Northern Australia Environmental Resources Hub

National Environmental Science Programme

Remote recycling, rubbish and marine debris management in north Australia needs strong helping hands:

Summary of Cape York Peninsula community case studies

Final report

NAILSMA North Australian Indigenous Land and Sea Management Alliance

RAIN Regional Advisory & Innovation Network

The NAER Hub, NAILSMA and RAIN recognise the traditional custodians of the participating communities and thank all those who generously gave their expertise, time and support to the project.

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Aboriginal and Torres Strait Islander peoples are advised that this document may include images of people who are deceased.

Cover photographs
Front cover: Lama Lama Junior Rangers and Tangaroa Blue Foundation Marine Debris Clean Up, One Mile Beach Cape York Peninsula (photo © H. Taylor / Tangaroa Blue).
Back cover: Marine debris littering very remote beaches in the Lockhart River region, Cape York Peninsula (photo © H. Taylor / Tangaroa Blue).

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Contents

List of maps

List of tables

List of figures

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Abbreviations

AMDI..... Australian Marine Debris Initiative
APC ..... Australian Packaging Covenant
C&D ..... Construction & Demolition [standardised municipal waste category]
C&I..... Commercial & Industrial [standardised municipal waste category]
CDS ..... Container Deposit Scheme
COAG ..... Council of Australian Governments
CSC ..... Cook Shire Council
CSIRO ..... Commonwealth Scientific and Industrial Research Organisation
CYP ..... Cape York Peninsula
CYMAG..... Cape York Marine Advisory Group
DATSIP..... Department of Aboriginal and Torres Strait Islander Partnerships (Queensland)
DEHP / EHP . Department of Environment and Heritage Protection (Queensland)
DOGIT ..... Deed of Grant in Trust
GBRMP ..... Great Barrier Reef Marine Park [World Heritage Area]
GNA..... GhostNets Australia
ILUA..... Indigenous Land Use Agreement [Commonwealth and Queensland native title acts]
IPA..... Indigenous Protected Area
LAWMAC..... Local Authority Waste Management Advisory Committee [facilitates NQ LGA waste engagement]
LGA/LGAs .... Local Government Area/s
LGAQ..... Local Government Association Queensland
LRASC..... Lockhart River Aboriginal Shire Council
MASC ..... Mapoon Aboriginal Shire Council
ML&S..... Mapoon Land & Sea
MRF/s ..... Materials recovery facility / facilities
MSW..... Municipal Solid Waste [standardised municipal waste category]
NAILSMA..... North Australian Indigenous Land & Sea Management Alliance Ltd
NESP..... National Environmental Science Program
NPA ..... Northern Peninsula Area [northern-most municipality on CYP]
NP(CYPAL) .. National Park (Cape York Peninsula Aboriginal Land)
NQ ..... North Queensland
NRM..... Natural Resource Management
NT..... Northern Territory
OMAC..... Old Mapoon Aboriginal Corporation
PACCI..... Pormpuraaw Arts & Culture Centre Inc.
PASC..... Pormpuraaw Aboriginal Shire Council
PLSM..... Pormpuraaw Land & Sea Management
PDR ..... (Cape York) Peninsula Development Road
QILSR..... Qld Indigenous Land & Sea Ranger program [State funding for Indigenous ranger groups]
Qld ..... Queensland
QWDS..... Queensland Waste Data System
RCJP ..... Remote Community Jobs Program
RNTBC ..... Registered Native Title Holding Body Corporate
TAP..... Threat Abatement Plan
TBF..... Tangaroa Blue Foundation (Tangaroa Blue)
WCCCA ..... Western Cape Communities Co-existence Agreement
WCTTAA..... Western Cape Turtle Threat Abatement Alliance
WOC..... Working on Country program [Commonwealth funding for Indigenous ranger groups]

Executive summary

Litter, rubbish and waste are inevitable daily by-products of modern human consumer lifestyles. This is just as much the case in Indigenous communities as it is in Australia's larger cities, towns and villages. However, remoteness, small populations, comparatively small waste volumes, standardised state-wide compliance laws, health and safety regulations and high operational costs make viable local options for marine debris and essential waste management challenging and highly dependent on local initiative, in an environment of diminishing grant funding and increasing costs[1].

Aboriginal and Torres Strait Islander communities in remote northern Australia, including Cape York Peninsula (CYP), must continuously deal with escalating waste management issues: litter; township garbage; outstation rubbish; remote recycling; waste generated by contractors, visitors and tourists; as well as large amounts of marine debris in coastal and island areas. On Cape York, use of natural and cultural resources is intensifying, local populations and consumption are growing, and tourist and visitor numbers are increasing across the Peninsula's exceptionally culturally diverse and ecologically significant land and sea-scapes.

The on-going management of municipal waste across CYP is the direct responsibility of local government. For the three case study communities in this project—Lockhart River, Mapoon and Pormpuraaw—the responsible agencies are the relevant Aboriginal Shire councils and in most adjacent areas, the Cook Shire Council (CSC). Other remote Indigenous waste managers include Aboriginal Corporations, either directly holding land or undertaking land and sea management on Aboriginal lands or jointly managed lands and/or seas, including marine and/or terrestrial protected areas. Municipal waste facilities for each case study community are situated within catchments in the immediate vicinity of nationally significant floodplains, coastal or littoral environments that are increasingly vulnerable to climate change impacts, including extreme weather event frequency, projected rising sea levels and related hydrological changes.

Increasing municipal waste loads in remote areas of CYP predominantly originate locally, both cumulatively as a direct result of localised population and visitation growth. All three case study communities are growing, with new housing under construction in each community to reduce over-crowding, to house younger generations of local families or to accommodate Indigenous families or individuals returning to their community of origin. There has been a concerted effort by senior CSC representatives to explore, discuss and consider better municipal waste management and recycling opportunities within Cook Shire over the past eight years. Landfill sites within catchments entering the Great Barrier Reef are being systematically decommissioned, including within Cook Shire, where a transition to locally sited transfer stations is well progressed.

Issues shared by the three communities include under-resourced municipal waste management, compliance with regulatory requirements, increasing retail and wholesale

[1] ABC News (12 October 2016) Most Queensland councils will fail to maintain basic infrastructure, this article also references the Queensland Audit Office 2016 Forecasting long-term sustainability of local government 2016-2017.

packaging and illegal dumping. All solutions will require locally tailored investments and brokering of informed solutions engaging all three tiers of government. This extends to the effective introduction of a proposed Queensland container refund scheme.

In Lockhart River, recycling is generally not practiced. This could be addressed by collaborations between council and local businesses to coordinate recycling, and by implementing a number of smaller recycling initiatives to build community-wide recycling. The problem of illegal dumping could be reduced by having a staffed landfill site, and local Indigenous organisations have expressed interest in hosting training to improve waste management in general.

In Mapoon, illegal dumping is seen as the biggest problem which, along with other waste management issues, could be best addressed for future generations with education in schools. Additionally, waste and recycling initiatives would benefit from being actively implemented as well as advertised as being available.

Pormpuraaw is seen as the current best practice example of remote municipal waste management in CYP. This community has landfill waste separation, bunded storage of selected hazardous wastes, selected semi-coordinated recycling and opportunistic transfer of recyclables to external re-processors using existing supply transport operators, with particular effort going into larger pre-wet season transfers. However, each community faces unique local challenges in progressing effective waste management, which require unique solutions—what works in one community might not be best practice for another community.

Marine debris collection and removal in the case study communities are undertaken either as part of current Indigenous Ranger program workplans, as a regularly coordinated volunteer activity predominately in partnership with Tangaroa Blue Foundation, as a community activity or as a combination of these approaches. Marine debris removal efforts recorded by the Australian Marine Debris Initiative (AMDI) in the three communities (to date) have involved 705 volunteers, who collected nearly half a million individual items of marine debris weighing nearly 40 tonnes. Marine debris loads in all three case study communities are routinely removed by hand by local Indigenous Ranger groups and volunteers under increasingly extreme conditions.

Escalating marine debris loads in remote areas of CYP predominantly originate from offshore domestic and international fisheries and from external land-based origins, often major urban areas to the north (South East Asia) or to the south (eastern seaboard of Australia).

Marine debris data collected over a number of years show decreasing numbers of ghostnets arriving on eastern Gulf of Carpentaria shorelines, but an increase in commercial fishing debris and associated marine litter. Marine debris loads on remote south-eastern facing Great Barrier Reef beaches are considered to be extreme, deposited there by the prevailing south-easterly winds.

In certain remote areas of CYP, marine debris can be tracked back to local remote community sources. However, Australian and international experience shows that incentivised recycling schemes like container deposit/refund schemes can effect real reductions in point-of-origin volumes and localised litter/marine debris loads.

This project also draws on the waste and debris management experiences of other remote northern Australian Indigenous communities including Warraber Island in the Torres Strait and the current recycling activities of the Kalkarindji/Daguragu and Wadeye communities in the remote Northern Territory.

Debris data collected across CYP over the past decade clearly shows that, where repeated efforts are made over successive years, a real reduction in the amounts and impacts of marine debris can also be made. Maintaining (and increasing) public investment into local Indigenous land and sea management and into marine debris removal initiatives will be crucial in sustaining positive associated environmental outcomes. It is strongly suggested that scaling up investment to regional strategies and support will achieve greater efficiency, effect and value for money.

Presently there is no coordinated recycling industry presence in the CYP region, with only minimal or negligible local recycling taking place. Nevertheless, this case study research project's findings and key learnings from CSC's investigations of Australian and international best practice waste management demonstrates that there are opportunities to strategically build a networked regional recycling effort, integrated with locally coordinated recycling in remote CYP communities, which can reduce local waste and marine debris loads, generate new or re-purposed resources and create new remote jobs and enterprises.

1. Introduction

1.1 The National Environmental Science Programme

The National Environmental Science Programme (NESP) will build on its predecessors, the National Environmental Research Programme (NERP) and the Australian Climate Change Science Programme (ACCSP). Like its predecessors, NESP aims to generate world-class biodiversity and climate science to environment decision-makers and other stakeholders. Research must have a strong public good focus, and importantly, be capable of delivering public good outcomes.

NESP comprises six research hubs, each with their own specific research priorities: Clean Air and Urban Landscapes; Earth Systems and Climate Change; Marine Biodiversity; Northern Australia Environmental Resources; Threatened Species Recovery, and Tropical Water Quality Hub (see the NESP website for a detailed description of each hub). The research about which this report is written was undertaken as part of the Northern Australia Environmental Resources Hub, which addresses issues associated with the sustainable development of the unique northern environments.

This report is associated with one of the core themes of that hub: Improving the management of threats to environmental resources.

2. Case study communities and the CYP region

The NESP Northern Australia Environmental Resources Hub[2] *Project 2.1 Addressing management of waste and marine debris in remote Northern Australian communities including Cape York* was initially secured by the North Australian Indigenous Land & Sea Management Alliance Ltd[3] (NAILSMA) and undertaken with the case study communities by an independent consultancy, the Regional Advisory & Innovation Network (RAIN) Pty Ltd between July and December 2016. NESP Project 2.1 is informed by a wide range of municipal waste and marine debris management initiatives actioned by Indigenous local governments[4], Indigenous landholding bodies, Indigenous ranger programs[5], Tangaroa Blue Foundation (Tangaroa Blue), GhostNets Australia (GNA) and other local or regional community organisations.

The project summarises local waste profiles (based on data available late 2016), examines how effective current solutions have been to date and identifies potential pathways for local recycling action and education. It does so by building on a desktop study compiled by NAILSMA and RAIN in mid 2016.

This report documents and summaries the central findings and recommends potential solutions for enhanced waste management and marine debris removal in remote Cape York Peninsula as compiled by RAIN together with the participating Aboriginal communities of Lockhart River, Mapoon and Pormpuraaw, all of which are situated in Australia's remote Cape York Peninsula (CYP) region (Map 1, Map 2, Map 3, Map 4). A full list of project participants and informants who contributed to this research is at Appendix A.

The aim of this research project is to review the current status of waste management in remote communities of northern Australia, and seek examples of best practice models[6]. The project forms part of the overall NESP research program incorporating Indigenous engagement and social, economic and biophysical research, and aims to complement emerging NESP research priorities.

The National Waste Policy[7] identifies six (6) key directional areas for action including the tailoring of solutions to increase capacity in regional, remote and Indigenous communities to manage waste and recover and re-use resources. The Policy states that its aims are to:

- avoid the generation of waste, reduce the amount of waste (including hazardous waste) for disposal;
- manage waste as a resource;

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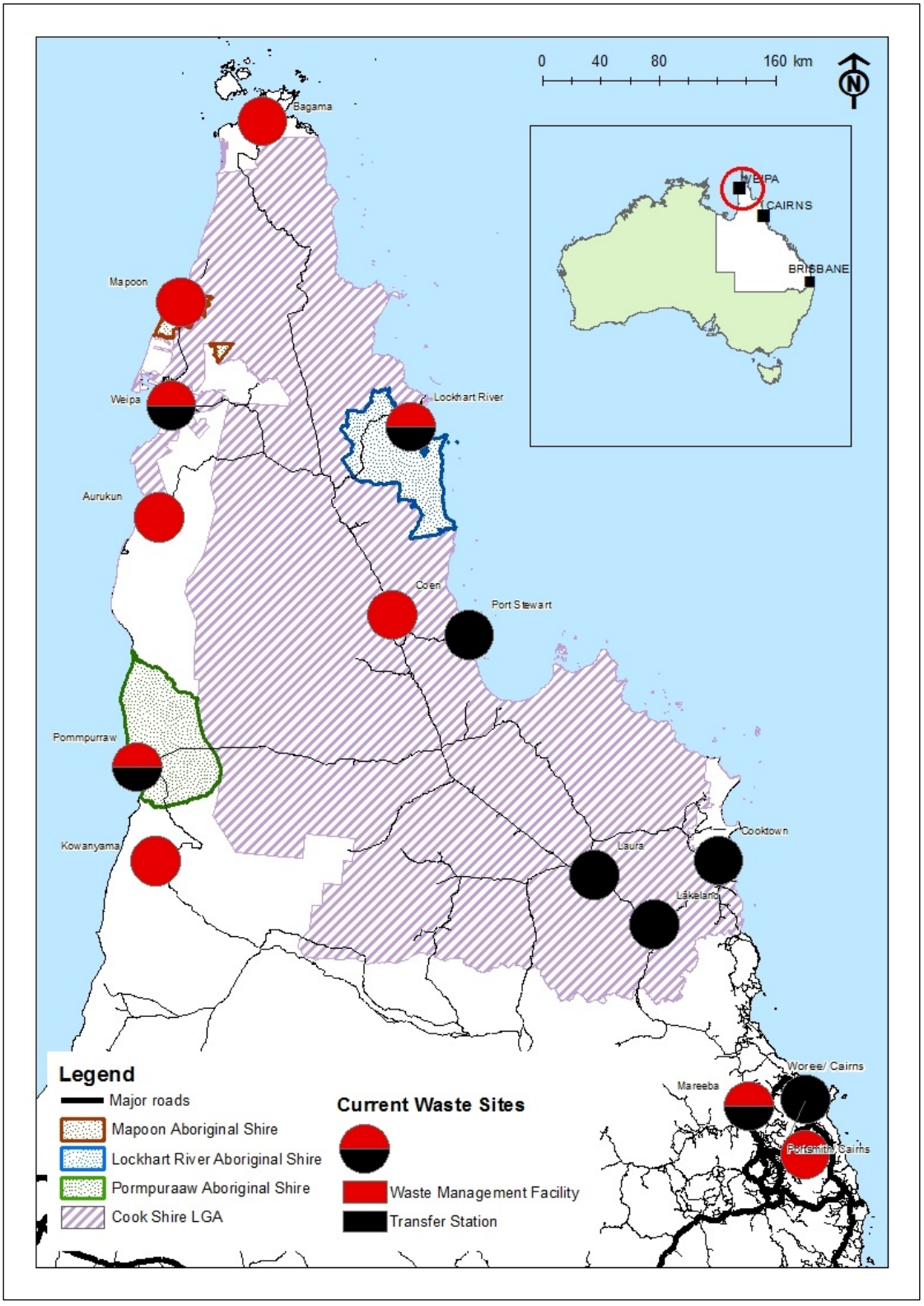
[2] Northern Australia Environmental Resources Hub http://www.nespnorthern.edu.au/nesp/projects/
[3] North Australia Indigenous Land & Sea Management Alliance https://www.nailsma.org.au/
[4] Project 2.1 recognises the key role of government at all levels in initiating, resourcing and coordinating improved waste management for community, and the particularly severe operational challenges of sustainable waste management in remote Aboriginal and Torres Strait Islander communities.
[5] The term *Indigenous rangers* is used to refer to localised Aboriginal or Torres Strait Islander community-based land and sea management effort, where traditional owners and/or other Indigenous people are employed to undertake biocultural resource management, including protected areas management and marine debris reduction.
[6] http://www.nespnorthern.edu.au/projects/nesp/waste-and-marine-debris-in-remote-northern-australian-communities/ accessed December 2016
[7] National Waste Policy https://www.environment.gov.au/protection/national-waste-policy accessed July, September and October 2016

- ensure that waste treatment, disposal, recovery and re-use is undertaken in a safe, scientific and environmentally sound manner; and
- contribute to the reduction in greenhouse gas emissions, energy conservation and production, water efficiency and the productivity of the land.



Map 1. *Relevant CYP waste disposal sites (2016).*

Lockhart River, Mapoon and Pormpuraaw Aboriginal Shire councils are all classified as Indigenous local governments: '*Local governments based in Indigenous communities, where service delivery is constrained by capacity and which share similar capability challenges and representational demands'* (Queensland Audit Office 2016). All three case study communities comprise of one main population locality within their respective Indigenous local government jurisdictions.

Senior representatives of the Lockhart River, Mapoon and Pormpuraaw Aboriginal Shire councils are able to engage with their fellow Mayors, Councillors and Chief Executive Officers through regional forums such as the Cape Indigenous Mayors Alliance and the Indigenous Leadership Group. Local government authorities in northern Queensland, including CSC, are actively progressing improved, regionally integrated waste management through the Local Authority Waste Management Advisory Committee (LAWMAC)[8].

In line with the National Waste Policy, the Queensland Government has developed the *Waste - Everyone's Responsibility: Draft Queensland Waste Avoidance and Resource Productivity Strategy (2014-2024)*[9] (draft Queensland Waste Strategy) and related compliance reporting requirements managed through the Queensland Waste Data System (QWDS). The current status of remote community QWDS reporting is further detailed below. The draft Queensland Waste Strategy's visions is that: *Queensland will become a national leader in avoiding unnecessary consumption and waste generation, adopting innovative resource recovery approaches, and managing all products and materials as valuable and finite resources.*

The draft Queensland Waste Strategy is further underpinned by five (5) guiding principles:

1. Protecting human health and the environment to secure our future prosperity.
2. Sharing responsibility for avoiding unnecessary consumption and improving resource management.
3. Recognising of the economic, environmental and social costs of waste generation and disposal.
4. Recognising of regional differences and opportunities.
5. Full lifecycle management of resources.

With respect to marine debris, selected data from all three communities (sourced from the Australian Marine Debris Initiative (AMDI) database) has also been incorporated into this research[10] together with the accumulated expertise and knowledge gained by Tangaroa Blue and their affiliated CYP remote community partners. Ghostnet data is not incorporated, as the GNA program remains unfunded post 2014: the GNA database has not been able to be maintained by dedicated project staff since that time[11]. However, this report does incorporate recent ghostnet and marine debris data collected by the Western Cape Turtle Threat Abatement Alliance (WCTTAA) with reference made to findings of the earlier GNA program.

