-controlled highly productive technologies and
3. Strengthen **R&D and innovation** capable of increasing sustainable food production capabilities.

The MAC has a footprint of about 1.8 ha with a total of 14 buildings, including purpose-built research facilities, incubation modules and other auxiliary facilities like seawater intake pump house. The MAC carries out research and development in tropical aquaculture through partnerships and collaboration with the industry.

Since its inception and through its partnership with the National University of Singapore's **Temasek Life Sciences Laboratory** (TLL), the MAC has focused on the **Asian seabass** with on-going selective genetics breeding program utilising aquaculture genomic tools for more accurate selection of superior individuals without the use of genetic modification.

Other programs and activities conducted at the MAC includes:

- **Indoor intensive closed-loop production** system enabling the control of diseases and minimises waste discharges:
- **Hatchery protocols** developed for other key marine fish species such as **snapper, pompano and grouper;**
- **R&D optimizing fish feeds** formulated with ingredients from sustainable sources for locally farmed species;
- **Technical advisory** to help local marine farms adopt environmentally sustainable practices and healthier methods and technologies;
- **Shared MAC's replicated tank systems and incubator** spaces for test-bedding and commercialization of R&D results and
- **Making available key biological materials** such as eggs, larvae, rotifers and microalgae for aquaculture research

In the context of Christmas Island's emerging aspiration to farm fish locally, it is suggested the most desirable initial steps prior to engaging in marine aquaculture research and development activities would be to:

a) conduct an ecological assessment of the marine environment around the island and
b) establish an inventory of the local fish species that may be suitable for farming.

In the longer-term MAC's successes with indoor aquaculture may also be significant and appropriate given the physical challenges in establishing an open water farm around the island with its steep coastal seabed, limited anchorage options and high swell regime during the monsoon.

Microalgae or phytoplankton cultures are indispensable in rearing various species of marine animals.

It is food for mini crustaceans such as artemia and rotifer in turn essential as live feeds for fish larvae

The upscaling production of microalgae is facilitated through the use of upright plastic bags supported with an external reinforcing mesh.

The verticality allows for a more efficient flocculation process with higher sedimentation rate and easier harvesting

The LED lighting setup provides uniform lighting through the water column whilst the light spectrum can be varied to enhance microalgae characteristics and or yield

Extensive indoor genetic selection with the Asian Seabass (Barramundi group) leading to 10x improvement in fry survival and 100x intensification over outdoor pond systems.

Many Singapore farms have adopted indoor hatcheries and nurseries thus allowing better control of diseases and waste discharge within more compact operations compared to open water aquaculture

Singapore Food Agency

Pilot Aquaculture Feedmill

INTRODUCTION

Aquaculture is one of the sectors that will contribute to Singapore's '30-by-30' goal. To increase aquaculture production in a productive, sustainable and resilient manner, fish feeds will need to be optimised for locally farmed species to promote healthy growth and be formulated with ingredients from sustainable sources.

SFA has established a new aquaculture nutrition facility at MAC which consists of a pilot aquaculture feedmill and tank systems that researchers can tap on for their R&D efforts to deepen our expertise in aquaculture nutrition.

Feeds produced by the pilot aquaculture feedmill at MAC

COMPOSITION OF AQUAFEEDS

Typical Feed Ingredients

Plant and animal ingredients mainly for protein and lipid

- Animal-based ingredients such as fish meal, fish oil, rendered animals by-products
- Plant-based products ingredients derived from soybean, cereal and maize products

Supplements to meet nutrient requirements

- Amino acids (e.g. L-Lysine, L-Cystine, DL-Methionine), vitamins and minerals

Additives to help improve fish performance or feed quality

- Antioxidants, binding agents, enzymes, immunostimulants, organic acids, palatability enhancers, prebiotics & probiotics

Proximate composition (seabass diet)