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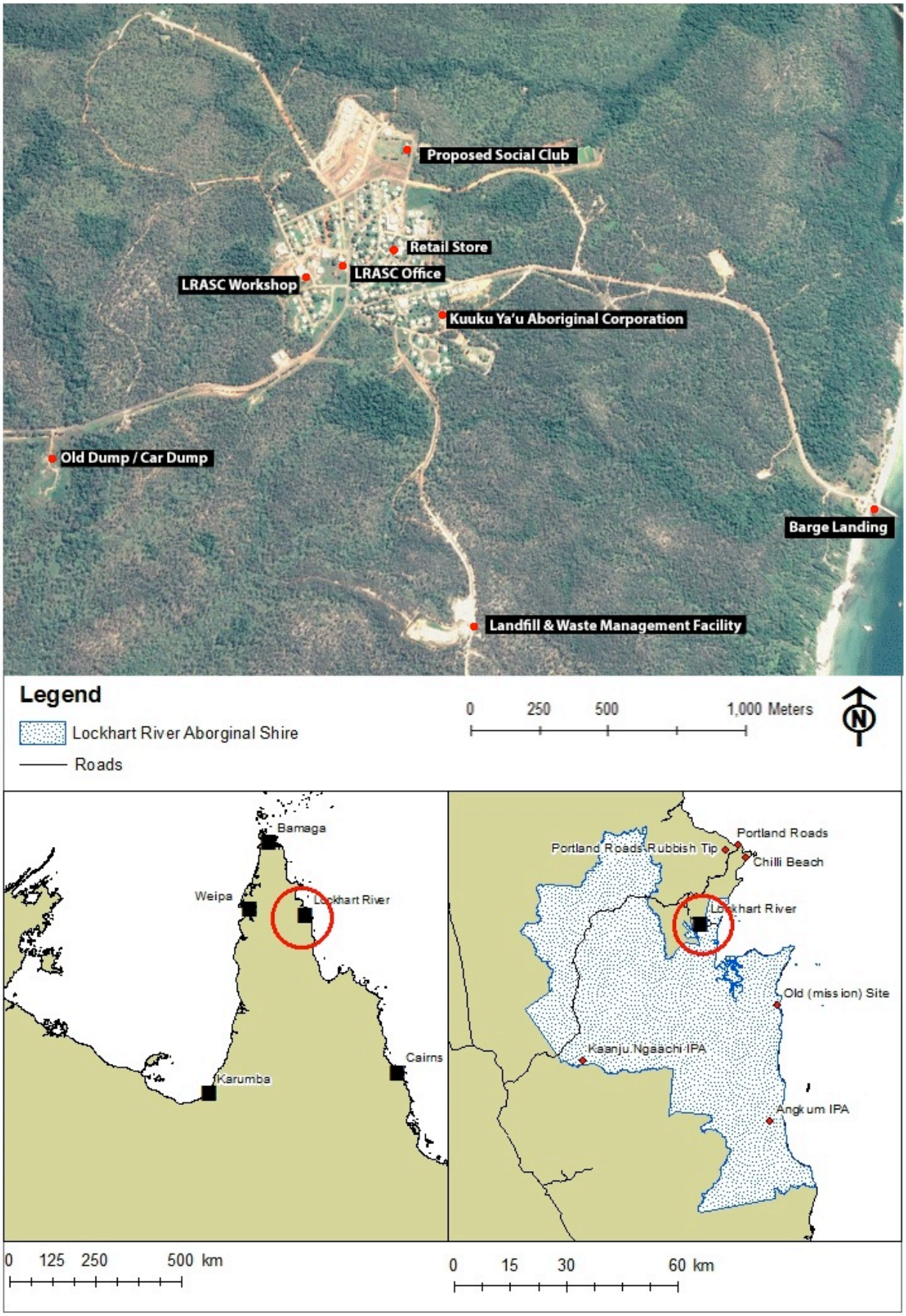
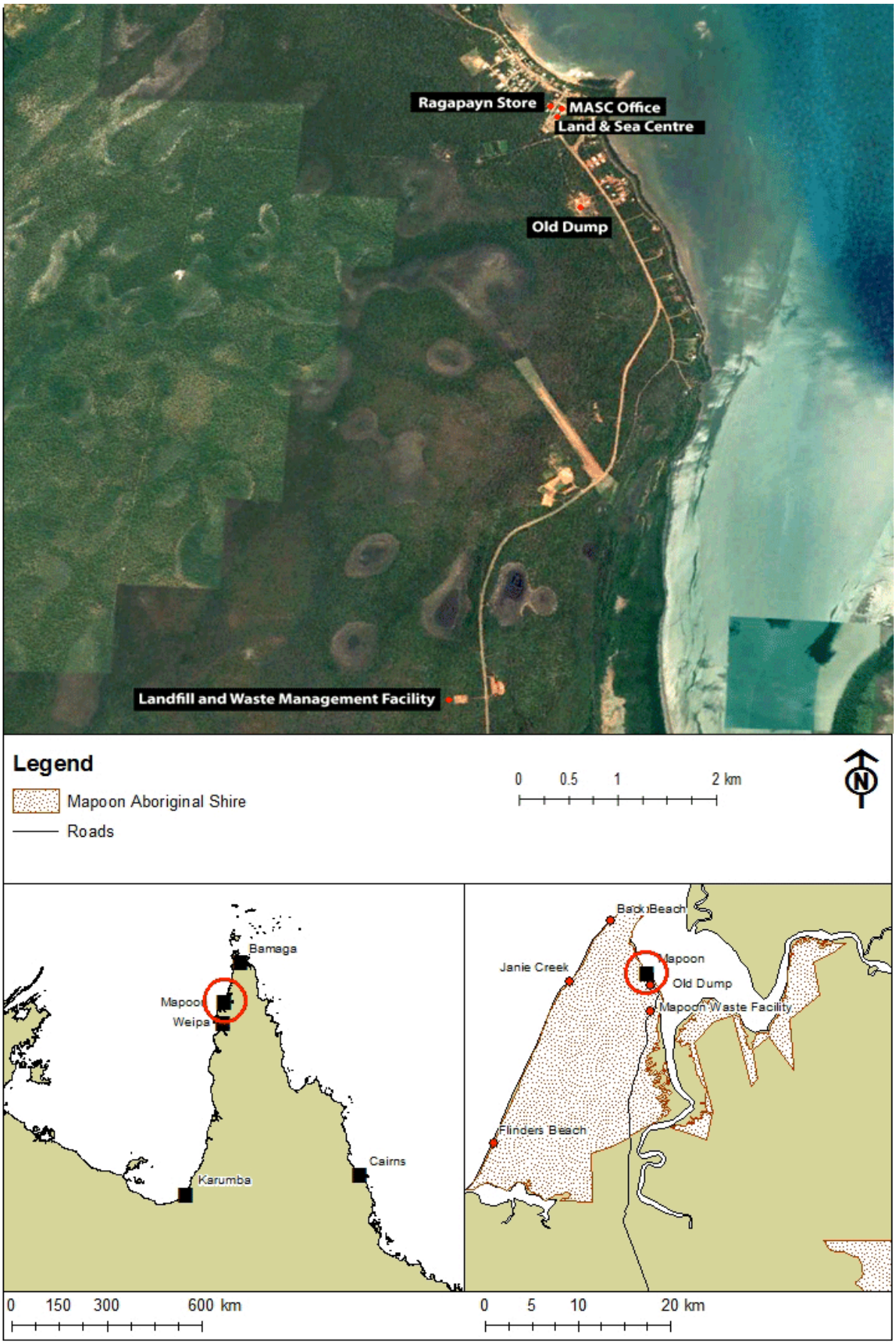
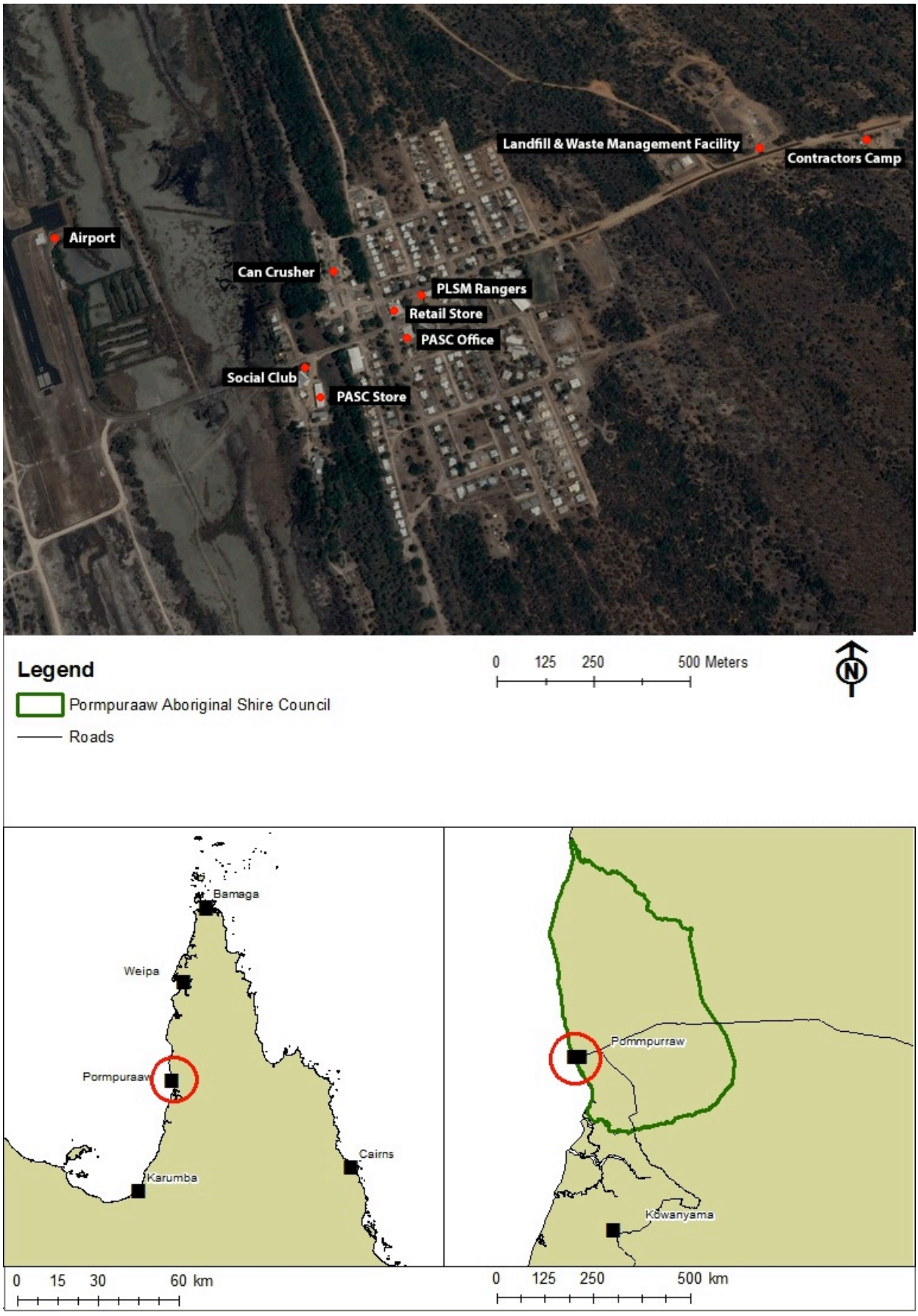
[8] *Personal communications* Alan Wilson, Deputy Mayor Cook Shire Council, 13 September 2016 and 27 November 2016
[9] https://www.ehp.qld.gov.au/waste/dev-industry-led-waste-strategy.html accessed July, September and December 2016
[10] AMDI data sets contributed by the Napranum Aboriginal community have been included in the Mapoon Community Case Study given the close proximity of both communities to the larger regional centre of Weipa. AMDI data sets contributed by Lamalama Traditional Owners for Yintjingga Aboriginal Corporation - managed Aboriginal freehold lands adjacent to Princess Charlotte Bay CYP have informed overall case study findings.
[11] Personal communications Riki Gunn, co-founder GhostNets Australia 14 November 2016



Map 2. *Lockhart River community map.*



***Map 3**. Mapoon community map.*



Map 4. *Pormpuraaw community map.*

Nationally, the 2009 *Threat Abatement Plan for the impacts of marine debris on vertebrate marine life* (TAP) identifies specific activities which *'seek to build on existing initiatives and strengthen coordination and partnerships to prevent, remove, mitigate and monitor marine debris… targeted at addressing gaps in existing measures...'* in line with the TAP's four main objectives:

1. Contribute to the long-term prevention of the incidence of harmful marine debris
2. Remove existing harmful marine debris from the marine environment
3. Mitigate the impacts of harmful marine debris on marine species and ecological communities
4. Monitor the quantities, origins and impacts of marine debris and assess the effectiveness of management arrangements over time for the strategic reduction of debris.

In 2014 Tangaroa Blue published the AMDI report *Marine Debris Management Plan for Cape York Peninsula and the Torres Strait Islands, Far North Queensland*[12], which the foundation is presently reviewing. The Plan notes that: '*[P]ractical and pragmatic solutions need to be utilised in eliminating waste at its source - this is the only way to prevent and mitigate marine debris long-term. These solutions will require integrated and innovative approaches at all levels of society - individuals, communities, councils, governments and beyond*'.

The Cape York Marine Advisory Group (CYMAG) undertook an assessment of eastern CYP beaches during 2007 and 2008. Key recommendations arising from CYMAG's resulting report are: that a large-scale clean up of eastern CYP beaches be conducted to remove the majority of rubbish from the system; to carry out follow up surveys in northern CYP and addressing the sources of rubbish including the use of bleach in adjacent countries (e.g. Papua New Guinea), and stricter regulation and enforcement of dumping at sea.

The purposes of the individual Community Case Studies are to:

- document the current marine debris and municipal waste management efforts undertaken in and around each participating community, all of which are located on Cape York Peninsula, Australia;
- identify existing marine debris and municipal waste management gaps at local and regional levels;
- document viable local solutions and opportunities for positive change to the present waste loads impacting each community and their local Aboriginal lands, seas, islands and/or foreshores; and
- outline viable approaches towards designing and implementing:
  a. a local Container Deposit Scheme (CDS) arrangement (referred to in Queensland as a container refund scheme, the term this report subsequently adopts); and
  b. more effective locally and/or regionally coordinated recycling and waste removal.

Case study research was conducted on-site at each participating community, primarily engaging the relevant Aboriginal Shire Council, local Indigenous Land & Sea Rangers (where operational), available Elders and other individuals. Project-related discussions were held with Aboriginal landholding entities, neighbouring non-Indigenous landholders including local

[12] http://www.tangaroablue.org/resources/cape-york-management-plan.html accessed July, October and December 2016

tourism operators, local retail store operators and other interested individuals. Following advice from local community store management, consultations were also held with the Director of the Retail Stores Board[13] about current recycling efforts undertaken by their remote Queensland retail stores, including local efforts and experience at the Lockhart River and Pormpuraaw retail stores. Brief discussions were also held with staff at the MASC Ragapayn Store. Napranum Aboriginal Shire and Kowanyama Aboriginal Shire have been directly referenced for added context as they are WCTTAA partners and initially expressed interest in participating in case study research, however no data was able to be sourced from these communities during the 2016 research period for a number of reasons beyond the control of the authors.

A key aim of this report is to provide a comparative overview of pan-CYP strategies for improved waste management and better regionally coordinated recycling efforts into the future. It therefore also integrates the general municipal waste management approach taken by Cook Shire Council (CSC) across the Cook Shire including current and past efforts by CSC to investigate regional recycling options, waste stream logistics, constraints and related cost/benefit analysis[14]. Additionally, this report incorporates selected waste and debris management findings relating to the communities of Napranum and Port Stewart[15].

All municipal waste generated in Napranum is disposed of at the Weipa waste facility privately operated by REMONDIS and maintained by Rio Tinto Alcan (RTA). There are high rates of personal inter-community movement between Napranum and Mapoon. Kowanyama maintains a similar landfill arrangement to all case study communities, with the Mayor of the Kowanyama Aboriginal Shire expressing a keen interest in accessing the case study research outcomes and related waste recycling recommendations[16]. Yintjingga Aboriginal Corporation / Lama Lama Land Trust have been included as they regularly host Tangaroa Blue coordinated marine debris clean-ups involving the Lama Lama Junior Rangers on their Aboriginal-held lands and joint-managed protected areas, including certain island National Parks (Cape York Peninsula Aboriginal Land) situated within Princess Charlotte Bay.

Whilst the Warraber Island Waste Pilot in the Torres Strait region was considered and local staff were consulted in undertaking project-related research[17], the authors were not tasked with investigating issues associated with waste management, marine debris nor recycling in that region. However, it is clear from the aforementioned local engagement, and from consultations held with other parties familiar with the overall waste and debris management situation in northern CYP (specifically the Northern Peninsula Area (NPA)) and in the Torres Strait that municipal waste and marine debris issues are significant challenges for local communities. In particular physical and other capacity constraints facing the Bamaga landfill (on the CYP NPA mainland) and critical limitations placed on recycling efforts by inter-regional quarantine restrictions and highly prescriptive freight conditions (particularly sea-borne freight) were

[13] An independent operation chaired by the Director General of the Queensland Department of Aboriginal and Torres Strait Islander Policy (DATSIP). At the request of local retail store managers the authors spoke with Eoin Quinvilan, Director Retail Stores Branch in October 2016.
[14] Personal communications Alan Wilson, Deputy Mayor Cook Shire Council, 13 September 2016 and 27 November 2016
[15] Data and/or information was sourced from AMDI data sets contributed by Nanum Wungthim Land & Sea Management at Napranum and from Yintjingga Aboriginal Corporation.
[16] Personal communications Cr Michael Yam, Mayor Kowanyama Aboriginal Corporation, 10 October 2016
[17] Personal communications Mika David, Senior Environmental Officer, Torres Strait Island Regional Council, 21 November 2016

raised as acute issues,. The Torres Strait Island Regional Council website provides an overview of the significant waste management challenges facing that region, which is highly vulnerable to climate change impacts[18].

The remote Northern Territory (NT) Indigenous communities of Wadeye, Kalkarindji and Daguragu also engaged with the authors in sharing their knowledge, expertise and experiences with remote recycling. Recycling industry representatives were also engaged by the authors, including a number of specialist recycling manufacturers based in various Australian locations who provided advice about best practice technology available for localised up-scaling of recycling. These are listed in Appendix B to this report.

Table 1 below summarises selected statistics and the current (2016) status of marine debris and municipal waste management arrangements for selected communities central to the case study research project.

[18] http://www.tsirc.qld.gov.au/our-work/waste-management/waste-facilities-charges accessed November and December 2016

Table 1. *Case study and selected Indigenous communities and the CYP region.*

Shire or Location	Population (ABS 2011)	Size[19] (km^2)	Km to Cairns	Marine debris removal	Municipal waste management
Lockhart River Aboriginal Shire	540	3,578	770 km	Tangaroa Blue and local community: Chilli, Chilli Middle, Quintell beaches (AMDI)	Municipal landfill (un-lined with trenching), limited separation and opportunistic recycling
Mapoon Aboriginal Shire	293	548	900 km	ML&S Rangers (MASC) Tangaroa Blue and local community: Janie Creek, Back Beach, Cullen Point (AMDI) ML&S Rangers (MASC) and Tangaroa Blue in remoter areas	Municipal landfill (un-lined with trenching), limited separation, no waste recycling
Pormpuraaw Aboriginal Shire	731	4,429	665 km	PLSM Rangers (PASC) Tangaroa Blue and local community: Mungkan and Chapman river mouths (AMDI) PLSM Rangers (PASC) in all remote areas	Municipal landfill (un-lined with trenching), separation, interim storage and transfer of recyclable waste (opportunistic back-loading), Art centre re-use loop, drink can crushing and baling
Cook Shire	4,260	105,781	250 – 1000 km	Multiple coastal locations in the Shire's south-east (AMDI)	Decommissioning all municipal landfills (other than Coen), replacement with waste transfer skips to enable separation and transfer of recyclables for external processing
Napranum Aboriginal Shire	943	1,998	885 km	Napranum Boat Ramp, Pennefather River (AMDI)	Municipal waste trucked for disposal at privately managed Weipa landfill
Kowanyama Aboriginal Shire	1,125	2,543	600 km	Reports no ghostnets, does not provide data to GNA database, AMDI	Municipal landfill (assumed unlined with trenching), limited separation, no current waste recycling
Yintjingga Aboriginal Corporation / Lama Lama Land Trust	30 (based at Port Stewart, Silver Plains)	2,926	550 km	One Mile Beach, Yallawonga Beach, Running Creek (AMDI)	Cook Shire operated waste transfer station (skip) at Port Stewart

[19] Statistics are compiled from Australian Bureau of Statistics (ABS) 2011 Census data

Lockhart River landfill site *- cement slab separation area, Sept. 2016*

Mapoon landfill site *- separation areas Mapoon Aboriginal Shire , Sept. 2016*

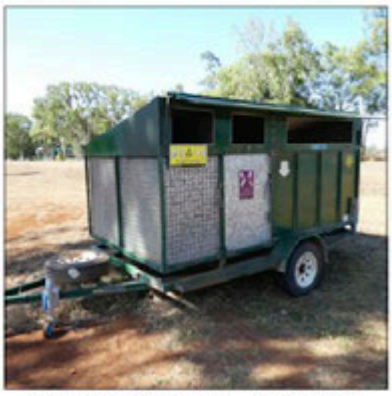
Pormpuraaw landfill site *- bunded undercover storage for hazardous waste, Sept. 2016*

Portland Roads waste disposal site *- general waste disposal area (Cook Shire) Sept. 2016*

Port Stewart transfer station *- general waste transfer skip (Cook Shire) Sept. 2016*

Coen landfill site *- waste oils collection and transfer point (Cook Shire) Sept. 2016*

Cooktown transfer station *- general waste transfer skip (Cook Shire) Sept. 2016*

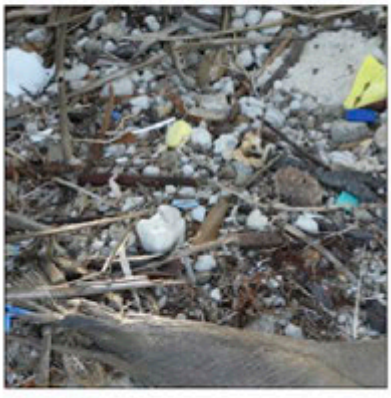


Lakeland transfer station *- general waste transfer bin trailer (Cook Shire) Sept. 2016*

Simple 44 gallon drum bin *- Boat ramp at Portland Roads (Cook Shire) Sept. 2016*

Dumped chemical containers *- Yallawonga Beach Lama Lama Land Trust, (Cook Shire) Sept. 2016*

Road-side tip at the Archer River *(Cook Shire) trench pit has since been closed, Sept. 2016*



Marine debris *- tiny pieces forever breaking up at Chilli Beach (Cook Shire) Sept. 2016*

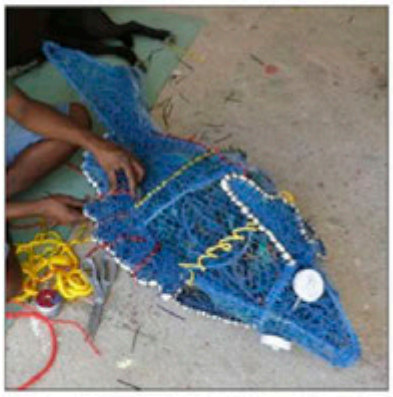
Re-purposed marine debris (unknown artist)
Chilli Beach, Lockhart River region, Sept. 2016

Ghostnet re-used for decoration and privacy
Mapoon Land and Sea Centre, Sept. 2016

Artwork made with ghostnets *- Pormpuraaw Arts & Culture Centre Inc, Oct. 2016*

Ghostnets entangle terrestrial animals too
© PLSM Rangers / PASC, 2009

Pormpuraaw Land & Sea Rangers removing ghostnets *© PLSM Rangers / PASC, 2015*



Recycling ghostnets into art *Pormpuraaw Arts & Culture Centre Inc, Sept. 2016*

Ghostnet removed by ML&S Rangers
Mapoon Aboriginal Shire © MASC 2008

Removed ghostnets pre-baling and transfer
Mapoon Land and Sea Centre, May 2014

Bollards made from recycled ghostnets
Mapoon Aboriginal Shire, May 2014

Marine debris on south-east aspect beaches
Lockhart River Aboriginal Shire © Heidi Taylor / Tangaroa Blue 2016

Marine debris collected - but not removed - by visitors *Chill Beach, Sept. 2016*

Repurposed Marine Debris *at Wattle Hills helicopter landing, Cook Shire Sept. 2016*

3. Findings

Debris: it keeps breaking up… not breaking down. (Heidi Taylor, Tangaroa Blue 2016)

The mainstream setting is worlds apart. Standard policy and regulatory requirements can make local solutions more complex and potentially unworkable. (Eoin Quinlivan, RSB Director 2016)

[Other levels of government] don't understand the pressures around diminishing resources and increasing compliance burden. (David Clarke, CEO Lockhart River Aboriginal Shire Council 2016)

A recent long term sustainability forecast for local government released by the Queensland Audit Office[20] highlights asset condition maintenance data; asset management plans; scalable project decision-making frameworks, direct community engagement and effective planning as key areas for local government improvement. This finding applies to local government across the board - regardless of size, jurisdiction (coastal, Indigenous, resources, rural/regional, rural/remote and South East Queensland) or revenues. It is known that climate change implications for remote waste management will require serious consideration[21].

The 3,578 km^2 Lockhart River Aboriginal Shire is located immediately adjacent to the Great Barrier Reef Marine Park (GBRMP) World Heritage Area and is surrounded by the Kutini-Payamu National Park (Cape York Peninsula Aboriginal Land). The Shire extends from the lower reaches of the Pascoe River south to Cape Sidmouth along Queensland's northeast coastline (including certain off-shore islands in the GBRMP) and inland to its northern, western and southern boundaries with Cook Shire. The area is characterised by large tracts of jointly managed marine and terrestrial protected estates containing highly intact biocultural ecosystems, superb native species diversity and globally unique cultural land- and sea-scapes.

The 548 kms^2 Mapoon Aboriginal Shire extends from the Pennefather River mouth to the Skardon River mouth on the eastern Gulf of Carpentaria coastline and inland areas west of the CYP Old Telegraph Track. The Mapoon peninsula (between Port Musgrave and Duyfken Point to the west of Weipa) features middens, enormous sand dunes, marine turtle and migratory shorebird nesting beaches, countless freshwater swamps and several major waterways. Mapoon Land & Sea Rangers have facilitated expert marine turtle censuses on local beaches since 2002. As at 2016, ML&S Rangers provide professional pest and feral control; registered carbon abatement, rare marine mammal surveys and visitor management.

The 4,429 km^2 Pormpuraaw Aboriginal Shire extends from the mouth of Coleman River to the Holroyd (South Kendall river) mouth on the eastern Gulf of Carpentaria coastline and inland to a boundary generally extending along a 1897 state gazetted Aboriginal reserve boundary. The Shire comprises the bulk of the Northern Holroyd Plain Aggregation, a wetland of national

[20] State of Queensland (2016) Forecasting long-term sustainability of local government 2016-2017 Queensland Audit Office
[21] These impacts will direct and indirect and will significantly impact already disadvantaged Indigenous communities in northern Australia ((Green 2006) - http://web.maths.unsw.edu.au/~donnag/docs/climateimpacts_health_report.pdf accessed December 2016

significance and intake for the Great Artesian Basin. These vast floodplains are subject to absolute extremes in seasonal inundation. The Shire features undeveloped landscapes within the lower catchments of multiple, intensely inter-braided waterways entering the Gulf, chenier dune systems, dune scrub, riverine galley forests, coastal plains and diverse savannah landscapes. Seasonal freshwater and saltwater (estuarine) interchanges extend across the entirety of the area. As at 2016, Pormpuraaw Land & Sea Management Rangers provide professional pest weed and feral animal control, native species predation control, registered carbon abatement, targeted threat abatement to protect endangered marine species and remote area tourism / visitor management.

The Pormpuraaw Aboriginal Shire municipal waste facility is presently considered to be the best regional example of compliance within CYP by Queensland Health's Environmental Health Branch[22]. The communities of Lockhart River and Mapoon are working to improve current local waste management arrangements. All three case study communities expressed a clear interest in improving local recycling and waste removal as a local priority.

Some degree of municipal waste separation takes place in all three communities, with the Lockhart River and Mapoon facilities having separation areas but little strategic day to day management of their respective landfill sites, which subsequently impacts on these communities' existing capacity to store and accumulate bulk recyclables for effective and timely transfer to southern waste re-processors. Currently Pormpuraaw is the only case study community to coordinate substantive bulk transfers of recyclables, however this is done opportunistically and predominately driven by the personal motivation of individuals.

There is no current resourced capacity within remote Indigenous councils for effective local coordination of recycling efforts nor to effectively integrate locally recovered resources with emergent recycling industries.

Out of necessity selected materials are already seen as resources by remote communities for direct reuse and repurposing. For example, at Lockhart River and Mapoon end-of-life cars and other vehicles are often accessed for mechanical and/or spare parts. At Pormpuraaw all locally collected ghostnets are re-used by local artists employed by that community's arts and culture centre, and in all communities marine debris is used by many residents for home decoration.

Local government planning schemes are mandatory under the *Sustainable Planning Act 2009* (Qld) and must have regard to municipal waste management policies and the running of designated local municipal waste management sites. Local planning schemes can provide guidance about environmentally sound site location and insights into a local government's waste management, waste disposal and recycling objectives. Land use planning for local governments into the future will come under the provisions of the newly enacted *Planning Act 2016* (Qld) coming into force mid 2017, which (amongst other matters) aims to give local governments more flexibility in how they work with their respective communities on local planning schemes and to define a limited number of mandatory elements for local schemes

[22] Pormpuraaw Aboriginal Shire Council 2015 Annual Waste Data Report provided to the Queensland Waste Data System (QWDS) https://www.ehp.qld.gov.au/waste/qwols.html and personal communications PASC Environmental Manager R Morris, September 2016.

rather than requiring adherence to the current, very large and highly prescriptive structure for planning schemes[23].

All three remote communities face significant waste and marine debris management challenges:

- Extreme remoteness: located 'at the end of the road' and 'a world away from the mainstream'.
- Situated within significant bioculturally resource-rich, comparatively intact land and sea-scapes.
- The biocultural environments of all case study communities are exceptional[24], even where major resource developments are present on their periphery (e.g. bauxite mining at Weipa).
- Absolutely unique local circumstances including highly complex (in part overlapping or intersecting) Indigenous (and other) land-holding, land management and native title related arrangements.
- Unforseen costs arising from infrastructure needs requiring additional native title agreements.
- Exponentially increasing regulatory and compliance burdens and related compliance costs.
- No viable rates base, with local rental incomes variable and payment defaults difficult to enforce.
- Rapid local population growth and ever-increasing presence of non-resident visitors and tourists.
- High rates of local staff turnover and frequently changing contractors presence and availability.
- Regularly maintaining plant, equipment and trained staff to provide regular domestic kerbside garbage collection and regular essential services garbage collection (school, hospital/clinic etc.).

Much like anywhere else in Australia, change in local behavioural norms and attitudes towards waste conscious lifestyle changes, household rubbish separation and community recycling efforts requires substantive capital infrastructure investments, tailored educational campaigns and locally viable incentives.

This project's research in the field during 2016 has clearly identified that:

- The implications for better coordinated waste management and recycling efforts at localised or regional scale across CYP are considerable and substantive.
- There are real opportunities to provide targeted resources to remote Indigenous local government for the effective coordination of remote waste management and the effective integration of locally recovered resources with emergent recycling industries.

[23] http://www.dilgp.qld.gov.au/planning-reform/plan-making/an-improved-system.html accessed September 2016

[24] Situated within the Lockhart River Aboriginal Shire is the Kutini-Payamu National Park (Cape York Peninsula Aboriginal Land) with the Iron Range Rainforests listed on the Register of the National Estate. The Wenlock River is designated a Special Environmental Area under the statutory CYP Regional Plan. The sand beaches of the Mapoon region (in part within the Mapoon Aboriginal Shire and in part within the Napranum Aboriginal and Cook shires) contain diverse Aboriginal middens. The Northern Holroyd Plain Aggregation (the entirety of the Pormpuraaw Aboriginal Shire) is a listed Wetland of National Significance and Great Artesian Basin intake area.

- All case study communities will require targeted immediate and long-term direct investment into waste minimisation and recycling infrastructure, culturally tailored educational campaigns and locally viable incentives to underpin inter-generational behavioural change.
- Optimum solutions like emissions neutral incineration and reverse vending (automaton collection point) technology are beyond the financial and technical capacity of individual remote jurisdictions.
- More effective recycling of municipal waste and marine debris in remote areas will require a locally coordinated recycling capacity that is well integrated with a developing regional recycling industry.
- The immediate future (2017 and 2018) presents an unrivalled opportunity to establish viable foundations for a well-integrated and brokered recycling effort engaging Cape York Peninsula and Gulf communities, and remote Indigenous and other local governments in Queensland.
- All solutions will require locally tailored investments and informed solutions brokerage engaging all three tiers of government. This extends to the effective introduction of a proposed Queensland container refund scheme, presently under development through Queensland's lead waste management agency, the Department of Environment and Heritage Protection (EHP).

3.1 Shared issues

Priority shared waste management issues highlighted by all case study communities:

- Operational requirements for municipal waste management are increasingly onerous; unable to be locally funded due to the lack of rateable residential bases and considered grossly under-resourced;
- A definite lack of resources, capacity and skills development to meet compliance requirements;
- Retail and wholesale packaging (locally sold goods, bulk supplies) generates significant waste;
- Illegally dumped rubbish is a significant problem in remoter areas of all case study communities (and a particular issue locally perceived to be adversely impacting the Mapoon municipal landfill);
- Implementing a locally viable approach to the proposed Queensland container refund scheme to enable the benefits of reduced litter and refund returns to also flow to remote areas;
- Any remote container refund implementation scheme needs to be locally tailored to be viable;
- Separation of household waste prior to disposal is not feasible without long-term local education;
- Most effective separation location is the local municipal waste facility, however additional staffing resources will be required to ensure separation and transfer activities are part of staff workplans;
- Specific resources for household waste separation are critical for future local recycling initiatives;
- Resourced local coordination during 2017 will directly benefit a 2018 container refund scheme; and

- Marine debris collection and removal continues to be resourced and expanded as paid work.

Priority shared marine debris issues informed directly by local parties:

- Sustained, annually repetitive efforts to remove marine debris from remote coastlines definitively reduces cumulative debris loads and significantly arrests the on-going break-up of in-situ debris.
- Sustained, annually repetitive efforts to remove marine debris from remote coastlines, coupled with international policy change and community education, definitively reduce ghostnet numbers.
- Other than selected re-use of some waste, recycling is not generally known of, or practiced.
- Separation of hard waste by type is often sporadic and at times only undertaken on an ad hoc basis.
- Council and local businesses will need to collaborate strongly to bring in coordinated recycling.
- Coordination of locally appropriate and effective recycling will require brokerage investments.
- Every local retailer would need to be involved for a container refund scheme to be locally viable.
- A number of smaller recycling initiatives can build the foundations for community-wide recycling.

Lockhart River foreshore at Quintell Beach *Lockhart River Aboriginal Shire, Sept 2016*

Foreshore between Red Beach and Cullen Point *Mapoon Aboriginal Shire, May 2014*

Main access road causeway in wet season *Pormpuraaw Aboriginal Shire*
© PLSM Rangers / PASC, 2013

Landfill: fenced, open trench, incineration *Lockhart River Aboriginal Shire, Sept. 2016*

Landfill: fenced, open trench, incineration *Mapoon Aboriginal Shire, Sept. 2016*

Landfill: fenced, open trench, incineration *Pormpuraaw Aboriginal Shire, Sept. 2016*

All case study communities are a long way away, *Pormpuraaw Aboriginal Shire*
© PLSM Rangers / PASC, 2014

Everything consumed there is bought in from outside, *Lockhart River Shire, Sept. 2016*

Illegal dumping always costs remote councils *Pormpuraaw Aboriginal Shire*
© PLSM Rangers / PASC 2015

Rubbish left by illegal campers *Yallawonga Lama Lama Land Trust (Cook Shire), Sept. 2016*

Video evidence can be used to prosecute breaches *Mapoon Aboriginal Shire, Sept. 2016*

Emerging hazardous wastes *Port Stewart transfer station (Cook Shire), Sept. 2016*

General signage at current Council landfill site
Mapoon Aboriginal Shire, Sept 2016

General signage at current Council landfill site
Lockhart River Aboriginal Shire, Sept 2016

General signage at current Council landfill site
Pormpuraaw Aboriginal Shire, Sept 2016

Separation signage at current landfill site
Mapoon Aboriginal Shire, Sept 2016

Separation signage at current Council landfill
Lockhart River Aboriginal Shire, Sept 2016

Separation signage at Council landfill
Pormpuraaw Aboriginal Shire, Sept 2016

Table 2. *Specific local findings tabulated by case study community.*

Case study community	Specific local findings: Marine debris	Specific local findings: Municipal waste management
Lockhart River Aboriginal Shire	Voluntary marine debris removal activities currently consistently target only limited local areas. Sustained debris removal in these areas over time has demonstrably reduced marine debris loads. Marine debris removal activities coordinated by Tangaroa Blue arrange for the transfer of collected recyclable materials out to southern MRFs / re-processors. Other areas are seeing a continuing gross accumulation of marine debris, in part due to inaccessibility. This could be improved through sustained, coordinated activity through either dedicated Aboriginal Ranger resources or external volunteers. The project was not able to ascertain the current capacity of local organisations to assist with targeted marine debris removal, in particular the capacity of Aboriginal Ranger groups based at Lockhart River. LRASC identifies the current lack of dedicated municipal land and sea management capacity as a significant constraint on its ability to better address biosecurity matters, including marine debris.	Other than selected re-use of some waste, recycling is not generally known of, nor practiced. The exception being one local business that recycles aluminium cans and the council mechanic who ensures that LRASC's waste oil is transported back to Cairns and recycled. Separation of hard waste by type is highly sporadic and only undertaken on an ad hoc basis. A staffed landfill site may assist with minimising the impacts of illegal dumping and fee avoidance. Limited LRASC capacity to meet regulatory compliance and data reporting obligations. LRASC, local businesses and the community will need to collaborate strongly to bring in coordinated recycling. Everybody would need to be involved in developing locally viable container refund scheme implementation. A number of smaller recycling initiatives can build the basis for community-wide recycling. Illegal dumping is generally attributed to 'outside' / non-local contractors. LRASC has difficulty in recovering waste disposal fees from contractors working within the Shire. Retail store cardboard waste is sorted, compacted, baled and removed to landfill. Staff are trained in these procedures.
Mapoon Aboriginal Shire	Marine debris and ghostnet removal is routinely undertaken by Mapoon Land & Sea Rangers - all being directly employed by the Mapoon Aboriginal Shire Council Most local beaches within the Shire are on lands held by the Old Mapoon Aboriginal Corporation, other beaches fall within the Cook or Napranum shires. Although ghostnets are now a high demand resource, no-one really wants to pay for them.	Illegal dumping is a significant problem. Community education needs to start in schools: most adults will not readily change ingrained behaviours and/or practices. Local recycling enterprises may be viable if separation is practiced. Regionally located product stewardship arrangements and recycling initiatives need to be actively implemented, and not just advertised as available. Current plastics recyclers are predominately situated in south-east Queensland. Initiatives or infrastructure that costs MASC money are unlikely to be considered.

Case study community	Specific local findings: Marine debris	Specific local findings: Municipal waste management
	Remote area debris removal requires substantial operational resources and logistical support. Local management of external volunteers is an additional impost requiring extra resources. Thick layers of plastic debris will accumulate but removing some volume every year will lower impacts over time. Removed and stored ghostnets are transferred to a southern MRF for re-processing into various items, including plastic access bollards which are subsequently purchased by MASC / ML&SC for local use.	It is the responsibility of Environmental Health Workers to educate community about rubbish and litter.
Pormpuraaw Aboriginal Shire	Marine debris and ghostnet removal is routinely undertaken by Pormpuraaw Land & Sea Management Rangers (all of whom are employed by PASC). Marine debris is increasingly observed to originate from domestic vessels (eg: Australian sourced empty oil and lubricant containers, plastic water bottles, broken fishing gear, storage containers, litter), as well as from other (foreign) ocean-going fishing vessels. Illegal dumping by commercial fishing operators (and others) remains a costly problem for PASC and PLSM, in particular its removal from very remote, ecologically sensitive regions. PLSM works with Commonwealth customs and quarantine agencies to monitor activities. Local hot spots for marine debris include estuaries, river mouths and the lower reaches of local waterways. Major debris items of concern include refrigeration gas containers and steel bottles. Ghostnet numbers arriving on the Shire's coastline have fallen in recent years - possibly due to a lack of recent cyclones and international reduction-at-source efforts, in particular in Indonesia.	Landfill sites operations are improved by having clearly delineated areas for separated mass contractor-generated waste (Commercial & Industrial (C&I), Construction & Demolition (C&D) and for separated general municipal waste (MSW). Maintaining on-site separation definitively assists in extending the lifespan of landfills, and in pooling recyclables for local re-use and/or periodic transfer / bulk backloading. Back-loading of priority toxic waste and recyclables is achievable if well targeted and locally arranged with transport operators servicing an area. All-weather storage for some recyclables is required to amass viable back-load volumes of recyclables over time. Selected recyclable materials are collected, appropriately stored and transported (or backloaded) by contractor to a Cairns MRF. PASC will not accept asbestos in municipal landfill, contractors engaged by QBuild as required for asbestos demolition / removal. Clinical waste is collected five (5) times weekly and incinerated in a separate pit at the landfill site. PASC receives no hazardous chemicals, as there are no local industrial activities. Reduction in single use plastic bags is achievable where in-store alternatives are made available. High attrition rate of 'wheelie-bins'.

Case study community	Specific local findings: Marine debris	Specific local findings: Municipal waste management
	Not many entanglements are observed locally. Ghostnets, marine debris and other waste are important resources for locally employed artists.	Retail store cardboard waste is sorted, compacted, baled and removed to landfill. Staff are trained in these procedures. Some waste types (e.g., tyres, concrete) are stockpiled for future local reuse by PASC. PASC consistently receives waste disposal fees from contractors working in the Shire. PASC is considering imposing contract conditions requiring contractors to dispose of all waste external to the Shire.

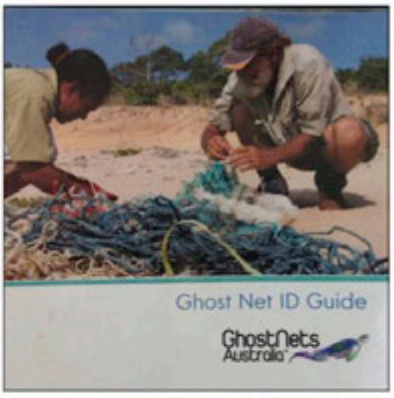
Table 3. *Marine debris: New hotspots, existing sites and effort to date.*

Marine debris region	2016 hotspots	Existing removal sites	Effort to date
Lockhart River Aboriginal Shire About 97.5% of all debris collected at Chilli Beach originated from the sea (2.5% identified as land debris). A marked finding of the AMDI data logged to date for this region is that the debris ratio at Quintell Beach located in the vicinity of the community of Lockhart River (land 48% : sea 52% = 1 : 1) is very different to the Chilli Beach debris ratio (land 2.5% : sea 97.5% = 1 : 39) suggesting a more terrestrial source of debris in the former location.	South-east facing GBRMP beaches within the Lockhart River Aboriginal Shire.	Annually: Chilli Beach (July 2012, August 2013, July 2014, July 2015, October 2016). More sporadically: Chilli Beach Middle (June and July 2012, May 2014), Quintell Beach (June 2012) and Quintell Beach South (November 2015). Chilli Beach 2012-2015: 341 volunteers (averaging 68 volunteers per event) over 8,652 hours, collected 212,545 individual items (totalling 1470 bags) weighing 19.2 tonnes.	Tangaroa Blue, local organisations and businesses, Kuuku Ya'u Traditional Owners and conservation volunteers. Overall, AMDI recorded marine debris removal efforts for the Lockhart River region (to date) have involved 375 volunteers, and collected 217,422 individual items of marine debris weighing some 19.5 tonnes.
Mapoon Aboriginal Shire About 96% of all debris collected at Back Beach has marine origins while 4% is identified as land debris. AMDI data logged to date for this region shows that the average debris ratio (at locations where this data is available) is between 6 –	Remoter beaches in the greater Mapoon region, in particular: Skardon Beach Flinders Beach	Annually: Back Beach (May 2012, April and June 2013, May and September 2014, August 2015 and June 2016). From 2012-2014: Janie Creek (May and September 2012, April 2013, September 2014).	Mapoon Land & Sea Rangers and Junior Rangers, Tangaroa Blue, conservation volunteers, Traditional Owners and other locals. Back Beach 2012-2016: 117 volunteers (av. 11 volunteers per event) over

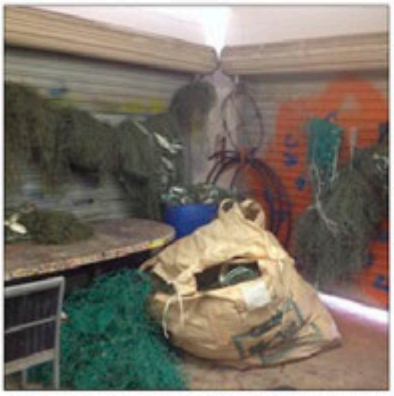
Marine debris region	2016 hotspots	Existing removal sites	Effort to date
12% for debris of marine origins and between 94 – 88% for debris originating from land.		Survey beach for nesting / hatching marine turtles since 2012. More sporadically: Cullen Point to Cattle Creek (March 2013, March 2014), Cattle Creek to Back Beach (February 2012, September 2014) and Cullen Point (May 2012, March 2014).	2,034 hours, collected 116,591 individual items (totalling 1178 bags) weighing 11.3 tonnes. Overall, AMDI recorded debris removal efforts in the Mapoon region (to date) have involved 254 volunteers, and collected 219,135 individual items of marine debris weighing some 19.5 tonnes.
Pormpuraaw Aboriginal Shire			
About 49% of all collected marine debris originated from land-based sources with about 51% identified to be of marine origins. Areas focussed for on for collections are general use areas often frequented by locals and visitors.	Existing (known) areas of Ghostnet occurrence, in particular: critical marine turtle (esp. Olive Ridley) nesting beaches between Edward River and Hersey Creek areas	Annually: Junior Ranger beach clean-ups at various beaches (community, remote) More sporadically: Manroopa the mouth of the Mungkan River (May 2014) and Rirranth the mouth of the Chapman River (June 2012).	Pormpuraaw Land & Sea Rangers, PLSM Junior Rangers, Pormpuraaw State School, Tangaroa Blue, volunteers, Traditional Owners and other locals. Overall, AMDI recorded debris removal efforts in the Pormpuraaw region (to date) have involved 76 volunteers for over 90 hours, collecting 2,205 individual items (totalling 18.5 bags) and weighing some 80kgs.