	% (min/max)
Crude Protein	Min 44%
Crude Lipid	Min 12%
Carbohydrate (starch)	Max 18%
Fibre	Max 5%
Moisture	Max 10%
Ash	Max 11%
Total	100%

Protein and minerals (macro) are building blocks for body growth

Lipid and carbohydrate are used mainly as energy sources

Vitamin, enzymes and trace elements regulates fish metabolism

Grinding & Sifting

Mixing

Ingredient samples

Rear view of the extrusion barrel

MAC's pilot feedmill process flow chart

Note the second last step "Vacuum coating" allowing heat sensitive probiotics to be added to the pellets to enhance the fish immune system and reduce the occurrence of diseases in confine environments

The pilot feedmill has and will continue to play a critical role in enabling the development of commercial scale optimum feed products for the Singapore marine

Front view of the extrusion barrel and pellets separators

Thank You

Appendix 11
Mining to Plant Enterprise

Australian Government
Department of Infrastructure, Transport, Cities and Regional Development

Murdoch UNIVERSITY

CHRISTMAS ISLAND PHOSPHATES

MINTOPE

Mining to Plant Enterprises (MINTOPE) 2012-2019 - A bi-partisan research project to determine the feasibility of transitioning mined land to agricultural land on Christmas Island.

Jointly funded by Department of Infrastructure, Transport, Cities and Regional Development, Murdoch University and Christmas Islands Phosphates and supported by the Water Corporation, the Shire of Christmas Island, the Chinese Literary association, the Christmas Island Islamic Council and the Indian Ocean Group Training Association.

Phosphate mining has been undertaken on Christmas Island for over 100 years, with ex-mined land within the National Park slowly rehabilitated back to forest. Mined land *outside* the National Park, until now, is not prioritized for rehabilitation. As all foodstuffs are imported to Christmas Island, the potential for transitioning the mined land outside the National Park to Agriculture was examined.

Phase 1 – Rehabilitate ex-mined land soils and make trafficable for agricultural machinery. Prepare contour banks to ensure heavy rainfall does not cause erosion.


1

Phase 2 - Determine factors limiting plant production with multifactor experiments and in particular response to Nitrogen and Potassium



Mining to Plant Enterprise - MINTOPE - A Commonwealth, Christmas Island Phosphates & Murdoch University Research Partnership

Phase 3 - Rebuild soil fertility utilizing hardy legumes and nitrogen fixation. Build up soil with microbial capacity, Carbon, Nitrogen, and Potash.


By contrast
K deficiency in
Lab Lab legume

Phase 4 - Select crops that are well adapted to the environment (insect pressures, soil characteristics, rainfall patterns) and that have food, feed or other economic potential

2

Sorghum crop for fodder recorded at 62T per Hectare

Mining to Plant Enterprise - MINTOPE - A Commonwealth, Christmas Island Phosphates & Murdoch University Research Partnership

Remarkable successes in the fields and with the local community; Yam bean, Coffee and peanuts

Phase 5 - Demonstrate agronomic production of crops, harvest and quantify yields, grain management for storage and manufacturing processes

Millet cereal quadrats recorded yield: 2,63T per Hectare

Carbon free power generation for seed storage

Seed cleaning mobile unit

Future Prospect beyond MINTOPE

The MINTOPE team has demonstrated that agronomic endeavours on Christmas Island's disused mining areas are highly achievable where small family enterprises could succeed in particular with niche value adding activities such as beer, gin or coffee making from locally grown crops.

From the perspective of economic diversification, a clear consensus has also been reached suggesting that Cocos (Keeling) Islands and Christmas Island exemplify "Living Laboratory" characteristics ideally located for higher education activities targeting our historic, economic and strategic partners in Singapore and the higher education market in Asia generally.

To this end an MOU between Murdoch University & the Harry Butler Institute in Perth and Temasek Polytechnic & the Murdoch Campus in Singapore is under consideration and has reached the second reading stage by the respective legal teams.