Ghostnet location data collected by Rangers *Pormpuraaw Land & Sea Management, 2014*

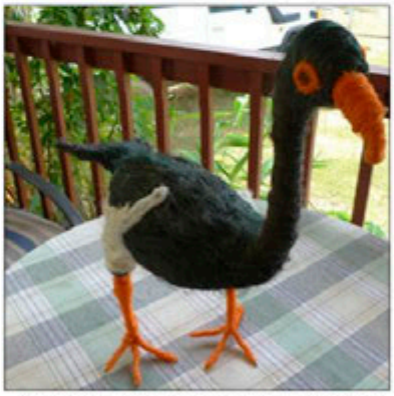
Ghostnets removed by Rangers *Pormpuraaw Aboriginal Shire © PLSM / PASC 2008*



Resources are used to identify net types and origins *Mapoon Aboriginal Shire, Sept. 2016*



Ghostnet can be re-used locally *Pormpuraaw Arts & Culture Centre Inc., Sept. 2016*



Recycled ghostnet used for making artwork *by Z. and S. De Jersey Mapoon, May 2014*

Ghostnet sorted, baled and stored pre-transfer *Mapoon Land & Sea Centre, Sept. 2016*

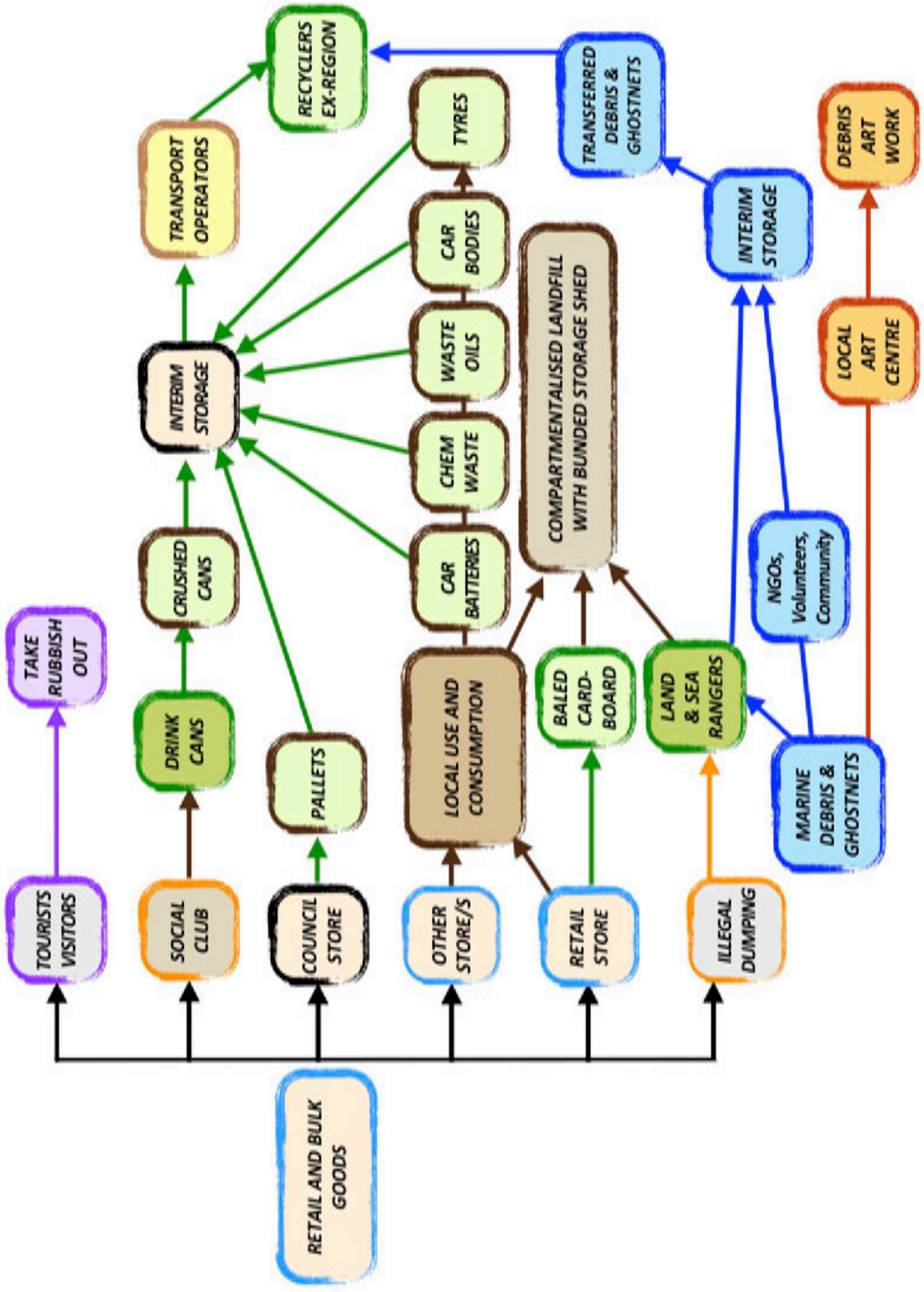


Figure 1. *Optimised recycling practice in CYP case study communities (2016).*

3.2 The critical problems

Rubbish is a relatively new problem in remote Indigenous communities. Waste products from food, clothing, tools and other items have traditionally come from the land and been recycled back into the land e.g. seeds from fruits, animal bones and skins, timber offcuts. In contemporary communities there is a huge amount of packaging and waste products that cannot be recycled back into the land e.g. plastics, metals. This creates a new problem of managing waste in a remote area where "rubbish" is relatively unfamiliar and its impacts on the environment have not been well considered.

Most, if not all, waste products in remote communities end up in landfill or become "rubbish", lying around the community, and being carried by wind and rain to the surrounding land and sea country. This rubbish can directly affect the health of people and wildlife, contributing to an unhygienic environment and harming / killing birds, fish, turtles and other sea life by eating the rubbish or getting tangled up in it. Waste products can also leach chemicals into our environment, indirectly affecting wildlife and food sources. Additionally, waste products from surrounding regions and ships travel on ocean currents e.g. plastic packaging, large fishing nets, and end up on relatively pristine beaches in remote communities.[25]

Table 4. *Case study communities: How does it work locally at the moment?*

Location	Municipal waste management structure	Marine debris coordination
Lockhart River Aboriginal Shire	LRASC Environmental Manager, who reports to the CEO who then reports to the full Council.	No coordination through LRASC at present. Kuuku Ya'u Aboriginal Corporation RNTBC Ranger program (current status of operations unclear). Angkum Aboriginal Corporation: Angkum Indigenous Protected Area (current status of operations unclear).
Mapoon Aboriginal Shire	Presently MASC Works Manager (vacant late 2016), who reports to the Operations Manager and the CEO who then report to the full Council.	Coordinated through Mapoon Land & Sea Rangers who are directly employed by MASC and presently funded by the Working on Country (WOC) program and the Qld Indigenous Land & Sea Rangers (QILSR) program.
Pormpuraaw Aboriginal Shire	PASC Environmental Manager (waste reporting, remote waste and recycling) and Operations Manager (township garbage runs), who both report to the CEO, who then reports to the full Council.	Coordinated through Pormpuraaw Land & Sea Management (PLSM), with PLSM Rangers directly employed by PASC and presently funded by the Qld Indigenous Land & Sea Rangers (QILSR) program.

[25] Extract from Rubbish Art Report, Thamarrurr Rangers, Thamarrurr Development Corporation, Wadeye (NT) 2016

Table 4 outlines the main reporting lines within each remote Indigenous municipality considered in this case study. Internal council reporting arrangements are generally fairly direct and streamlined, and can greatly benefit from routine managerial staff meetings. Marine debris management arrangements range from the relatively straightforward: where marine debris and related land and sea management is routinely undertaken by established ranger services, to the more challenging: where land and sea management is undertaken by a number of parties or on a more sporadic ad hoc basis.

At the end of the road, a world away from the mainstream

Almost exclusively, all fresh and frozen foods, other goods and various consumables used in the case study communities originate externally, and are transported into all of these communities from southern origins. Commercial & Industrial (C&I) and Construction and Demolition (C&D) supplies are predominately sourced and imported from outside locations by contractors or other remote service providers. Ultimately, regardless of where consumables (and their related waste components) are sourced from, waste residual must still be dealt with by the receiving remote community itself. This report assumes that 100% of all consumables are imported into these remote case study communities. For the purposes of this report, local subsistence resource use is assumed to not create inorganic waste or debris *per se*[26]. Local residents also opportunistically purchase supplies (general and bulk) in Cairns, Weipa or Mareeba.

Map 5 provides an overview of the main, relevant CYP remote road transport and barge supply routes.

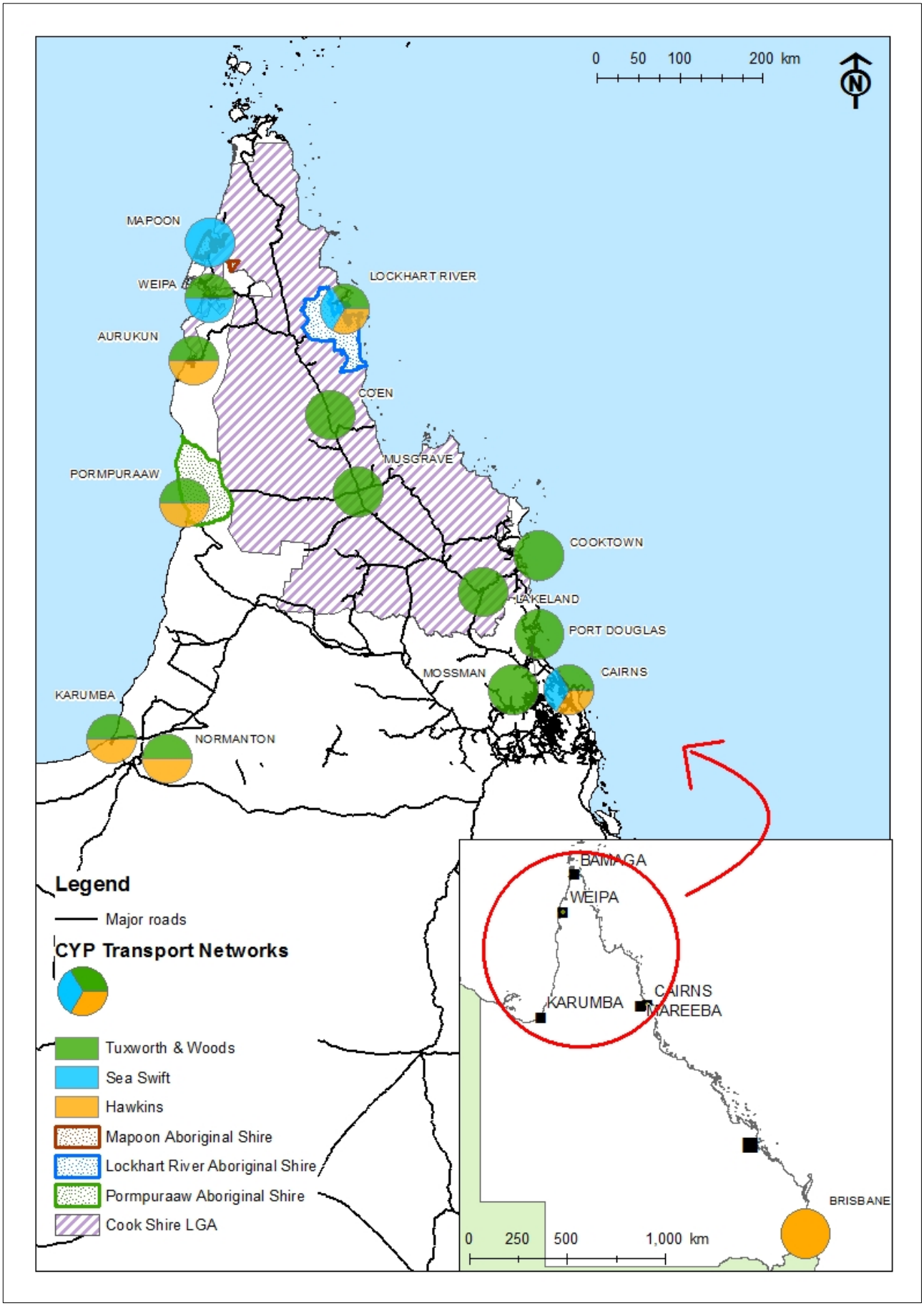
Community retail stores operated by the Remote Stores Branch (RSB) trade in Lockhart River and Pormpuraaw. RSB retail stores' supply chain is predominately active during the northern dry season, with the sole freight transport provider Hawkins Transport (a small family business operating out of Normanton) essentially backloading RSB supplies out of Brisbane's Rocklea Markets as part of the company's general seafood and fresh produce transport operations. Weekly supply runs to CYP communities during the dry season generally leave Brisbane late in the week, dropping off store supplies early in the following week. In effect RSB are only paying for freight the one way, added freight costs would be completely uneconomic[27].

Operations are highly seasonal with a significant supply run taking place before each wet season. RSB retail store warehouses in communities are filled up with a six (6) month supply of dry, fresh and frozen goods during each November. Available warehouse space is used for this provisioning, thus leaving no space to store accumulated recyclables in store. Storage of any items in stores or associated warehouses is subject to rigorous food storage and handling standards, workplace health and safety codes and fire-prevention regulations. Any accumulated bulk recyclables require external storage and arrangements requiring stores to

[26] It is acknowledged that related activities may generate some local waste at times e.g. discarded fishing line, bait packaging, litter etc.
[27] *Personal communications* Eoin Quinvilan, Director of Retail Stores, Retail Stores Branch, DATSIP 17 October 2016

transport waste back out of communities will cost money and thus reflected in local store retail prices.

In the financial year to 30 June 2016, RBS transported some 380,000kgs of trading stock to its Pormpuraaw retail store and about 454,000kgs to its retail store at Lockhart River (excluding diesel and unleaded fuel). Applying 2011 ABS census data, this equates to an estimated 520kg of consumables per capita per annum for the Pormpuraaw community and about 841kg of consumables per capita per annum for Lockhart River. These figures are don't take into account consumables by visitors, government workers and contractors that spend time in these communities.



Map 5. *Selected CYP transport networks (2016).*

Mapoon's Ragapayn Store is owned and operated by MASC and receives weekly supplies through Weipa, where bulk supplies from southern centres are delivered by scheduled Sea Swift barge services operating out of Cairns. However, many Mapoon residents prefer to shop in Weipa for food and consumables including alcoholic beverages. An estimate of 681kgs of consumables per capita per annum is assumed for Mapoon for the purposes of this study.

The respective Alcohol Management Plans (AMP) for the Lockhart River and Pormpuraaw Aboriginal shires have zero carriage limits (alcohol is prohibited). Certain regulated carriage limits apply under the Mapoon Aboriginal Shire AMP but there is presently no existing canteen or social club selling alcohol locally. The closest restricted sales points for alcoholic beverages in the vicinity of Lockhart River are the roadhouse at the Archer River (140kms) and Coen (210kms). Apart from the Pormpuraaw Brothers Social Club (a scheduled canteen under the Pormpuraaw AMP) the closest restricted sales point for alcohol in the vicinity of Pormpuraaw is the roadhouse at Musgrave (220kms). LRASC is working towards re-opening a social club (canteen) at Lockhart River during 2017, and MASC is currently considering a similar venue at Mapoon.

Unique local circumstances

All three case study local government areas are waste levy exempt[28] (in total 39 of 73 local governments in Queensland are waste levy exempt). Cook Shire and the Weipa Town Authority Area are also levy exempt. Each of the case study Aboriginal Shire councils allocate oversight of municipal waste management in slightly different ways and the coordination of marine debris removal activities also varies from place to place (Table 4). From time to time incoming local administrations and staff turn-over may cause these to change. In addition, statutory or regulatory requirements may cause these arrangements to change.

Collaborative initiatives such as GNA and Tangaroa Blue have worked towards finding solutions to the huge amount of marine debris in the Gulf of Carpentaria and the Torres Straits region over the past decade, with a clear finding being the need for some sort of recycling to mitigate increasing pressures on local landfills[29].

Ever increasing costs and onerous regulatory compliance burdens

Local governments in Queensland, including remote Indigenous local governments, and private waste operators are required to provide waste data returns and to complete an Annual Waste Survey for input directly into the Queensland Waste Data System (QWDS) maintained by the Department of Environment and Heritage Protection. Generally, waste-related data is entered on-line by a designated council employee. Other compliance requirements revolve around bore water quality monitoring in proximity to landfills.

[28] State of Queensland (2011) Waste Site Characterisation Survey Final Report, Dept. of Environment and Resource Management
[29] Personal communications Riki Gunn, co-founder GhostNets Australia 14 November 2016

Key capacity issues for effective data collection, consistent record keeping, and timely data input revolve around available waste collection equipment; calculation of waste estimates; high staff turnover rates; employee commitment to meeting workplace tasks; time management and strategic priority setting. Presently, there are only so many people available in remote communities who can fulfil the demands of complex, intersecting workplace duties which generally prevail in these smaller localities.

Of the three case study communities, all councils have indicated waste data is to be imputed into QWDS, however the capacity of the individual councils concerned to do so on a consistent basis is highly varied:

- PASC (Pormpuraaw) routinely provides data to QWDS, with local data records going back to 2008.
- MASC (Mapoon) stated it had provided some waste data to QWDS, but on a less consistent basis.
- LRASC (Lockhart River) stated it is presently trying to find capacity to provide data for input into QWDS.

Based on comprehensive waste data collected in 2014 and 2015 at Pormpuraaw 222 households benefited from regular kerbside garbage collection, with an average of 462 tonnes collected per annum. This data provides for an attributable average household garbage volume of 2 tonnes p/household p.a., and an attributable average individual garbage volume of around 600kgs p/person p.a. (based on the 2011 ABS census). These figures do not include kerbside collected green waste, illegally dumped waste or other waste types. This compares in relative terms with the 2014-2015 average per capita waste volume generated in remote Queensland of some 573kg per person[30].

Selected waste data provided by the Pormpuraaw community is summarised diagrammatically below, and is used as a base line for estimates across the other case study communities, as other councils were not in a position to provide similar data within this research work's timeframes. Note that some totals in the Pormpuraaw data may include totals for certain items which have been accumulated over time.

It is clear from this data that domestic waste places the largest annual average volumetric burden on this community's landfill capacity. The data also indicates remote infrastructure development (e.g. housing construction, public benefit infrastructure and services facilities) can pose significant periodic volumetric burdens on landfills maintained in remote CYP Indigenous communities.

Costings for proposed solutions use the Warraber Island Waste Pilot Project undertaken by the Torres Strait Island Regional Council commencing in 2009 are discussed below. Available information about remote CDS implementation at Wadeye and Kalkarindji / Daguragu in the Northern Territory is also discussed below.

[30] QWDS dataset per capita waste generation in Queensland by local government category - https://data.qld.gov.au/dataset/soe2015-per-capita-waste-generation/resource/indicator-3-3-1-3-1 - accessed November 2016.

As all case study community Aboriginal Shire councils have expressed a keen interest in the progression of locally tailored recycling arrangements and recycling infrastructure development, the lessons learnt and general recommendations of that project are considered to be the most relevant and compatible to their own circumstances, particularly given the current discussions around implementation of a State-wide container refund scheme in Queensland.

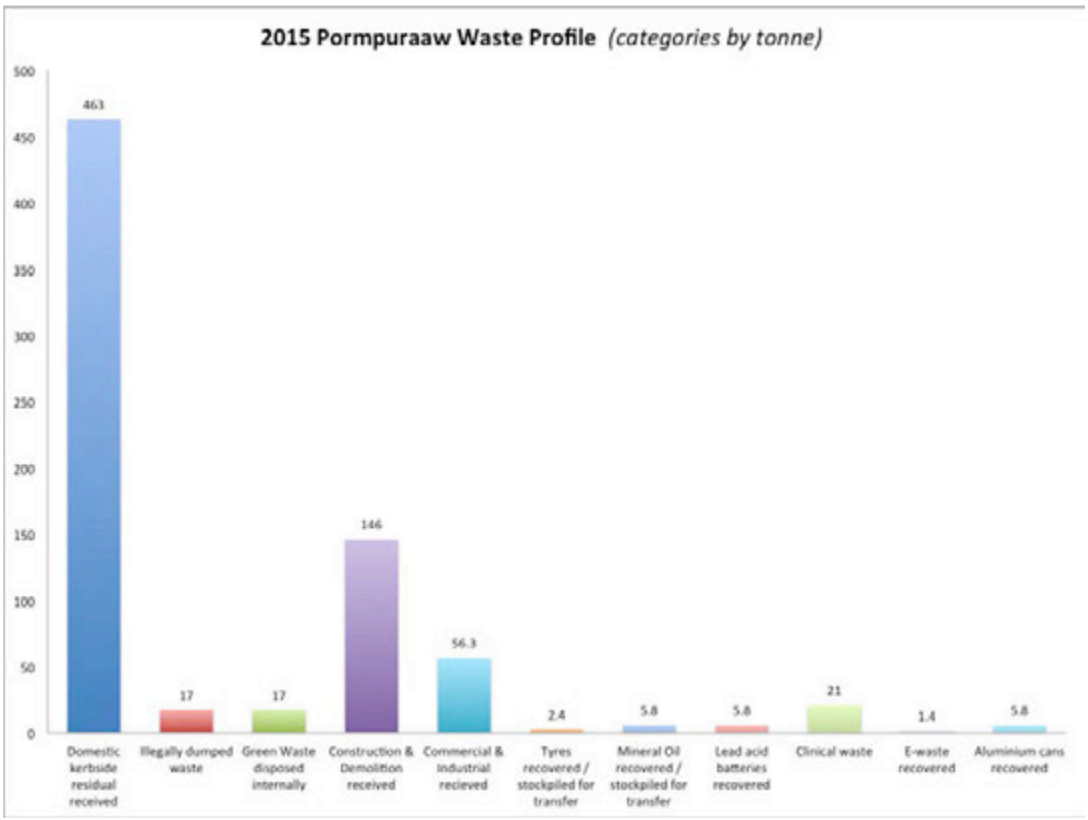


Figure 2. *2015 community waste profiles from Pormpuraaw (source: PASC).*

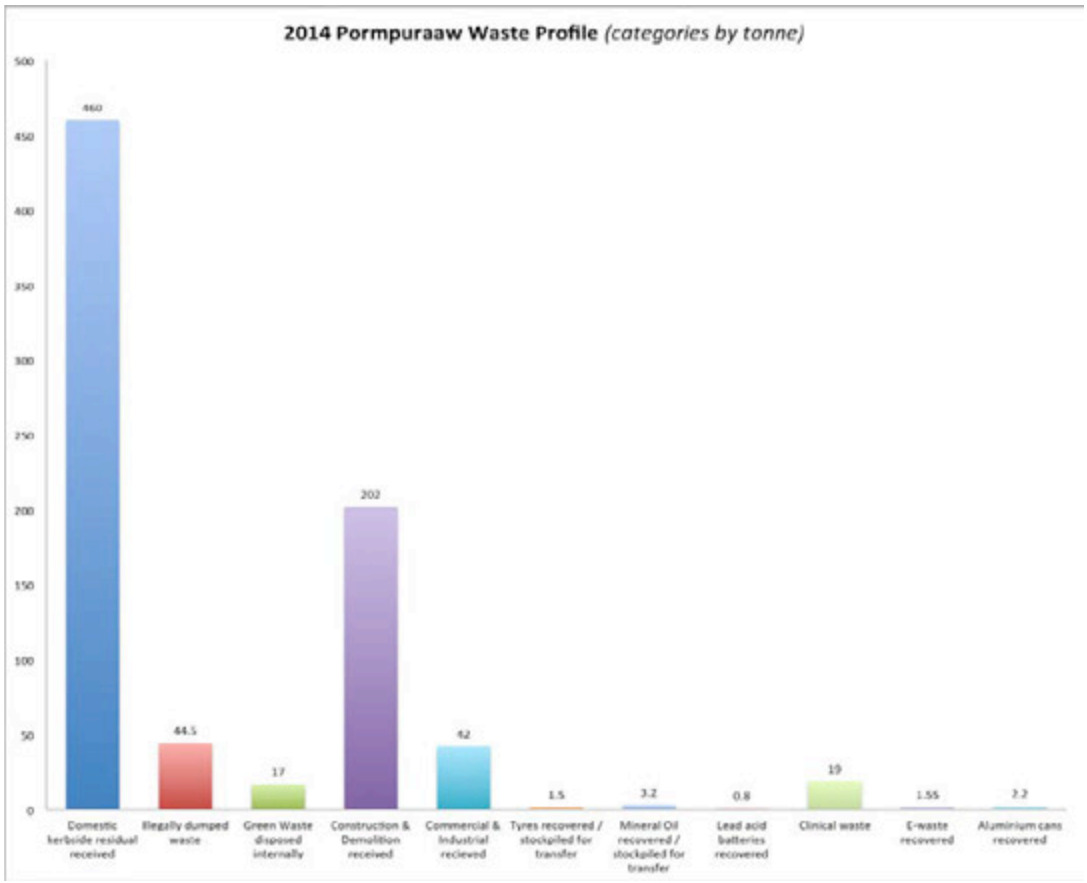


Figure 3. *2014 community waste profiles from Pormpuraaw (source: PASC).*

4. Emerging regulatory mechanisms require local resources and industry incentives

> *We are very committed to looking at ways to how we can improve the management of what's consumed here and what's produced waste-wise. As we know we are at the end of the line. We are remote Australia, and what comes here doesn't necessarily go anywhere else... At the end of the day, we need the connections to make it back into recycling. (Leon Yateman, CEO Mapoon Aboriginal Shire Council 2016)*

> *We have a can crusher and baler… but we now need a bigger volume crusher to better prepare recyclables and maximize our returns [income generated by selling recyclables to processors]. (Robbie Morris, Environmental Manager Pormpuraaw Aboriginal Shire Council 2016)*

Extreme remoteness, logistical and municipal resource constraints, service delivery realties, limited consumer options, rigorous food safety regulations, intermittent electricity supplies, localised cultural preferences and ingrained behavioural practices all act to impede waste minimisation in the three case study communities.

It is clear that emerging regulatory mechanisms like the proposed Queensland container refund scheme must be developed in parallel with effective complementary local recycling arrangements and industry incentives. This will require additional locally-deployed resources: in terms of initial capital outlays for recycling plant and equipment; to ensure on-going capacity for optimised remote recycling and for strategically effective cross-regional coordination and brokerage. Industry incentives – for example fuel cost offsets for regular transport / backloading of recyclables – will also require serious consideration, as the distances involved are prohibitive no matter which remote jurisdiction is involved. Current efforts, whilst highly commendable, come at the expense of remote local governments with minimal grant or other financial assistance, remain locally ad hoc in nature and are highly dependent on committed individuals.

QWDS data from Pormpuraaw indicates that the largest tonnage of recyclable material arises from steel (e.g. end-of-life vehicles, scrap metals, obsolete whitegoods etc.). Aluminium cans and plastic drink containers also contribute consistently large volumes throughout the year. Various C&D and C&I materials are allowed to accumulate in storage areas within the PASC landfill facility prior to local re-use or periodic transfer for recycling (e.g. tyres, clean fill, hazardous wastes). However, there is no in-house separation of recyclable materials and there are currently no locally available resources for coordinated recycling.

Pormpuraaw data indicates that a significant amount of time, cost and effort is committed by that remote local government in dealing with illegally dumped waste, predominately generated by commercial fishing operators, who operate under roving permits issued by fisheries agencies but whose local presence within that Shire is not authorised by the local landholding trustee, in this instance the Aboriginal Shire Council. For example in 2014 PASC dealt with 17 tonnes of illegally dumped waste at a cost of $16,000 to Council.

QWDS data was unable to be provided from either Lockhart River or Mapoon at present. Research conducted with those communities shows there is minimal opportunistic re-use and only sporadic recycling. Again, there is no resourced local coordination of recyclables, nor has there been any organised brokerage of local or intra-regional recycling within these communities to date.

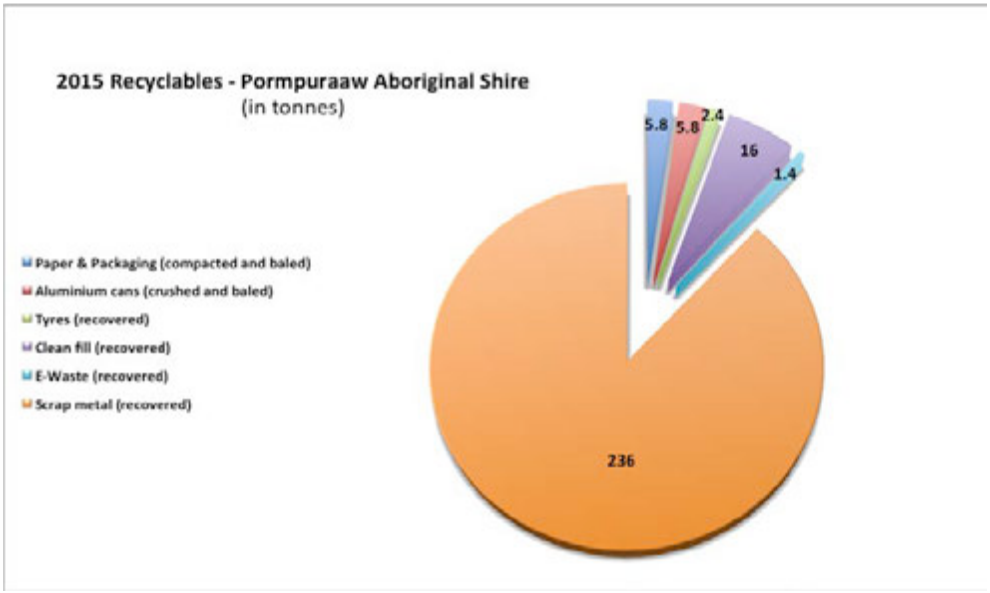


Figure 4. *2015 PASC recyclables data (source: PASC).*

The following holds for all of the case study communities:

- All have growing populations, with active infrastructure / housing expansion programs in train;
- All are extremely remote and may be inaccessible for a significant proportion of any one year;
- All local councils are clearly mindful of the operational limitations of their existing landfills;
- Recycling effort is often directly proportional to the personal commitments of key individuals;
- Local climatic conditions are seasonally extreme;
- Environmentally sound strategies available for a reasonable cost are generally lacking;
- Management of rubbish and hard waste is council resource intensive and extremely challenging;
- Transport costs within the CYP region, and to major southern MRFs and centres are extremely high;
- Transfer of recyclables to processing centres presents considerable challenges and costs;
- Calculating volumes of certain waste streams is difficult; and
- Whitegoods and electronic goods consumption rates are exacerbated by variable power supplies and native title compensation schemes that may annually distribute large volumes of new goods.

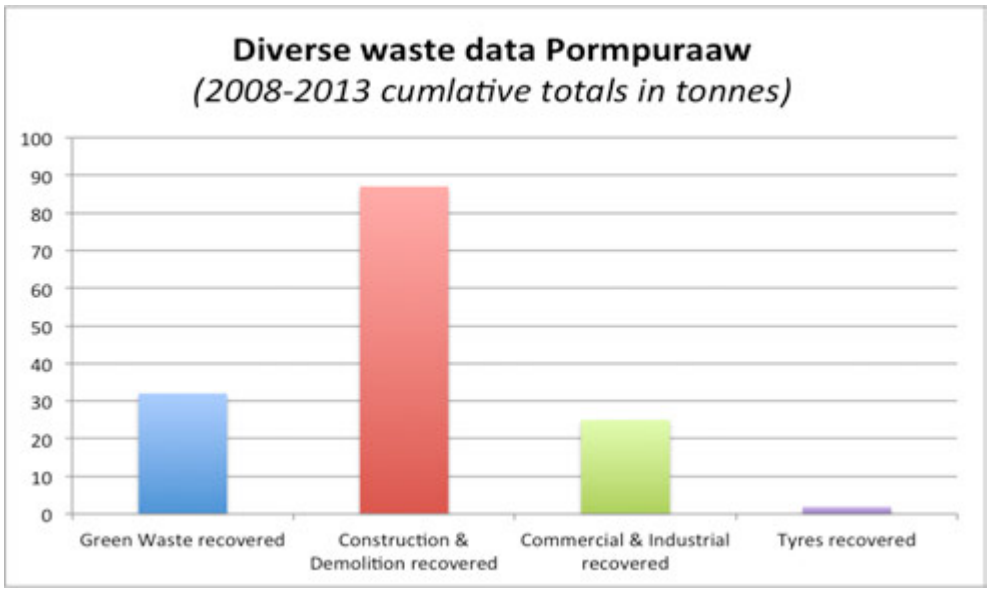


Figure 5. *Multi-year selected waste data (source: PASC).*

Best practice - locally coordinated recycling and regional industry incentives to complement emerging state-wide regulatory recycling schemes

Container deposit / refund schemes are proposed to be introduced in New South Wales during 2017 and in Queensland during 2018. The next 12 months will be critical for regulatory agency engagement with remote Indigenous communities to develop complementary local and regional arrangements which do not disadvantage remote Indigenous communities from sharing the benefits associated with such schemes: significantly reduced litter and marine debris volumes, related enterprise development potential / remote Indigenous employment growth, improved environmental health outcomes and local income generation.

The Queensland Container Deposit Scheme Advisory Group has the role of initiating discussions and facilitating dialogue with all stakeholders in the development of the container refund proposed for the state. The Group is also charged with investigating potential regulatory changes regarding single-use plastic bags[31]. The proposed scheme has a number of clear initial objectives:

- Objective 1 – Reducing the litter impact from beverage containers in the away-from-home context.
- Objective 2 – Improving resource recovery, especially in regions, and providing benefits to jobs and the economy.
- Objective 3 – Enhance social benefits by encouraging community-based enterprises to participate in the scheme.

The Group's website details the scheme's recommended design principles, namely that the scheme must:

- Cover the whole state to ensure all Queenslanders have the opportunity and ability to recover their beverage containers – regional arrangements are necessary.
- Be cost-effective with minimal cost to the Queensland community.
- Be straightforward and convenient to use while providing public education and awareness and approaches to encourage participation.
- Recognise the potential financial and resource recovery impacts on existing recycling services and present opportunities to mitigate these impacts and minimising duplication of existing recycling infrastructure.
- Be flexible and responsive with ability to improve and adjust over time if circumstances change.
- Provide transparent mechanisms for accountability, including the ability to easily track the flow of monies and the quantities of recovered and recycled containers and materials.
- Provide clear and efficient governance arrangements.
- Consider other national and state packaging initiatives by government and industry either in place or proposed.
- Recognise the potential commercial impacts associated with a scheme.
- Be designed to prevent fraudulent behaviour.

[31] https://www.ehp.qld.gov.au/waste/container-deposit-scheme.html accessed July, September, October, November and December 2016

- Utilise different collection methods to suit local circumstances and provide opportunities for multiple participants and beneficiaries.
- Have legislated features (eg. refund amount, container scope, container approval and labelling requirements and governance arrangements) to provide an enduring arrangement.

Discussions with CSC indicate there is clear potential to build recycling industries in the medium term which utilise recyclable resources extracted from CYP, but that these must be underpinned by regulatory recycling initiatives and incentives, backed up by coordinated local remote community recycling which can provide consistent payloads for private industry operators, and a useful monetary return for remote communities[32]. Remote regional councils in Australia's north are also increasingly developing waste reduction strategies[33].

Thus key coordinating entities which support the selected CYP case study communities like the Cape Indigenous Mayors Alliance and the Indigenous Leadership Forum are considered essential partners in strengthening and scaling up remote recycling across the region. Regulatory agencies will also need to be directly involved and coordinated into a regionally effective and well-integrated network to support recycling including locally viable container refund scheme arrangements.

Local coordination needs to consistent and dedicated over time. The experience of the Warraber Island Waste Pilot clearly demonstrates that substantial capital investments require sustained local government commitment to remain operative over time. It is acknowledged that the Torres Strait region is subject to special circumstances: e.g. very restrictive quarantine regulations, very dispersed localities within a single local government jurisdiction and no terrestrial transport routes. Clear commitments are required from local government to keep facilities such as the one established on Warraber Island operational, and there are further requirements for other levels of government to commit additional capital for human resources, capacity building, technical support and cross-agency coordination to keep remote facilities functional[34].

Advice from remote communities in the NT[35] who are engaged in recycling is that coordinated brokerage, over a collective of municipalities, can maximise the array of viable opportunities and alternative solutions. Several remote NT regional councils have come together with the NT Department of Health to resource a full-time coordinator whose role is to liaise between remote jurisdictions, regulatory agencies, transport companies and recycling industry operators to facilitate better waste management, integrated recycling and related outcomes in remote areas[36]. The position, which commenced some 6-7 months ago, has an initial annual budget of around $120,000 which comprises nominal contributions from 3 remote regional

[32] Personal communications Alan Wilson, Deputy Mayor Cook Shire Council, 13 September 2016 and 27 November 2016
[33] For example the East Arnhem Regional Council 2015-2025 Waste Management Strategy (http://www.eastarnhem.nt.gov.au/waste-strategy/)
[34] Personal communications Mika David, Senior Environmental Officer, Torres Strait Island Regional Council, 21 November 2016.
[35] Personal communications Rob Drew, Council Operations Manager Kalkarindji Daguragu Communities within the Victoria Daly Regional Council jurisdiction, 2 December 2016.
[36] Personal communications Liam Harte, Coordinator Big Rivers Waste Management Working Group NT, 7 December 2016

councils (~$10,000 each) and a contribution of some $90,000 from the NT Department of Health. The success of the project to date, and the value the collaborating regional councils derive from the role, may see the project continued for a further 2 years to mid 2019 as a co-funded initiative resourced through two NT government departments. It should be noted that this role is separate to, and in addition to, remote environmental health workers located in remote NT communities to improve Indigenous health outcomes.

The Wadeye community and the Kalkarindji / Daguragu communities are situated in the remote NT, at substantial distance from basic recycling facilities in Darwin, which can currently only process Container Deposit Scheme (CDS) recyclables. Other recyclers used to date by remote NT Indigenous communities are based in Brisbane or in Adelaide. Both communities have local recycling programs which link into the NT's CDS, with subtle differences in how these local recycling initiatives operate.

Table 5 provides a general overview of the aforementioned remote NT and Torres Strait recycling schemes.

Table 5. *Examples of remote recycling in the NT and the Torres Strait.*

Community	Type of scheme	Current status	Supported by
Kalkarindji and Daguragu (NT)	Local community recycling scheme which feeds into NT CDS, run and managed by Victoria Daly Regional Council employed staff	Actively processing most local drink container waste (cans, plastic bottles) with regular transfers back-loaded out to recyclers. No direct monetary refund (benefit) to individuals. All collected refund monies go back into community.	Income generated from CDS refunds is directly re-invested into community e.g. purchase of more recycling equipment or for priority community projects. (Source: R Drew, 2016)
Wadeye (NT) Local population around 2,500 persons	Local community recycling scheme which feeds into NT CDS, run and managed by Thamarrurr Development Corporation	Actively processing all local drink container waste (cans, plastic bottles, glass) with regular transfers back-loaded out to recyclers for free. Direct monetary refund paid by ranger program to local residents participating in the scheme. Making money for ranger program as they act as "middle men" and gain 2c extra p/item as well as the 10c refund they pass on.	Run as part of the local Working on Country (WOC) ranger program. 1 Team Leader and 6 Indigenous rangers. Rangers are tasked with assisting community to access and bring waste to designated counting area on 1 day each week (Fridays). May handle up to 20,000 - 25,000 items a week.

Community	Type of scheme	Current status	Supported by
		Looking to up-scale in terms of other recyclable items (soft plastics, scrap metal) and geographically (across smaller towns, outstations)	(Source: Thamarrurr Development Corporation, 2016)
Warraber Island (Sue Island, Torres Strait) Local population around 200 persons	12 month pilot project with all aspects of best practice waste management including: organic composting, green waste, recycling, transfer of recyclables; and non-landfill disposal. Was recycling some 85-90% of recyclables on Warraber Island.	No longer operating at capacity. No local resources currently available to responsible local government entity for facility operations or facility staff. Plant and equipment still there and reportedly only needs minor maintenance for sound working order.	Funded at $440,000.00 to establish pilot. No current funding. Funded as a one-off pilot project, with high level technical support and good community up-take. Achieved tangible benefits whilst operational (Sources: M David, 2016 and Aurecon, 2011)

Existing remote recycling effort in the NT and the example of the Warraber Island Waste Pilot clearly show that coordinated local capacity building requires direct capital and resource investments to establish and maintain. A failure to strategically invest in the short-term clearly has medium-term consequences for establishment costs. Conversely any remote recycling effort means a reduction in landfill waste volumes.

There are a number of discrete options for integrated scaled-up recycling at the remote regional scale, (although it should be noted that this area of technology is constantly evolving and rapidly expanding):

1. Bio digesters – potentially modular and scalable (dependent on system technology); expensive; requires operational volume of materials collected over a geographic region, technical maintenance and support
2. Thermal digesters – modular; scalable; proven in extreme / remote conditions overseas; expensive; requires operational volume of materials collected over a geographic region, technical maintenance and support: e.g. Batch Oxidation System™ Thermal Gasifier (Canadian technology); PlastofuelTM which creates a solid fuel or ThermofuelTM which creates diesel (both from plastics).
3. Composite plastic recycling – an example of this is the Plasmar™ recycling process (Australian) creating a timber substitute: this material is used for fencing, access bollards, decking, pallets etc.
4. 3D printing technologies hold some potential for localised re-use of certain plastics, including ghostnet materials removed from remote beaches. However, it needs to be

recognised that such processes create new plastic waste[37]. There is an internationally active research and development (R & D) community investigating materials use, technology and applications, e.g. Circular Ocean (http://www.circularocean.eu/research).

Research undertaken by GNA[38] has found that:

- Companies recycling plastic in Australia tend to mostly apply composite recycling technology;
- Some companies advised that ghostnets may not be suitable for certain recyclable processes (unconfirmed) as the material must be pelletised (plastic material shredded first then compressed) and apparently nets are unable to be shredded as they are too fibrous and clog up the machines.
- Recycling companies appear to be primarily interested in dealing with large and easy solutions (such as working with larger metropolitan councils for kerbside waste); and
- Companies were definitely not that interested in marine debris and related complications of waste transportation.
- All present recycling processes involve very large continual supply of raw materials.

Costs associated with advanced technologies are generally considered prohibitive, with the technical skills required for maintenance and up-keep also considered to be exceedingly rare and expensive to import on a needs basis. However, such equipment (e.g. Thermal Gasifier) is being used increasingly in India and in very remote parts of industrialised nations, including in remote Indigenous communities in north America. An initial list of selected Australian waste /mitigation reduction / recycling equipment suppliers, including some with demonstrated remote community supply experience, is at Appendix B. It is recognised that there are many more specialist retailers and technical support providers operating in the Australian market.