The parties to this MOU also referred collectively as the **Indian Ocean Learning Communities** (IOLC) want to collaborate, under the auspices of the Australia-Singapore Comprehensive Strategic Partnership (ASCSP), in establishing a tripolar higher learning research and innovation field Hub (the Hub) to enhance food security in Singapore and the Australian Indian Ocean Territories (IOT) namely the Cocos (Keeling) Islands & Christmas Island.

The IOLC would be considering in priority learning, research and innovation disciplines such as, but not limited to, bio-security, bio-prospecting, intensive agribusinesses, urban farming, brewing & distillation, land & marine aquaculture, ecologic diversity monitoring & adaptation, micro sustainable energy, mining land rehabilitation, sustainable mine transformation, productive forestry management, environmental land management, food business development and food for eco-tourism.

Research in high density "urban" aquaculture

Crab hatchery

State of the art research facilities in horticulture and aquaculture at the vocational education focused Temasek Polytechnic campus in Singapore

LED lighting experiment for sustainable plant health & insect management

Appendix 12

Indian Ocean Learning communities - MOU

Memorandum of Understanding

Between:

(In Western Australia)

The HARRY BUTLER INSTITUTE
and
MURDOCH UNIVERSITY

(in Singapore)

MURDOCH SINGAPORE PTE LTD
and
TEMASEK POLYTECHNIC

November 2019

This non-legally binding Memorandum of Understanding (MOU) is entered into between the following parties (the Parties):

1

HARRY BUTLER INSTITUTE of South Street, Murdoch 6150, Western Australia;

MURDOCH UNIVERSITY of South Street, Murdoch 6150, Western Australia;

MURDOCH SINGAPORE PTE LTD of 390 Havelock Road, Singapore 169662;

TEMASEK POLYTECHNIC of 21 Tampines Avenue 1, Singapore 529757.

Hereinafter referred to collectively as the Indian Ocean Learning Communities (IOLC)

Whereas the IOLC wants to collaborate, under the auspices of the Australia-Singapore Comprehensive Strategic Partnership (ASCSP), in establishing a higher learning research and innovation field Hub (the Hub) to enhance food security in Singapore and the Australian Indian Ocean Territories (IOT) namely the Cocos (Keeling) Islands & Christmas Island.

The IOLC may explore expanding the Hub's scope of collaboration to include relevant Temasek Polytechnic schools or departments and affiliates of Harry Butler Institute, Murdoch University and Murdoch Singapore as long as mutually agreed by the Parties.

Furthermore, upon the agreement of all Parties to this MOU and relevant to the nature of the projects, any Party may from time to time co-opt disciplines and/or domain knowledge within its own institution or propose the involvement of other complementary education providers.

It is hereby agreed between the parties as follow:

1. INTENT OF THE MOU

The Parties to the IOLC intend to:

1.1 Pursue higher learning, scientific research and innovation into the holistic productivity of known and emerging food businesses to ultimately bolster food security and affordability utilising sustainable environmental practises primarily in Singapore and the IOT;

1.2 Facilitate dialogue, technical research and collaboration between the IOLC researchers and the Singapore primary food industries to assist these in investing and expanding in the IOT where appropriate;

1.3 Capitalise on the recognised historical, social, cultural, economic and defence ties between Singapore, Western Australia (WA) and the IOT;

1.4 Collectively make representation to the Australian and Singapore Governments to secure government and regulatory support in order to establish the international operating framework for the Hub in the IOT and

1.5 Invite other entities/partners who have signed separate MOU(s) with either of the Parties to be part of this MOU on the basis of related, relevant or complementary activities relating to the scope of cooperation of the MOU.