Indicative local waste stream mapping for each community are visually illustrated in Appendix C. Tailored Waste Reduction Plans have been developed for each case study community as a part of this project, and an overview of these is at Appendix D, together with tailored community waste stream education posters.

[37] *Personal communications* Heidi Taylor, Coordinator and Founder Tangaroa Blue Foundation 26 October 2016
[38] *Personal communications* Riki Gunn, co-founder GhostNets Australia (GNA) 14 November 2016

5. Remote recycling needs strong helping hands

> *The red tape has turned into a chain. (Paul Jenkins, Essential Services Director Lockhart River Aboriginal Shire Council 2016)*
>
> *[Government] want compliance that's consistent with [an urban council], with no cross-reference to resourcing. (David Clarke CEO Lockhart Aboriginal River Shire Council 2016)*

This project's research findings indicate that optimum local pathways to mitigating the increasing waste burden generated by growing remote communities and growing visitation by others to remote CYP is to invest in strategic cross-regional brokerage, collaborative partnerships, standardised infrastructure and appropriate technology options that can assist in creating as many locally closed or regionally aligned loops for best practice waste disposal and recycling as possible:

a. By initially investing in new or used capital equipment to establish an integrated array of local recycling operations, supported through community-wide coordinated recycling and locally tailored education programs focused on waste reduction / waste mitigation / recycling;
b. By reducing landfill burdens as much as possible through clearly signed and well managed source separation of transferable / recyclable / other waste and continuous operation of local recycling;
c. By regulatory agencies pro-actively assisting private industry to support and appropriately inter-face with remote community recycling streams to supply regional waste recycling operations and/or enhanced bulk recycling transfer options; and
d. Subsequently transitioning to ideal longer-term solutions such as waste bio-gasification systems or modern waste incineration equipment which delivers small amounts of fly-ash and maximises the retention of recyclable materials (glass, steel etc.) at whole-of regional-waste catchment scales.

There is no current capacity for any level of routine recycling – other than ad hoc effort – in any mainland remote Indigenous community located on CYP or in the Northern Peninsula Area (NPA), nor for that matter within the Cook Shire. Coordinated recycling is an immediate priority to extend the lifespans of exiting (or proposed expanded) municipal landfills in all three case study communities. CSC advise that they will continue to investigate the potential to initiate an emissions neutral, renewable energy powered MRF in the region over time, with a short-term focus on the establishment of container refund scheme depots and the alignment of related transport and other logistical support arrangements across the CYP region[39].

Table 6 (immediately following) is compiled as three separate listings, given the detail and complexity of related content.

[39] *Personal communications* Alan Wilson, Deputy Mayor Cook Shire Council, 13 September 2016 and 27 November 2016

The photographic images accompanying each table section illustrate a number of critical issues impacting waste and debris management highlighted by local participants and informants from the respective community concerned. Further photographs illustrating specific aspects of current and potential recycling and re-use practices in the various case study communities are included in subsequent sections of this report.

Table 6. *Priority issues and potential solutions by case study community.*

Identified priority issue	Brief description	Potential solution/s	Comments
LOCKHART RIVER ABORIGINAL SHIRE			
Landfill and Waste Separation Facility *Local Waste Reduction Plan developed for this issue*	No current separation of kerbside garbage takes place. Rudimentary separation of recyclable materials is practiced (tyres, batteries, whitegoods, green waste, oils). Difficulty in getting recyclable materials removed from separation area for recycling due to transport logistics and coordination. Difficulty in getting contractors to dispose of rubbish and waste at the facility. No leachate or water monitoring currently being conducted.	Well-resourced and increased staffing of landfill and waste separation facility. Discrete (covered where necessary) bays for waste separation. Build bunded structures at landfill to store recyclables prior to transfer to prevent spillage and contamination. Broker rudimentary transfer / recycling wherever possible, in particular for hazardous wastes. Strengthen local compliance and enforcement powers through tailored local laws. Streamline a mechanism whereby contractor dumping fees are recovered upfront by LRASC. Clear protocols for contractors entering the community on expected waste management behaviours and community expectations. Better coordination between LRASC workshop and waste separation facility could remove more oils from the community if more clean 200L oil drums were supplied (Sea Swift have very particular carriage requirements).	Separation of household waste into comingled items prior to disposal would require additional infrastructure (new collection bins) and long-term, ongoing education. As a start this project has: a) circulated a local waste newsletter b) developed local Waste Reduction Plans c) liaised with local parties to establish mobile phone and ink cartridge recycling arrangements d) liaised with recycling and transport operators to identify local opportunities Limited local backloading opportunities exist on an ad hoc basis and could be better utilised. More consistent power supply would reduce the amount of white goods entering the facility.

Identified priority issue	Brief description	Potential solution/s	Comments
Beverage container waste (aluminium cans, plastic and glass bottles) **Implementing a locally viable Container Refund Scheme** *Local Waste Reduction Plan developed for this issue*	Setting up a local container refund implementation scheme during 2017 for proposed 2018 commencement of a Qld-wide container refund scheme.	Provide culturally effective education. Secure resources for effectively brokered local coordination Pro-actively engage all local retailers. Implement a locally tailored container refund scheme Trial of beverage container collection bins at appropriate sites, e.g., front of community store, school, etc. Community discussions around use of potential income with local container refund scheme implementation.	Aluminium can waste is / will be generated from a small number of local retail outlets. LRASC is working towards approving a commercial enterprise to sell alcohol under set conditions. The opportunity to recover the vast majority of beverage containers from such an enterprise exists. Support for effective local coordination during 2017 will clearly benefit the introduction of a container refund scheme in 2018.
Retail and bulk packaging waste *Local Waste Reduction Plan developed for this issue*	Waste generated through day to day consumption, including single use plastic bags and other plastic packaging.	Provide culturally effective education. Implement a locally tailored container refund scheme. Acquire industrial baling machines capable of processing cardboard and paper. Introduce biodegradable single use bags (note a state-wide ban of single use plastic bags is under current consideration). Consider new local rules for government retail packaging disposal. Mitigate or reduce retail and bulk packaging waste. Encourage multiuse shopping bags with the view to phasing out single use bags over time.	The Retail Store uses a commercial baling machine to compact cardboard, which is then disposed of at the landfill, however this is not available for general use. Retail practice change will require RBS policy change and State Government regulatory changes. The loop needs to be closed on RSB generated baled cardboard. Options for opportunistic back loading cardboard to a recycler in Cairns or Mareeba or the shredding and reuse of cardboard needs to be investigated.

Identified priority issue	Brief description	Potential solution/s	Comments
Illegal behaviours regarding waste disposal *Local Waste Reduction Plan developed for this issue*	Illegal dumping and waste disposal fee avoidance by contractors.	Well-resourced and staffed municipal waste facility with surveillance in place. Streamline a mechanism whereby contractor dumping fees are recovered upfront by LRASC. Clear protocols for contractors entering the community on expected waste management behaviours and community expectations. Establishment of surveillance camera(s) at waste facility. Increased community education on the dangers and costs of illegal dumping. Signage in regards to littering in strategic places around the community. Consider legal action against breaches where related conditions are set in contracts. Consider contractor bans for repeat offenders. Secure stronger local compliance and enforcement powers. Lobby for improved regulatory agency support for local authorised officers.	The costs of taking legal action would need to be considered as these could be considerable. Some remote councils have a policy of contractor bans if repeat breaches occur.
Meeting the requirements of **increased municipal compliance**	Onerous compliance burdens and reporting requirements for small remote landfill sites	Streamline waste mandatory reporting requirements Clear, unambiguous (not duplicated) decision-making Lobby for effective technical support for remote councils Ensure waste management facility areas are factored into local agreements including ILUAs Development of a easy to use and workable formula to estimate different waste volumes for mandatory reporting	Flexibility in adapting compliance requirements to local constraints may be required in State regulatory frameworks. Well considered, strategic waste planning an essential foundation for improved compliance.

Identified priority issue	Brief description	Potential solution/s	Comments
Marine debris loads on SE facing beaches within the greater Lockhart Region *Local Waste Reduction Plan developed for this issue*	Marine debris loads on south-east facing beaches in the greater Lockhart region are extreme	Secure investment in remote marine debris removal and coordinated data maintenance Joint marine debris recovery operations on sea-access only remote beaches with assistance of Australian Defence Force (ADF) or similar	Remote Indigenous local government requires some form of locally accessible and consistent land and sea management capacity. Complex local situations can arise in relation to these arrangements. Brokered coordination assists implementation.

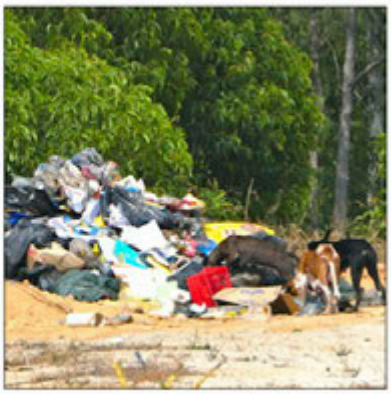
Nappies - a growing litter problem *for the Lockhart River Aboriginal Shire, Sept. 2016*

Old dump re-used for local dog pound *Lockhart River Aboriginal Shire , Sept. 2016*

Contractor waste at landfill *Lockhart River Aboriginal Shire , Sept. 2016*

Wheelie bins don't tend to enjoy long lives *Lockhart River Aboriginal Shire , Sept. 2016*

Garbage collection compactor maintenance *Lockhart River Aboriginal Shire , Sept. 2016*



Dogs scavenging at landfill *Lockhart River Aboriginal Shire , Sept. 2016*

Identified priority issue	Brief description	Potential solution/s	Comments
MAPOON ABORIGINAL SHIRE			
Illegal dumping *Local Waste Reduction Plan developed for this issue*	Illegal dumping was described as having both local and external sources. Opportunistic dumping of whitegoods (mainly) happens at landfill and waste separation facility from Weipa residents avoiding dumping fees in Weipa.	Well-resourced and staffed municipal waste facility with surveillance in place. Consider legal action against breaches where related conditions are set in contracts. Consider contractor bans for repeat offenders. Secure stronger local compliance and enforcement powers. Lobby for improved regulatory agency support for local authorised officers. Increased signage on entering the Shire and within the Shire.	The costs of taking legal action would need to be considered as these could be considerable. Some remote councils have a policy of contractor bans if repeat breaches occur. Visitor information and tourist camping permits include clear protocols on rubbish and dumping as well as access restrictions.
Landfill and Waste Separation Facility *Local Waste Reduction Plan developed for this issue*	No current separation of kerbside garbage takes place. Rudimentary separation of recyclable materials is practiced (tyres, batteries, whitegoods, vehicles). Landfill area reaching capacity and in need of expansion.	Landfill footprint is currently being rescaled to provide increased capacity into the future. Well-resourced and staffed municipal waste facility with discrete bays for waste separation. Build bunded structure/s at landfill to store recyclables prior to transfer. Broker rudimentary transfer / recycling wherever possible, in particular for hazardous wastes. Strengthen local compliance and enforcement powers. Transportation of white goods, batteries and tyres to REMONDIS in Weipa on a regular basis.	Separation of household waste into comingled items prior to disposal would require additional infrastructure (new collection bins) and long-term, ongoing education. As a start this project has: a) circulated a local waste newsletter b) developed local Waste Reduction Plans c) liaised with local parties to establish mobile phone and ink cartridge recycling arrangements d) liaised with recycling and transport operators to identify local opportunities.
Implementing a locally viable Container Refund Scheme *Local Waste Reduction Plan developed for this issue*	Setting up a local container refund implementation scheme during 2017 for proposed 2018 commencement of a Qld-wide container refund scheme.	Provide culturally effective education. Secure resources for effectively brokered local coordination. Pro-actively engage all local retailers. Implement a locally tailored container refund scheme.	Support for effective local coordination during 2017 will clearly benefit the introduction of a state-wide container refund scheme in 2018.

Identified priority issue	Brief description	Potential solution/s	Comments
Marine debris on remoter beaches in the greater Mapoon region *Local Waste Reduction Plan developed for this issue*	Secure investment in remote marine debris removal and coordinated data maintenance.	Remote Indigenous local government requires some form of locally accessible and consistent land and sea management capacity. Complex local situations can arise in relation to these arrangements. Brokered coordination assists implementation. Remote debris removal will require resources to periodically engage a barge and additional manpower.	Secure investment in remote marine debris removal and coordinated data maintenance required.

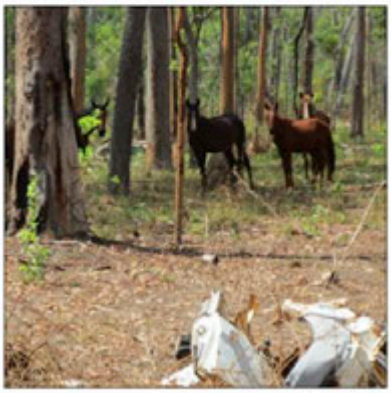
Whitegoods, with some allegedly illegally dumped *Mapoon Aboriginal Shire, Sept. 2016*

Local debris hotspots - remote beaches
Mapoon Aboriginal Shire © Kerry Trapnell for Mapoon Land & Sea Rangers / MASC

Kerbside wheelie bins have high turn-over
Mapoon Aboriginal Shire, Sept. 2016

The "Golden Thong" Marine Debris award
Mapoon Land & Sea Rangers, Dec. 2014

Bins on stands at Cullen Pt camping area
Mapoon Aboriginal Shire, May 2014



Horses cause problems for landfill fencing
Mapoon Aboriginal Shire, Sept. 2016

Identified priority issue	Brief description	Potential solution/s	Comments
PORMPURAAW ABORIGINAL SHIRE			
Illegal dumping *Local Waste Reduction Plan developed for this issue*	Rubbish, debris, hard and hazardous waste discarded in remote, seasonally inundated areas.	Secure stronger local compliance and enforcement powers. Lobby for improved regulatory agency support for local authorised officers.	Commercial fisherman accounted for almost all illegally dumped waste.
Implementing a locally viable Container Refund Scheme *Local Waste Reduction Plan developed for this issue*	Setting up a local container refund implementation scheme during 2017 for proposed 2018 commencement of a Qld-wide container refund scheme.	Provide culturally effective education. Secure resources for effectively brokered local coordination. Pro-actively engage all local retailers. Implement a locally tailored container refund scheme.	PASC currently supplies large mesh cages at sports club (pub) for empty aluminium cans, which are picked up and taken to small makeshift recycling shed where they are crushed and baled for transfer to a Cairns based MRF for re-processing.
Meeting the requirements of increased municipal compliance	Onerous compliance burdens and reporting requirements for small remote landfill sites.	Streamline waste mandatory reporting requirements. Clear, unambiguous (not duplicated) decision-making. Lobby for effective technical support for remote councils.	Recent landfill upgrade (cost ~$89,000) brings PASC facility up to remote compliance standards. Flexibility in adapting compliance requirements to local constraints may be required in State regulatory frameworks.
Retail waste *Local Waste Reduction Plan developed for this issue*	Waste generated through day to day consumption, including single use plastic bags and other plastic packaging.	Implement a locally tailored container refund scheme. Acquire industrial baling machines capable of processing cardboard / paper. Introduce properly biodegradable single use bags. Consider new local government retail packaging rules. Mitigate or reduce retail and bulk packaging waste.	The Retail Store uses a commercial baling machine to compact cardboard, which is then disposed of at the landfill, however this is not available for general use. Retail practice change will require RBS policy change and State Government regulatory changes.
Coordination of local transfers and recycling *Local Waste Reduction Plan developed for this issue*	No current separation of kerbside garbage takes place. At the local level better coordinate the enhanced collection, all-weather storage	Continue to facilitate periodic transfers out of community for all recyclables and hazardous wastes, in particular prior to each wet season. Safely stockpile other bulk recyclables for periodic on-site compaction and transfer out to	PASC stores waste oils and transports to Cairns as required by a contractor to an external MRF (Newport Recycling Cairns Qld). Lead Acid batteries are stored in the new hazardous goods bunded storage building and are

Identified priority issue	Brief description	Potential solution/s	Comments
	and effectively timed transportation of selected recyclables by to identified MRFs in southern centres.	recyclers (e.g. end-of-life vehicles). Implement a locally tailored container refund scheme. Secure resources to acquire, maintain and operate larger capacity recycling equipment. Establish a separately resourced (new) Council position to broker and coordinate cross-community recycling.	transported by contractor to an external MRF (Newport Recycling Cairns Qld). PASC stores accumulated e-waste (electronic waste) and periodically arranges for its safe transport and disposal to an external MRF (Sims Recycling Solutions Cairns Qld). In 2014-15 PASC financed a mobile car crushing plant to travel to Pormpuraaw and crush/bale a 15 year stockpile of 123 vehicles (Zebra Metals Gracemere Qld www.zebrametals.com.au.

Kerbside garbage bins secured on stands
Pormpuraaw Aboriginal Shire, October 2016

Municipal garbage collection *Pormpuraaw Aboriginal Shire, October 2016*

Hard waste being disposed at landfill site
Pormpuraaw Aboriginal Shire, Sept 2016

Rubbish bin at Waa-Hurpaanth Homeland
Pormpuraaw Aboriginal Shire, Oct. 2016

Town bin with Kuuk Thaayorre language
Pormpuraaw Aboriginal Shire, Sept. 2016

Bins secured on stands in public areas
Pormpuraaw Aboriginal Shire, Oct. 2016

Used cans collected for crushing and baling *Pormpuraaw Aboriginal Shire Council, Sept. 2016*

RamCan™ crushing and baling machine *Pormpuraaw Aboriginal Shire Council, Sept. 2016*

Crushed cans ready for transfer out *Pormpuraaw Aboriginal Shire Council, Sept. 2016*

Hand crusher for drink cans, Green Hoose *Cook Shire (adjacent to Lockhart River) Sept. 2016*

Crushed drink cans, Green Hoose *Cook Shire (adjacent to Lockhart River) Sept. 2016*

Baled aluminium cans stored for transfer *Portland Roads (Cook Shire) Sept. 2016*

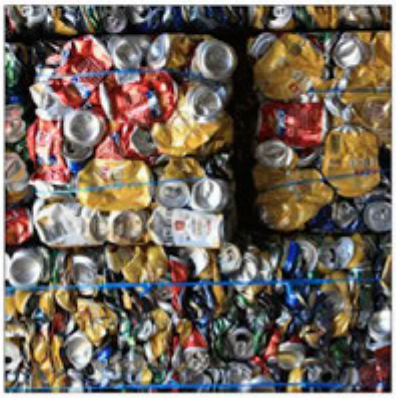
Batteries: sometimes used to make sinkers *Lockhart River Aboriginal Shire, Sept. 2016*

Illegally dumped waste creates local hazards *© PLSM Rangers / PASC 2009*

Tourist collected thongs - not appreciated locally *Mapoon Aboriginal Shire, May 2014*

Routine debris removal creates employment *© PLSM Rangers / PASC 2015*

Community education is critical to changing habits around littering *Cooktown (Cook Shire) Sept. 2016*



Waste is a new resource if it is recycled *Pormpuraaw Aboriginal Shire. Sept. 2016*

6. Recommendations

> *Cost is always going to be an issue, so if we are able to find partners [then that may improve waste management efficiencies]. (Leon Yateman, CEO Mapoon Aboriginal Shire Council 2016)*

Effective recycling of municipal waste and marine debris in remote areas requires pro-active local and regional brokerage, and locally co-ordinated recycling capacities which are well integrated with a developing regional recycling industry. Limited discretionary funding of small footprint activities will not result in long-term reductions of marine debris loads nor in mitigating remote municipal landfill challenges. As mentioned above, there is limited current capacity for any level of systematic recycling in any mainland remote Indigenous community located on CYP or in the NPA, nor for that matter within the Cook Shire without additional (new) investment in local and regional coordination, and basic recycling infrastructure. Given the extreme transportation distances involved both between locations within the CYP region and to existing MRFs (exclusively located outside the region), well-resourced brokerage of local and regional recycling, depot and transfer infrastructure development and facilitation of complementary arrangements will be essential for long-term operational viability for remote recycling and waste mitigation / reduction success in local communities and at regional scale on CYP.

Recommendations in relation to municipal waste in remote CYP Indigenous communities:

1. Experience in remote Torres Strait Islands and NT Indigenous communities demonstrates that local recycling works most effectively where permanent workers (not rotational employment program participants) operate all aspects of a local recycling program or community enterprise.
2. Reverse vending (passive automaton collection points) technology requires additional negotiated physical space within very limited retail floor space or public areas in all case study communities.
3. Passive schemes are not considered likely to generate the buy-in that a pro-active scheme would.
4. A locally coordinated scheme, which pro-actively brokers optimised remote recycling through immediate direct benefit incentives, is considered to be a sound working model – where it can be supported by ongoing investments in local Indigenous rangers (e.g. through WOC, IPA, QILSR or similar programs) and where it can effectively link into an operational container refund scheme.
5. There are now immediate opportunities to provide targeted resources to remote CYP Indigenous local governments for the effective coordination of remote waste management and the effective integration of locally recovered resources with emergent recycling industries, and specifically with the imminent State-wide container refund scheme roll-out during 2017 and 2018.
6. All case study communities require targeted immediate direct capital investment (indicatively in the order of $300,000 per remote community) to optimise / adapt local waste infrastructure to maximise their potential direct benefits from the Queensland-wide container refund scheme.
7. In addition to such an initial direct capital investment into waste minimisation and recycling infrastructure and associated annual operational and maintenance costs (an indicative

annual allocation of $130,000 per community at a minimum), culturally tailored educational campaigns and locally viable incentive schemes are required for inter-generational behavioural change.