2

2. PRINCIPLES OF THIS MOU

The Parties agree to collaborate with each other, on the principles as set out below:

2.1 Work in good faith to achieve the objectives of this MOU towards the establishment of the Hub and its ultimate activation;

2.2 Where feasible and appropriate, share scientific, logistic, human and financial resources to encourage cooperation in education, research, innovation and ultimately commercial productivity outcomes;

2.3 Be concerned with food focused education, research and innovation practises where community, business and biodiversity can co-exist by integrating and balancing holistically and simultaneously the needs and aspirations of all three sectors;

2.4 Evaluate and address, so far as is reasonably practical and economical, the requirements of all other interested entities that may elect to have direct interest in partnering with the IOLC;

2.5 Acknowledge that the activities of the Hub may not be strictly limited to the IOT but could involve supporting actions taken in Singapore under Temasek Polytechnic's guidance and in Western Australia under Murdoch's guidance;

2.6 Support in priority the involvement of local businesses in Singapore and the IOT to achieve the objectives of the IOLC;

2.7 Ensure that the activities of the Hub are holistically assisting the economic outlook of Singapore and the IOT, the well-being of its inhabitants and the healthiness of the environment;

2.8 Ensure that, unless officially confirmed otherwise, the activities of the Hub are performed within the requirements of Singapore or Australian laws and regulations in force.

3. SCOPE OF COOPERATION

In recognising the intentions and spirit of this MOU, the Parties to the IOLC agree to cooperate in the following areas:

3.1 Resource, jointly share information, undertake and complete the Hub's overall business case based on information provided by each Party;

3.2 Consider in priority disciplines of interest such as, but not limited to, bio-security, bio-prospecting, intensive agribusinesses, urban farming, brewing & distillation, land & marine aquaculture, ecologic diversity monitoring & adaptation, micro sustainable energy, mining land rehabilitation, sustainable mine transformation, productive forestry management, environmental land management, food business development and food for eco-tourism;

3.3 Work collaboratively to organise programmes, including industry-based learning journeys, staff exchange, student internships, talks and educational outreach programmes in the above disciplines of interest;

3.4 Explore and lead in the development of a Singapore-Australia educational and research programme including research, innovation and enterprise activities in the IOT .

3.5 Explore opportunities for Temasek Polytechnic staff and students to participate in exchange and or internship in the IOT as well as Western Australia.

3.6 Dedicate resources, when necessary and available, for the efficient implementation of the joint activities envisaged under this MOU;

3.7 Include any additional party/entity to this MOU through a deed of accession with the current Parties to this MOU under which such party/entity agrees to be bound by and be entitled to the benefit of this MOU as if an original Party hereto;

3.8 Temasek Polytechnic shall serve as a gateway through which the IOLC could engage with potential Singapore partners and alliances to partake in the collaboration;

3.9 Murdoch shall serve as a gateway through which the IOLC could engage with potential Australian partners and alliances to partake in the collaboration;

4. TERMS & DURATION

The Parties to the IOLC agree as follow:

4.1 This MOU constitutes a statement of the mutual intentions of the Parties and is not intended to create legal relations between the Parties or be legally binding;

4.2 This MOU affirms the intent of the Parties to work together in good faith and to the best of their abilities to progress the matters described under this MOU.

4.3 The term of this MOU is for a period of two year from the date of execution and may be extended for a further one-year period or such duration as mutually agreed in writing between the Parties;

4.4 The Parties may review this MOU 6 months before it expires to ensure that it is fulfilling its intended purposes and make any necessary revisions accordingly

4.5 Either Party may terminate this MOU upon thirty (30) days written notice without penalties or liabilities;

4.6 The Parties to this MUO may enter into separate binding agreements to consolidate and fulfil the operative arrangements of the Hub under the auspices of the ASCSP.

5. NON-LIABILITY

Pursuant to the non-binding effect of this MOU:

5.1 Each Party (including its employees, agents, servants) shall be under no liability whatsoever for any loss, expense, damage or injury to reputation suffered as a result of any act, omission or default, whether innocent, negligent or wilful of the other Party at any time during the course or after the termination of this MOU;

5.2 All Parties shall in good faith, endeavour to protect the interest of, and the reputation of all parties during the course of this MOU.

6. INTELLECTUAL PROPERTY

6.1 All intellectual property rights created in the course of or resulting from subsequent projects pursuant to this MOU shall be subject to terms and conditions to be negotiated in the respective definitive agreements between the relevant Parties that have created or will be creating such rights. In particular, the Parties shall apportion the intellectual property rights in such manner that will be commensurate with contributions from the respective Parties;

6.2 All underlying methodology utilised by one Party which was created and/or developed before the date of this MOU and utilised in the course implementing activities pursuant to this MOU shall not become the property of the other Parties;

6.3 Except as otherwise expressly provided herein, this MOU does not give a Party any ownership rights or interest in the other parties' trade name, trademarks or copyrights.

7. CONFIDENTIALITY

7.1 Unless expressly agreed in writing, the Parties to this MOU undertake to keep confidential from third parties all knowledge, documents and data coming to their respective possession or knowledge as a result of or in connection with this MOU and as a result of the relationship of the Parties herein (the "Confidential Information");

7.2 The above undertaking of confidentiality shall not apply to information which is already known to or obtained by independent means by the receiving Party, or to information already in the public domain, or to information required to be disclosed under written law, an order of court or any government authority or regulatory body;

7.3 The exchange or sharing of confidential information between the Parties, including commercial information, will be possible subject to the establishment of either a Confidential Agreement or a Non-Disclosure Agreement prior to the sharing of such confidential information.

8. DISPUTE RESOLUTION

8.1 In the event of any dispute arising from this MOU the Parties agree that they shall first attempt in good faith to negotiate and reach an amicable solution to the dispute by mediation conducted under the auspices of a third independent mutually agreed entity or the Singapore Mediation Centre if the dispute involves Temasek Polytechnic;

8.2 In the event that mediation does not result in a resolution of the dispute, then each Party agrees that, should the dispute involves Temasek Polytechnic, the dispute shall be finally resolved by arbitration to be conducted at the Singapore International Arbitration Centre ("SIAC") in accordance with the prevailing SIAC rules.

9. REFERENCE GROUP

9.1 The IOLC will establish a Reference Group equally representing the four organisations (Two members maximum for each Party) to provide strategic direction, monitor progress and act on proposals required to ultimately establish and operate the Hub;

9.2 The Reference Group will initially meet once a month either physically or via teleconference. The frequency of meetings will be adjusted thereafter at the discretion of the Reference Group.

9.3 The Reference Group will expedite the engagement and resourcing of an independent Project Manager/Coordinator, with experience in the IOT, to facilitate, coordinate and report on all aspects of the process leading up to the agreement sought from the Singapore and Australian governments under the auspices of the ASCSP including the formulation of the Hub's overall business case as referred in section 3.1 of this MOU;

9.4 Any media announcement, official communication, publication and or paper relating to the IOLC will be reviewed and authorized by the nominated representative of each organisation prior to be released.

11. NOMINATED REPRESENTATIVES

Each Party's nominated representative will have responsibility for the orderly and timely development and implementation of this MOU.

For MURDOCH UNIVERSITY
Name: Peter Davies
Title: Interim Pro Vice Chancellor
Telephone: +61 418 913 584
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For The HARRY BUTLER INSTITUTE

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For TEMASEK POLYTECHNIC
Name: Ms Sim Hwee Peng
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EXECUTED as a Memorandum of Understanding between
MURDOCH UNIVERSITY, the HARRY BUTLER INSTITUTE,
MURDOCH SINGAPORE PTE LTD and TEMASEK POLYTECHNIC

EXECUTED for and on behalf of
MURDOCH UNIVERSITY by:

Name David Morrison
Title Deputy Vice Chancellor (Research & Innovation)
Date 18/11/2019
Signature