8. Industry incentives are required to off-set prohibitive remote transportation costs for transfer or subsidised back-loading of recycled materials / resources and for any periodic on-site industrial compaction or shredding (e.g. for scrap metal including end-of-life vehicles, tyres etc.) .
9. Optimum long-term solutions (e.g. emissions neutral incineration at regional scale powered by renewable energy) are beyond the present financial and technical capacity of individual remote councils, and would require waste payloads coordinated across the greater CYP region.
10. The immediate future (2017 and 2018) presents an unrivalled opportunity to establish viable foundations for a well-integrated and brokered recycling effort engaging remote CYP and Gulf communities, together with remote Indigenous and other local governments across Queensland.
11. Key forums for progression of region-wide coordination, waste management planning and related infrastructure development include the Cape Indigenous Mayors Alliance, the Indigenous Leadership Group and the Local Authority Waste Management Advisory Committee.
12. Solutions require investment into local brokerage and coordination efforts, locally tailored capital investments and informed regional-scale brokerage engaging all tiers of government.

Recommendations in relation to marine debris impacting remote CYP Indigenous communities:

1. In all case study communities, marine debris removal is seen as a potential route to employment or forms part of the operational workplan of an existing skilled and professional workforce (e.g. land and sea rangers employed at Mapoon or Pormpuraaw, Traditional Owner bodies etc.). Jurisdictional governments should avoid cost shifting to other programs and guarantee long term support (e.g. contracts) for such municipal services.
2. In all case study communities, existing effort / capacity to remove debris must be supported and not compromised with other, often immediate, competing demands for allocated professional or general resources.
3. Direct capital investment - to increase remote recycling capacity and to integrate this with emerging regional recycling capacity - is an immediate need in addressing environmentally sustainable and economically viable marine debris removal in remote areas of CYP.
4. Sustained well-resourced and well-coordinated effort demonstrably lowers the prevalence of debris and ongoing in-situ break up of debris into incrementally smaller bits, thus mitigating harmful impacts on vulnerable marine and terrestrial species, and human health and wellbeing.
5. Funding needs to be complementary (well-aligned) and not duplicated between various agencies, it also needs to be invested directly into proven on-ground efforts, not allocated to bodies without marine debris removal capacity or track-records (e.g. statutory or regulatory agencies).
6. Address marine debris as an immediate and ongoing environmental management issue for remote Indigenous communities – particularly extreme loads prevailing on eastern CYP beaches, beaches around the ‘Tip’ in the NPA region and on north-western CYP beaches.

7. Remote marine debris hotspots on CYP are either highly exposed or very difficult to remove bulk debris from. Very significant resources and potential military logistical support are required.
8. Sustained investment in local Indigenous Land and Sea Management capacity, additional to municipal service support (e.g. for waste management away from community boundaries) is required to reduce debris loads in these areas.
9. Direct capital investment to increase remote recycling capacity and to integrate this with emerging regional recycling capacity is an immediate need in addressing environmentally sustainable and economically viable marine debris removal in remote areas of CYP.
10. New regulatory incentives (e.g. container refund schemes) and industry incentives (e.g. fuel rebates, capital investment subsidies) will be required to maximise recycling of marine debris.

6.1 Legislative burdens and regulatory prescriptions

Remote Indigenous local governments are required to function in the same jurisdictional environment as all other local government authorities in Queensland. The Australian Local Government Association commissioned PricewaterhouseCoopers to produce the 2006 National Financial Sustainability Study of Local Government. The study states the following factors as common financial issues typically facing councils with sustainability problems:

- minimal (or negative) revenue growth
- cost growth that has typically exceeded revenue growth. Expenditures have been rising by an average of CPI +2-3% per annum. This cost growth is mainly due to award wage rises, stronger cost escalations in the maintenance and construction sectors as well as service diversification. The divergence between cost and revenue growth can lead to operating deficits that in turn are often partly funded by deferring some renewals expenditure
- increasing involvement in non-core service provision due to escalating community demands coupled with a related tendency by some councils to 'step-in' to provide a non-traditional service and some cost-shifting from other levels of government
- operating deficits creating a need to defer or underspend on renewal of infrastructure, particularly community infrastructure which is often repeated annually creating a backlog
- limited access to strong financial and asset management skills, which are critical to identifying sustainability problems, optimising renewals expenditure and improving revenue streams, and
- significant population growth… means infrastructure is augmented to meet demand. However, over the longer term, once the transitionary impacts moderate, a larger scale population, coupled with a modern asset base should improve the prospects for a council to be financially sustainable.

Further, the study states that enabling a council to respond directly to the service and infrastructure demands of an informed community would (amongst other matters):

- Provide for greater choice and consultation on council provided services and infrastructure, and encourage more participation in community activities raising levels of inclusion and wellbeing. This would promote increased community cohesion and safety, particularly in rural areas.

- Enable the implementation of local programs that recognise the diverse needs of communities and support cultural diversity, access and equity, equal opportunity, involving minority groups.
- Support sustainable environmental strategies for each community to improve local environmental outcomes.
- Enhance linkages within regional areas to promote regional equity and development.

In relation to essential municipal service provision the study encourages local governments to establish a robust long-term service plan which defines what council will provide and how services will be undertaken, and further states that local governments should:

- Exercise caution prior to stepping in to attempt to resolve non-local issues without sound funding.
- Secure long-term funding (not just capital grants) prior to new services and infrastructure.

The findings of the 2006 study and its key recommendations could be applied directly to the present realities of waste management responsibilities placed on remote Indigenous councils. Relevant recommendations made by the study include:

- Improved funding for local councils, particularly for the renewal of community assets, would assist local communities by enabling councils to return community infrastructure to acceptable condition.
- In conjunction with improved financial and asset management practices, more appropriate funding levels for local infrastructure and services would help to ease the pressure of operating deficits.
- In addition, such extra funding would support the clearance of backlogs in renewals expenditure… and then also support more regular periodic maintenance to retain service levels.
- Importantly, additional funding would assist local government to take full advantage of their ability to flexibly gauge and respond to the changing demands at a community level.
- With increasing demands for enhanced and improved community services and infrastructure, it is important that local government has the resources to ascertain community priorities, and to then inform and consult with community on trade-offs of council provided infrastructure and services.

The Queensland State Government instigated a review of local government in 2007 (the Size, Shape and Sustainability review) which resulted in changes to local government arrangements across the state. In addition to the provision of a funded reform package, the Local Government Association of Queensland (LGAQ) recommended a number of models to obtain cost savings and improve sustainability, including:

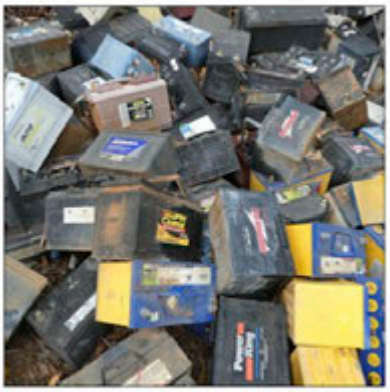
- Retaining processes that require unique ad hoc local knowledge and are strategic
- Outsourcing non-strategic, low risk, rule based activities or high volume transaction processing
- Sharing or outsourcing to gain access to latest technology without ongoing significant capital investment or a requirement for a specialist expertise; and
- Sharing or outsourcing to gain expertise, which the local government could not otherwise afford.

Table 7 presents ideal solutions for remote communities in reducing landfill burdens, implementing local recycling and scaling up regionally integrated recycling over time. This table also presents viable strategies and actions which can be implemented in the short-term to assist waste mitigation, remote waste volumes and remote recycling in the short-term.

Table 7. *Optimal outcomes and viable strategies for short-term adoption.*

Identified priority issue	Optimal outcomes	Viable strategies for short-term adoption
Marine debris on remoter beaches	A substantive reduction in marine debris arising from implementation of container deposit schemes (or similar) and bans on single use plastic bags. Well-resourced local land and sea management capacity.	Maintain existing partnerships, to undertake regular paid marine debris removal and transfers for recycling, including the removal of ghostnets. Maintain and increase resources for locally active land and sea management in CYP remote communities and collaborate with them to extend fee-for-service work. Lobby with other CYP communities for an integrated, region-wide and well-resourced alliance of ranger groups to systematically remove debris (e.g. based on the highly successful WCTTAA example). Actively collaborate with and support local biosecurity efforts with in-kind resources, expertise and personnel. Provide funds for regular marine debris removal in CYP remote coastal areas, the NPA and Torres Strait.
Illegal dumping at municipal landfills	Less or no illegal dumping through behavioural change. Reduced costs and overheads for remote councils in removing illegally dumped wastes.	Maintain staffed municipal landfills in remote communities to monitor illegal dumping. Develop and enact local laws with clear penalties for illegal dumping and waste disposal breaches. Support Indigenous Rangers to obtain relevant training and compliance/enforcement (Cert iv) certification. Consider closed-circuit surveillance monitoring. Enforce contractual breaches involving dumping. Maintain registers of banned contractors.
Illegal dumping in remoter areas of Aboriginal Shires	Less or no illegal dumping through behavioural change. Reduced costs and overheads for remote councils in removing illegally dumped wastes.	Establish or maintain land and sea management rangers or local government enforcement presence to monitor illegal dumping in remoter areas and collect direct evidence for prosecution of related breaches. Install / maintain behavioural and directional signage. Enforce contractual beaches involving illegal dumping. Ensure at least some council senior staff hold accredited enforcement and regulatory compliance powers. Support Indigenous Rangers to obtain relevant training and compliance/enforcement (Cert iv) certification. Develop and enact local laws with clear penalties for illegal dumping and waste disposal breaches. Develop strong relationships with enforcement agencies such as Fisheries, Police and Biosecurity.
Meeting increasing		Work with regulatory agencies to develop plain English guide for Queensland Waste Data System (QWDS).

Identified priority issue	Optimal outcomes	Viable strategies for short-term adoption
municipal compliance requirements		Work with regulatory agencies to tailor QWDS surveys to better reflect localised remote circumstances. Obtain specific QWDS data input support / assistance. Coordinate remote community support across agencies. Technical support and capacity building for remote local governments is required.
Landfill and Waste Separation Facility	Local integrated recycling system - brokered, coordinated and fully operational. Local recycling enterprises are operational.	Brokerage of locally viable recycling and container refund scheme. Coordinated, locally viable recycling arrangements. Municipal council plant for local recycling (indicative set up, operational and maintenance costs in the order of $350,000). Transport for recyclables to external re-processors. Support for local recycling enterprise development.
Implementing a locally viable **Container Refund Scheme** **Drink container waste** (aluminium cans, plastics, glass, tetra packs) **Retail waste** **Retail and bulk packaging waste** **Resourced and brokered local coordination**	Local integrated recycling system - brokered, coordinated and fully operational. Local recycling enterprises are operational.	Brokerage of locally viable recycling / container refund scheme will be a necessary pre-requisite for up-scaling. Support full recycling of all store generated packaging (e.g. part capital contribution to recycling equipment for plastics, cardboard shredding). Participate in coordinated local recycling program, including a local container refund scheme. Engage councils and all local retailers early and fully in container refund scheme implementation for viability. Ensure full participation of all local beverage retailers. Maximise local coordination to minimise confusion about introducing local container refund arrangements. Centrally coordinate all local recycling arrangements, transfer schedules and communications where possible. Acquire and operationalize municipal council plant for local recycling (indicative set up, operational and maintenance costs in the order of $350,000). Negotiate transport for recyclables to external MRFs. Build support for local recycling enterprise development. Require remote job service providers to routinely and effectively collaborate locally (not happening presently). Specific public capital investment programs for remote community recycling are urgently required. Expanding Indigenous land and sea management programs will assist to address remote waste and debris. Resourcing ongoing technical skills training for best practice remote community recycling will be essential.



***Old car batteries**, Portland Roads rubbish tip (located within Cook Shire) Sept. 2016*

***Batteries stored in bunded shed** Pormpuraaw Aboriginal Shire Council, Sept. 2016*

***Car batteries stored on pallets pre-transfer** Pormpuraaw Aboriginal Shire Council, Sept. 2016*

***Tyre separation at current landfill site** Lockhart River Aboriginal Shire, Sept 2016*

***Tyre separation at current landfill site** Mapoon Aboriginal Shire, Sept 2016*

***Tyre separation at current landfill site** Pormpuraaw Aboriginal Shire, Sept 2016*

***Baler for compacting and baling cardboard,** Pormpuraaw RSB Retail Store, Sept. 2016*

***Separated, compacted and baled cardboard,** Lockhart River RSB Retail Store, Sept. 2016*

***Pallets can be re-used to store collected recyclables and for transfer,** September 2016*

***Waste oils dumped at landfill site**, Lockhart River Aboriginal Shire, Sept. 2016*

***Waste oils stored in bunded shed** Pormpuraaw Aboriginal Shire Council, Sept. 2016*

***Waste oils are consolidated pre-transfer** Pormpuraaw Aboriginal Shire Council, Sept. 2016*

7. Implementation

> *There is strong evidence that Indigenous people in remote communities experience significant levels of social and economic disadvantage due to lack of access to services. Historical approaches to service delivery for remote communities have resulted in a mixture of patchy service delivery, ad hoc and short-term programs, poor coordination, and confusion over roles and responsibilities. Complications have been exacerbated by Indigenous-specific programs being added in, often to replace missing mainstream services and/or without any relationship to community development priorities. This lack of collaborative [action] and inconsistent government policy on the funding and delivery of services has contributed to the disadvantage experienced by many communities.*[40]

Across all case studies, remote area waste management and recyclables transfers to external processing centres is extremely expensive in terms of absolute cost, compliance, staffing, training and material costs. The actions required to address, over the longer-term, growing waste burdens in case study communities will be numerous, and will need to be staged over successive years of increased effort and investment.

The benefits of regionally aligned and technically supported coordination, where underpinned by strategic State agency resourcing, are evident from the initial success of the Big Rivers Waste Management Working Group (NT) in securing buy-in and resources across multiple remote local government agencies[41]. Remote Indigenous communities in the NT who have initiated stand-alone local container deposit scheme linkages also advise that the support of senior government representatives and community champions is critical[42].

Implementing improved resource recovery, waste minimisation and recycling will require all participating Aboriginal Shire councils to develop waste reduction partnerships within the local community and beyond. Critical support will need to be secured through the Qld Container Refund Implementation Advisory Group and Queensland representatives on the National Environment Protection Council (NEPC) Committee.

Lessons learnt and recommendations arising from the Warraber Island Waste Pilot, which ran for a 12 month period during 2009-2010, will likely apply to all remote community recycling and include:

- The system requires behaviour change from the community, workers and management. A targeted education campaign is required to achieve this. Education needs to be ongoing and consistent.

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[40] https://www.anao.gov.au/work/performance-audit/national-partnership-agreement-remote-service-delivery - Note that none of the case study communities involved in this research are defined Remote Service Delivery locations under the *National Partnership Agreement for Remote Service Delivery*. Queensland RSD communities are limited to Aurukun, Coen, Doomadgee, Hope Vale, Mornington Island and Mossman Gorge.

[41] *Personal communications* Liam Harte Coordinator, Big Rivers Waste Management Working Group, Katherine Town Council NT, 7 December 2016

[42] *Personal communications* Melissa Bentivoglio, Women's Facilitator, Thamarrurr Development Corporation, Wadeye NT, 8 December 2016

- The entire waste system on Warraber Island [as a single remote location] should be integrated and the Pilot Project and general waste activities operated as a single system.

- Occupational health and safety (OH&S) issues need to be considered closely in future systems and ongoing education on OH&S issues is required.
- The community should continue with the system even during a breakdown of one of the system elements to reinforce the behaviour change.
- Suppliers need to provide training in the operation of their equipment and need to supply easy to understand operation and maintenance manuals.
- Maintenance assistance must be provided to the project.
- Supply of plastic bags from IBIS [local retail store] should cease.
- Project Champions at both the community and management level are needed. These people are the key to keeping the momentum of the project going.
- Businesses should be charged a levy to have their waste collected.
- Consideration be given to changing the BiobiNs [organic waste digesters] from diesel to solar powered.

The local recycling process instigated at Wadeye (NT) by Thamarrurr Rangers (Thamarrurr Development Corporation) relies on an existing Working on Country (WOC) investment and on being able to link into the NT's established container deposit scheme (CDS). Without these elements the program could not operate[43]. In early 2016 the Thamarrurr Rangers received a small grant of $15,000 to assist in the establishment and operation of a once-weekly community recycling day arrangement at Wadeye, which:

- established a CDS Collection Point at the Thamarrurr Ranger Base at Wadeye;
- trained 10 ranger staff to count and sort recyclable materials (items), and process direct refund payments;
- established the physical infrastructure for recycling, including areas for processing and storage, equipment and signage [note this did not extend to the construction of any new purpose-built infrastructure];
- established paper and computer systems for recording recycled items, and managing refunds and reimbursements;
- facilitated an MoU with a Darwin-based recycler (Bevcon Recycling Pty Ltd), to take CDS items from Wadeye and pay the [CDS aligned] 10c p/item refund plus a 2c p/item partial handling fee;
- negotiated support from a transport company to take bulk bags of recycling from Wadeye to Darwin each week, by back loading the truck or barge servicing the community (both are operated by Murin Freight);
- raised community awareness about the impacts of waste on the environment and recycling opportunities (several talks at the local school and a Rubbish Art Competition promoting the message "No Rubbish on Country", the project poster is reproduced on the following page);

[43] *Personal communications* David Curmi and Melissa Bentivoglio, Thamarrurr Development Corporation Wadeye (NT) 7 and 8 December 2016 (respectively)

- expanded the recycling service (mid 2016) to glass (as per CDS), lead acid batteries ($3 p/battery refund) and scrap metal. Both Murin Freight and Bevcon Recycling support the expanded service, with some 500 old batteries collected by community members and sent back to Darwin; and
- enabled six Thamarrurr Rangers to undertake a fieldtrip to the Bevcon Recycling Depot in Darwin, to help understand the stages in the recycling process and two rangers to attend the Australasian Waste and Recycling Expo (Sydney, August 2016) to share their experience of litter management in Indigenous Communities.

Community members are invited to bring their used (unwashed) beverage containers (plastic bottles, aluminium cans, tetra packs, glass bottles) to the Ranger Base each Friday, and receive the 10c p/item refund. Between January and November 2016 over 400 people collected some 315,489 beverage containers for recycling, generating direct local incomes totalling $31,500 in refunds. (note: these statistics do not include numerous donations of beverage containers made to the project: e.g. older cans pre-2012).

A big 'Thank you!' to the Thamarrurr Rangers at Wadeye in the NT for their consent to include their inspirational recycling poster in this Report. (image © Thamarrurr Development Corporation, 2016)

Table 8. *What needs to be done in the immediate term.*

Waste Reduction Partnerships	What actions need to be taken?	Who needs to be involved?
Community waste reduction partnership	Educate the local community about recycling using tailored Waste Reduction Plans	Traditional Owners Community members Aboriginal Shire Councils Retail stores and local shops Social clubs / canteens / pubs Aboriginal landholding bodies Rangers / Aboriginal land & sea management bodies Local Arts centres Local schools Remote Community Jobs Program NGO partners including Tangaroa Blue and Clean Up Australia
	Develop a local recycling plan in each community, including related coordination	
	Consider, design and roll out improved local separation, transfer and recycling efforts, including a viable local container refund scheme	
	Continue supporting regular local and remote beach clean ups	
Regional remote Indigenous and other local government waste reduction partnerships	Share local learnings and experience about waste management approaches, *with a particular immediate focus on CDS capacity in remote areas*	Cape Indigenous Mayors Alliance Indigenous Leadership Group (CEOs) Aboriginal Shire Councils' CEOs and Councillors Qld Container Refund Implementation Advisory Group (https://www.ehp.qld.gov.au/waste/container-deposit-scheme.html) Local Authority Waste Management Advisory Committee (http://www.lawmac.org.au/)
	Lobby to secure dedicated waste and recycling support resources, in particular staff funds and skills development	
	Promote remote recycling enterprise opportunities if considered appropriate	
Strategic industry / corporate waste transfer partnerships	Scaling up across communities is a pre-requisite for commercial operators to engage more effectively	Senior Queensland Government officials, including Ministers Department of Environment & Heritage Protection (DEHP) Waste re-processors / commercial recyclers
	Market prices for recycled materials (e.g. scrap metal) will determine interest in collaboration / assistance	
	Corporate social licences / native title compensation schemes can generate substantial hard waste burdens in remote areas – corporate social responsibility has real consequences	Rio Tinto Alcan (RTA) Other locally active mining companies Qld Minerals Council and other industry representative groups
	Understanding the emerging market in waste as a resource and liaising with recycling industry innovators	refer to Appendix B
State agency support	Targeted support to improve local government waste and recycling	Depts. of State Development, Local Government & Planning, DATSIP

Waste Reduction Partnerships	What actions need to be taken?	Who needs to be involved?
	infrastructure e.g. Building Our Regions funds[44]	Indigenous Leadership Group (CEOs) Cape Indigenous Mayors Alliance
	Lobby for more local Land & Sea Management rangers through Qld Indigenous Land & Sea Rangers program https://www.qld.gov.au/environment/plants-animals/community/about-rangers/	Aboriginal Shire Councils Aboriginal landholding bodies Rangers / Aboriginal land & sea management bodies
	Continued support for integrated environmental health outcomes in remote areas	Queensland Health – Environmental Health Unit Aboriginal Shire Councils
Commonwealth support	Seek targeted funds and support for implementing the National Waste Policy through the National Environment Protection Council (NEPC) Committee http://www.nepc.gov.au/home	*Qld representatives* Committee member Mr Tony Roberts (DEHP) Senior Officers Group Mr Jon Black, Director General DEHP
	Lobby for secured resourcing for Indigenous land and sea management https://www.dpmc.gov.au/indigenous-affairs/environment/indigenous-rangers-working-country	Dept. of Prime Minister and Cabinet, Minister for Indigenous Affairs Far North Indigenous Coordination Centre Indigenous Leadership Group (CEOs) Cape Indigenous Mayors Alliance
NGO support	Opportunities for potential collaboration in the collection, removal, transfer and recycling of marine debris and other plastics need to be brokered, resourced and implemented	Tangaroa Blue Clean Up Australia Oceanwatch Australia Cape York NRM Boomerang Alliance GhostNets Australia (not currently active – presently un-funded)

[44] http://www.statedevelopment.qld.gov.au/regional-development/building-our-regions.html

Interim old car storage site near mechanics *Lockhart River Aboriginal Shire Sept. 2016*

Derelict or abandoned car bodies at landfill *Mapoon Aboriginal Shire, Sept. 2016*

Car body haulage vehicle *Weipa, Sept 2016*

Old car not yet removed to car dump *Lockhart River Aboriginal Shire, Sept 2016*

Old motor used for spare parts at car dump *Lockhart River Aboriginal Shire, Sept 2016*

Trial vehicle surrender: 15 year stockpile (123 cars) crushed, baled and transferred *Pormpuraaw Aboriginal Shire , Sept. 2016*

Illegally dumped contractor waste*, Lockhart River Aboriginal Shire, Sept. 2016*

Illegally dumped waste at old landfill site *Mapoon Aboriginal Shire, Sept. 2016*

Stranded foreign vessel *Pormpuraaw Aboriginal Shire © PLSM / PASC 2015*

Illegal commercial net *Pormpuraaw Aboriginal Shire © PLSM / PASC 2014*

Illegally dumped waste *Pormpuraaw Aboriginal Shire © PLSM / PASC 2014*

Illegally dumped rubbish *Pormpuraaw Aboriginal Shire © PLSM / PASC 2015*

7.1 Costs and resources required for implementation

A list of selected waste /mitigation reduction / recycling equipment suppliers consulted as part of this case study is at Appendix B. All state that they have supplied remote communities previously and have adapted machinery for safe and easy remote community use. The authors of this report do not endorse in any manner any of these businesses, nor the products they supply. Recommendations for cost effective investment from state and national actors to address key waste management needs that can be prioritised are listed below. The indicative costings have been incorporated into Local Waste Reduction Plans developed through this project for the further use and reference of all participating case study communities.