EXECUTED for and on behalf of
HARRY BUTLER INSTITUTE by:

Name Ian Campbell
Title Chairperson
Date 15/11/2019
Signature

EXECUTED for and on behalf of
MURDOCH SINGAPORE PTE LTD by:

Name Peter Waring
Title Pro Vice Chancellor Transnational Education & Singapore Dean
Date 18/11/2019
Signature

EXECUTED for and on behalf of
TEMASEK POLYTECHNIC by:

Name Dr. Lay-Beng Goh
Title Director School of Applied Science
Date 15/11/19
Signature

ADDENDUM

This addendum to the above MOU, provides guidance to the Parties to the IOLC on operational matters pertinent to the orderly operation of the Hub in the IOT.

Working in the IOT

The IOLC may, from time to time, engage and take advice from the following officials:

a. The Administrator for the IOT and officers working directly with the Administrator;
b. Representatives of the Australian Department of Infrastructure, Transport, Cities and Regional Development (the Department) responsible for the IOT;
c. Officers of the Department of the Environment & Energy responsible for the CI and CKI National Parks;
d. The elected representatives and the officers of the Shire of Christmas Island and
e. The elected representatives and the officers of the Shire of Cocos (Keeling) Islands.

Enabling IOT resources

The IOLC may, from time to time, engage and secure technical assistance from:

f. Personnel that have been involved with the 2012-2019 Mining to Plant Enterprise (MINTOPE) agronomic & biological research partnership between the Australian commonwealth government (the Commonwealth), Christmas Island Phosphates (CIP) through Phosphate Resources Limited (PRL) and Murdoch University (Murdoch);
g. Executives of PRL/CIP to ascertain opportunities to utilise, and where appropriate enhance, support infrastructure established during the MINTOPE research and the continuation of experimental field activities within existing designated areas;
h. The Commonwealth and PRL/CIP to explore the possibility/feasibility to utilise disused mining areas within the Rural zone of the Shire of CI Town Planning Scheme in force;
i. The Commonwealth to explore the potential utilisation of Crown Land on CI outside the National Park and the CIP mining lease where appropriate and or possible
j. The Commonwealth to explore the potential partial utilisation of the CKI former quarantine station;
k. The Cocos Cooperative which is currently establishing, with the assistance of the Commonwealth and Murdoch, a commercial scale aquaponics infrastructure subsequent to a small and successful trial conducted on Home Island with the financial support of the Indian Ocean Group Training Association (IOGTA) and MINTOPE's technical assistance;
l. The "Hidden Gardens" being a private CI based horticulture entity that has displayed willingness to participate in field teaching and commercial research within its property and
m. The CKI Land Trust, through the Shire of CKI as the trustee, who own in Fee Simple 85% of the CKI land mass and has consistently asserted in the last 10 years interest in the development of local sea and land food productions.

Enabling opportunities

The IOLC may learn from and, where possible, appropriate or applicable:

n. Seek funding from the Cooperative Research Centres (CRC) Future Foods where Murdoch's contribution could be matched by one or more industry participant(s) and
o. Align the Hub's activities with the Murdoch led Singapore Centre for Research in Innovation, Productivity and Technology (SCRIPT).

List of Acronyms

CISS	Christmas Island – Singapore Strategy
CI	Christmas Island
ASCSP	Australia-Singapore Comprehensive Strategic Partnership
IOT	Indian Ocean Territories
CKI	Cocos (Keeling) Islands
ABS	Australian Bureau of Statistics
SOCI	Shire of Christmas Island
SFA	Singapore Food Agency
MAC	Marine Aquaculture Centre
ASFP	Australia - Singapore Food Pact
CITA	Christmas Island Tourist Association
CIMP	Christmas Island Marine Park
SJINML	Saint John's Island National Marine Laboratory
MESN	Marine Environment Sensing Network
MINTOPE	Mining to Plant Enterprise
TP	Temasek Polytechnic