Table 9 *(parts 1, 2 & 3). Indicative costs: Debris, recycling maintenance, manpower.*

Immediate requirements	Details	Indicative base costings (GST and freight excl.)	Rationale/comment
Marine debris management on remote beaches *(Costs based on approx. figures given by Mapoon Land & Sea Rangers 2016)*	Marine debris removal from very remote CYP beaches	$50,000 - $75,000 per year for a single very remote beach clean up *(not including staff wages for minimum number of local workers)* Requires trucks, towable crusher, silo bags, PPE and large barge hire.	Unpatrolled remote beaches may have very high predation rates of nesting marine turtle nests by pigs, dogs and goannas
Marine debris management on more accessible local beaches		Single, easier access beach clean ups cost between $12,000 and $20,000 each	Based on Tangaroa Blue expert advice 2016
Brokering locally viable recycling / local remote container refund scheme implementation	Part time local / council position or locally preferred supplier	Minimum of $50,000.00 over initial 12 months (2017-2018)	Brokerage with local and regional parties to design and instigate effective local remote recycling arrangements
Coordinating locally viable recycling	Minimum 1 full time position plus on-costs	from $75,000 per staff position per annum	Implementing on-going local and regional coordination
Community Education program *These examples are sourced from the Warraber Island Waste Pilot report Aurecon (2011)*	Community meetings Radio interview with project team Involvement through the school including art design competition, general giveaways and school projects. Repeated on a number of occasions Meetings with council and other businesses Posters, fridge magnets and stickers in both English and local language Community launch and project blessing including community BBQ One on one meetings with households to deliver new equipment Ongoing education and training		

Immediate requirements	Details	Indicative base costings (GST and freight excl.)	Rationale/comment
Council (or private enterprise) plant for local recycling	Multi-purpose shredder	from $40,000	Volumetric compaction of bulk recyclables, reduces incineration frequency at landfill site
	Mini-compactor	Price on application (POA)	Improved waste data collection in real time
	Crusher/Baler	between $25,000 - $40,000	Volumetric compaction for a range of materials
	Medium size cardboard chipper	between $6,000 - $15,000	Local on-site cardboard recycling (mulch, organic packaging), reduces incineration frequency at landfill site
	Purpose-built shed	up to $100,000	All weather recycling
	Recyclables collection / local transfer vehicles	from $60,000	Reduces volumes of waste entering landfill
	Bulk storage (shipping) containers	from $2,500 each	Safe, secure storage of recycled resources pre-transfer to recyclers (resources are valuable)
	Data management (e.g. computer, printer)	$4,000	Item count, refund cash records management
	PPE and padlocks etc.	$3,000	OH&S
	Indicative total set up costs per community	in the order of $350,000	Cost is commensurate with Warraber Is pilot. Figure does not include wages, on-costs etc.
	Indicative annual operational costs	$120,000	Assumes a min. of 1 additional FT staff
	Indicative annual maintenance costs	$7,500	Assumes some FIFO technical assistance
	Warraber Is. Pilot initial set up cost total (2009)	$345,065	All figures contained in Aurecon (2011)
	Warraber Is. Pilot 1 year operational cost (2009)	$89,769	
	Warraber Is. Pilot 1 year maintenance cost (2009)	$5,300	
Transport for external transfers	Negotiated with transport service providers	Likely part of a local / regional brokerage role, requires industry support	Requires additional local government human resources to coordinate

Medium term requirements	Details	Indicative base costings (GST and freight excl.)	Rationale
Local integrated recycling system - brokered, coordinated and fully operational	Staffed multi-purpose shredding plant eg: MPS 50HD or model with hammermill[45]	$275,000 - $0,000+	[This type of shredding plant presently in use at Nhulunbuy (see image on footnoted web-link]
	at least 1 additional full time technical position placed with council	from $120,000 p.a. plus on-costs	On-site maintenance requires certain level of technical competency
Local recycling enterprise development	Locally owned and operated recycling enterprises	Set up and operational costs	Case study communities have indicated there is some local scope for private operation of recycling activities

Long term optimum	Details	Indicative base costings (GST and freight excl.)	Rationale
Bio-digester or other waste to energy system / technology	Integrated industrial scale system which could service the entire CYP region (may require 2 systems to effectively service the entire region given remoteness and distances involved.	> $2M not including staffing, operational or maintenance costs	Emissions neutral. Uses and produces renewable energy. Significantly reduces volumes of waste entering remote landfills. Addresses waste related environmental impacts (water quality, contamination) and improve remote Indigenous environmental health.
Local and regional recycling enterprises and remote area Indigenous economic development	Local Indigenous owned and operated recycling, transport and related enterprises	N/A	Case study communities have indicated there is some local scope for private operation of recycling activities

[45] An example of this type of plant can be seen at http://www.brentwood.com.au/machine/shredding-plants accessed December 2016

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Key legislation

Biosecurity Act 2014 (Qld)

Environment Protection Biodiversity Conservation Act 1999 (Commonwealth)

Environmental Protection Act 1994 (Qld) - Environmental Protection (Waste Management) Regulation 2000 (Qld)

Environmental Protection Regulation 2008 (Qld)

Qld Fisheries Act 1994 (Qld)

Great Barrier Reef Marine Park Act 1975 (Commonwealth), Protection of the Seas Act 1983 (Commonwealth)

Local Government Act 2009 (Qld)

Planning Act 2016 (Qld), Sustainable Planning Act 2009 (Qld)

Waste Reduction and Recycling Act 2011 (Qld) - Waste Reduction and Recycling Regulation 2011 (Qld)

Appendix A: Case study research participants and informants

Pormpuraaw Community

Mylene Holroyd, Kuugu, Pormpuraaw Arts & Culture Centre Inc. (PACCI)

Christine Holroyd, Kuugu, PACCI

Jeanie Holroyd, Kuugu Elder, PACCI

Christine Yantumba, Kuugu, PACCI

Cr Tim Koo-aga, Pormpuraaw Aboriginal Shire Council, Kuugu

Edward Natera, PASC CEO

Robbie Morris, PASC Environmental Manager, Pormpuraaw Land & Sea Management

Andrew Healy, PASC Operations Manager

Hassan Binawell, PASC Council Stores Manager

Paul Jakubowski, Coordinator, Pormpuraaw Arts & Culture Centre Inc.

Rebecca Hafner, Pormpuraaw Indigenous Knowledge Centre (PASC Library)

Store Manager, Retail Stores Branch (RBS) Retail Store, Pormpuraaw

Relief Store Manager, RBS Retail Store, Pormpuraaw

Lockhart River Community

David Claudie, Kaanju, Chair Mangkuma Land Trust, Chair Chuulangan Aboriginal Corporation

Lucy Hobson, Kuuk Ya'u Elder

Beverly Pascoe, Kuuku Ya'u Elder, Director Kuuku Ya'u Aboriginal Corporation

Christopher Dean, Kaanju, Chair Angkum Aboriginal Corporation

Cr Wayne Butcher, Mayor Lockhart River Aboriginal Shire Council, Kuuku Ya'u

David Clarke, CEO Lockhart River Aboriginal Shire Council (LRASC)

Paul Jenkins, LRSAC Environmental Manager

Josh Hubbard, LRASC Workshop Manager

Bernie Singleton, Umpila

Stephen Bryant, Store Manager, RBS Retail Store, Lockhart River

Tim and Mark, staff members, The Green Hoose tourism accommodation

Christina Howes, LRASC media consultant

Mapoon Community

George Manantan, Taepithiggi, Director Old Mapoon Aboriginal Corporation (OMAC)

Cr Aileen Ado, Mayor Mapoon Aboriginal Shire Council (MASC)

Cr Polly Smith, MASC, Director OMAC, Yupangathi

Leon Yateman, MASC CEO

Sarah Barkley, MASC Mapoon Land & Sea Rangers

Geraldine Mamoose, MASC Mapoon Land & Sea Rangers

Delwyn Ropeyarn, MASC Mapoon Land & Sea Rangers

Rachel Peter, MASC Mapoon Land & Sea Rangers

Jason Jia, MASC Mapoon Land & Sea Rangers

Tani Ling, MASC Mapoon Land & Sea Rangers

Jocelyn De Jersey, MASC Mapoon Land & Sea Rangers

Brandin Ryan, MASC Mapoon Land & Sea Rangers

Louise Stone, Coordinator MASC Mapoon Land & Sea Rangers

Lee Ase, MASC Animal Management

MASC Operations Manager (position vacated during project period)

Vicki Warring, Ragupayan Store Manager, MASC

Brian Warring, Ragupayan Store, MASC

Napranum Community

Phillip Mango, Ranger Coordinator Nanum Wingthim Land & Sea Management

Lama Lama Traditional Owners

Alison Liddy, Lama Lama, Director Yintjingga Aboriginal Corporation

Lama Lama Junior Rangers

Kowanyama Community

Cr Michael Yam, Mayor Kowanyama Aboriginal Shire Council

Coordinator, Kowanyama Aboriginal Land & Natural Resources Management Office

Other project informants

Planet Ark

MobileMuster

Eoin Quinlivan, Director Retail Stores Branch (RSB) Department of A&TSI Partnerships

Cr Alan Wilson, Deputy Mayor, Cook Shire Council, LAWMAC Chair Local Authority Waste Advisory Group, past Chair Queensland Container Deposit Scheme (CDS) Advisory Committee

Lana Polglase, Wattle Hills resident

Heidi Taylor, Tangaroa Blue Foundation

Rikki Gunn, Ghostnets Australia

Maya Reddy, Manager of remote community shops, Anglican Diocese North Queensland

Lyndal Scobell, Communications Manager Cape York Natural Resource Management (CYNRM)

Kerri Woodcock, Coordinator Western Cape Turtle Threat Abatement Alliance (WCTTAA)

Joanna Karam, former WCTTAA coordinator

Mika David, Senior Environmental Manager, Torres Strait Island Regional Council

Rob Drew, Council Services Manager, Kalkarindji and Daguragu, Victoria Daly Regional Council NT

David Curmi, Ranger Manager, Thamarrurr Development Corporation, Wadeye NT

Melissa Bentivoglio, Women's Facilitator, Thamarrurr Development Corporation, Wadeye NT

Liam Harte, Coordinator, Big Rivers Waste Management Working Group, Katherine Town Council NT

Commercial informants

John Watson, Proprietor RamCan Pty Ltd

Ken Russ, Sales Manager Qld, Wastech Engineering Pty Ltd

Graham Badman, Managing Director, Bentwood Recycling Systems

Manager of REMONDIS Weipa Waste Facility

TechCollect

Weipa Business Equipment

Project sub-contract manager

North Australia Indigenous Land and Sea Management Alliance Ltd (NAILSMA)

Appendix B: Selected recycling plant suppliers and recycling businesses

The following Australian businesses, specialising in recycling plant manufacture and supply, have directly informed indicative equipment pricing included in this report. All state that they have supplied remote communities previously and have adapted machinery for safe and easy remote community use. The authors of this report do not endorse in any manner any of these businesses, nor the products they supply.

- Bentwood Recycling Systems
- RamCan Pty Ltd
- Wastech Engineering Pty Ltd

The below companies have been identified as potential industry partners by this project's informants. Again, the authors do not endorse in any manner any of these businesses, nor the products they supply.

- Australian Composite Technologies - http://www.plasmar.com.au/
- Newport Recycling Cairns - http://www.newportrecyclinggroup.com.au/page1.aspx
- REMONDIS - http://www.remondis.com.au/en/reau/sonderseiten/home/
- Sims Recycling Solutions - http://au.simsmm.com/
- Toro Industries - http://www.torowasteequipment.com.au/
- Visy - http://www.visy.com.au/recycling-services-enquiry/
- Zebra Metals http://www.zebrametals.com.au

Appendix C: Local waste reduction plans developed through this project

The following documents have been developed as part of this project in consultation with participating case study communities. All plans and posters are at draft status only, and are not public documents. All materials have been provided to the participating case study Aboriginal Shire councils for further local consideration, finalisation and/or adoption.

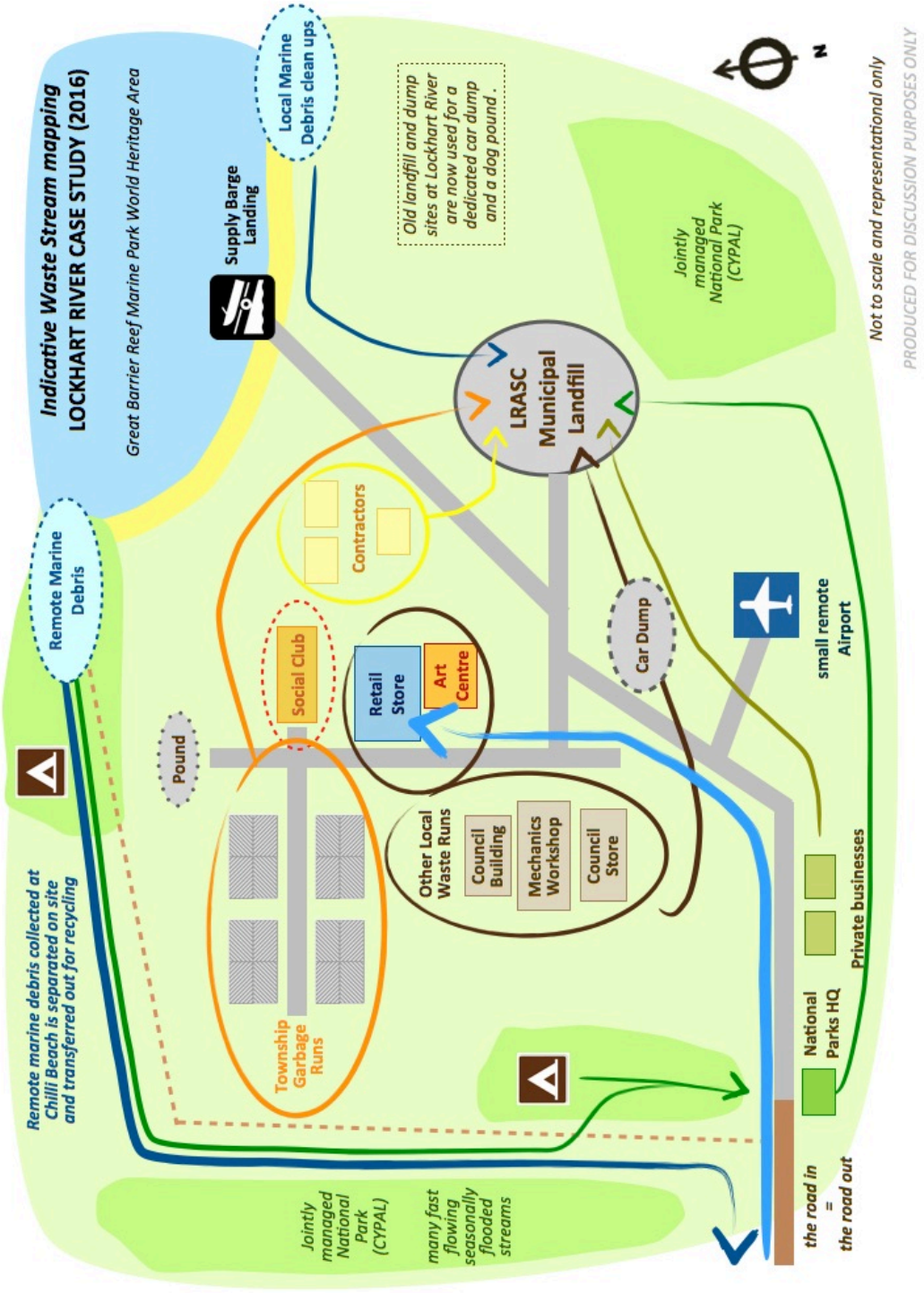
Local Waste Reduction Plans (WRP) developed through this project:

Lockhart River
Lockhart River Landfill Waste Separation and Transfers WRP
Littering and Illegal Dumping at Lockhart River WRP
A viable container refund scheme at Lockhart River WRP
Coordinated Recycling at Lockhart River WRP
Packaging Waste coming into Lockhart River WRP
Lockhart River Beaches and Marine Debris WRP

Mapoon
Mapoon Landfill Waste Separation and Transfers WRP
Rounding Up Litter at Mapoon WRP
A viable container refund scheme at Mapoon WRP
Coordinated Recycling at Mapoon WRP
Mapoon Beaches and Marine Debris WRP

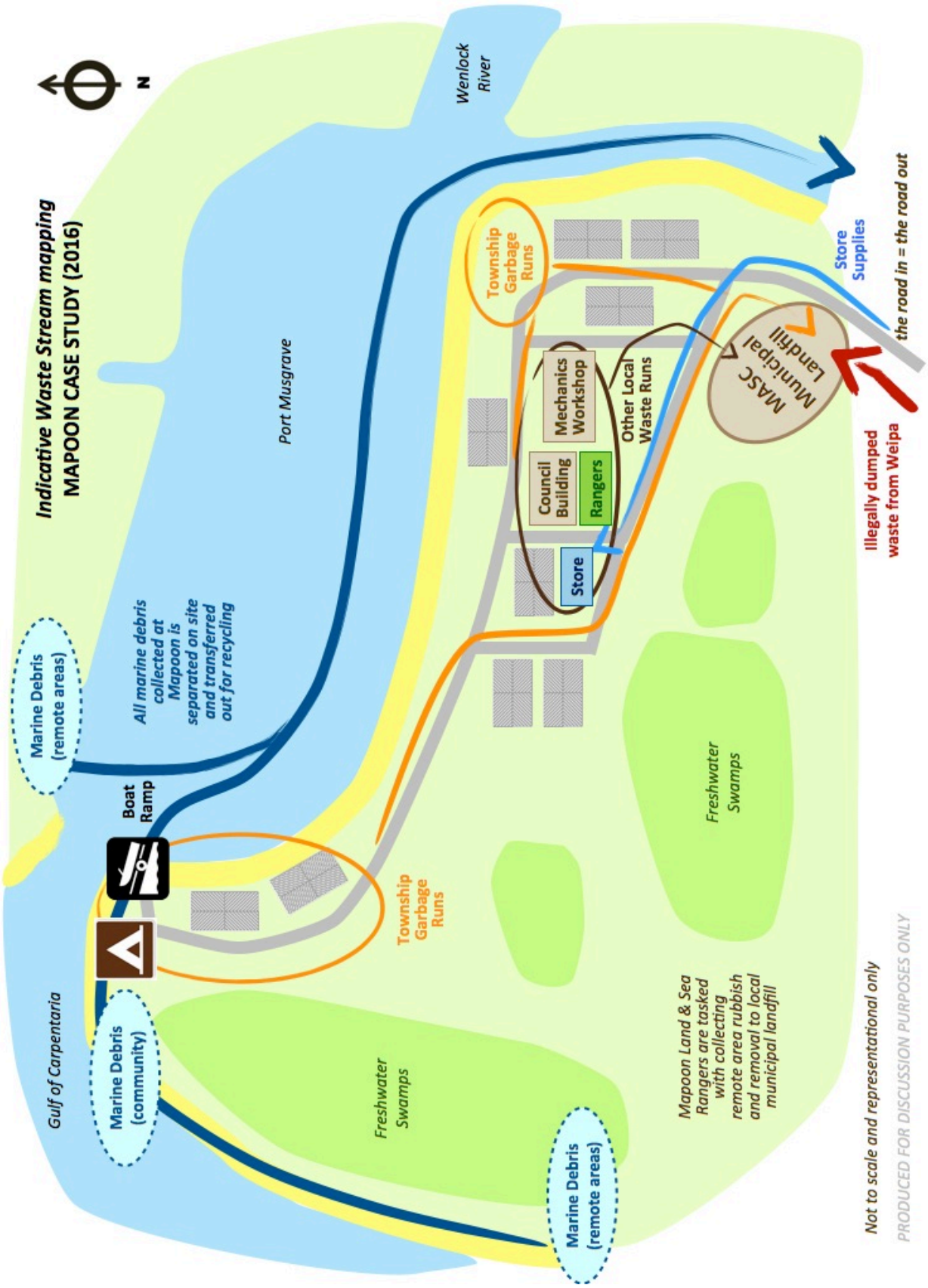
Pormpuraaw
Illegally Dumped Waste WRP
A viable container refund scheme at Pormpuraaw WRP
Packaging Waste coming into Pormpuraaw WRP
Coordinated Recycling at Pormpuraaw WRP
Marine Debris on Pormpuraaw's Beaches WRP

Appendix D: Indicative local waste stream mapping



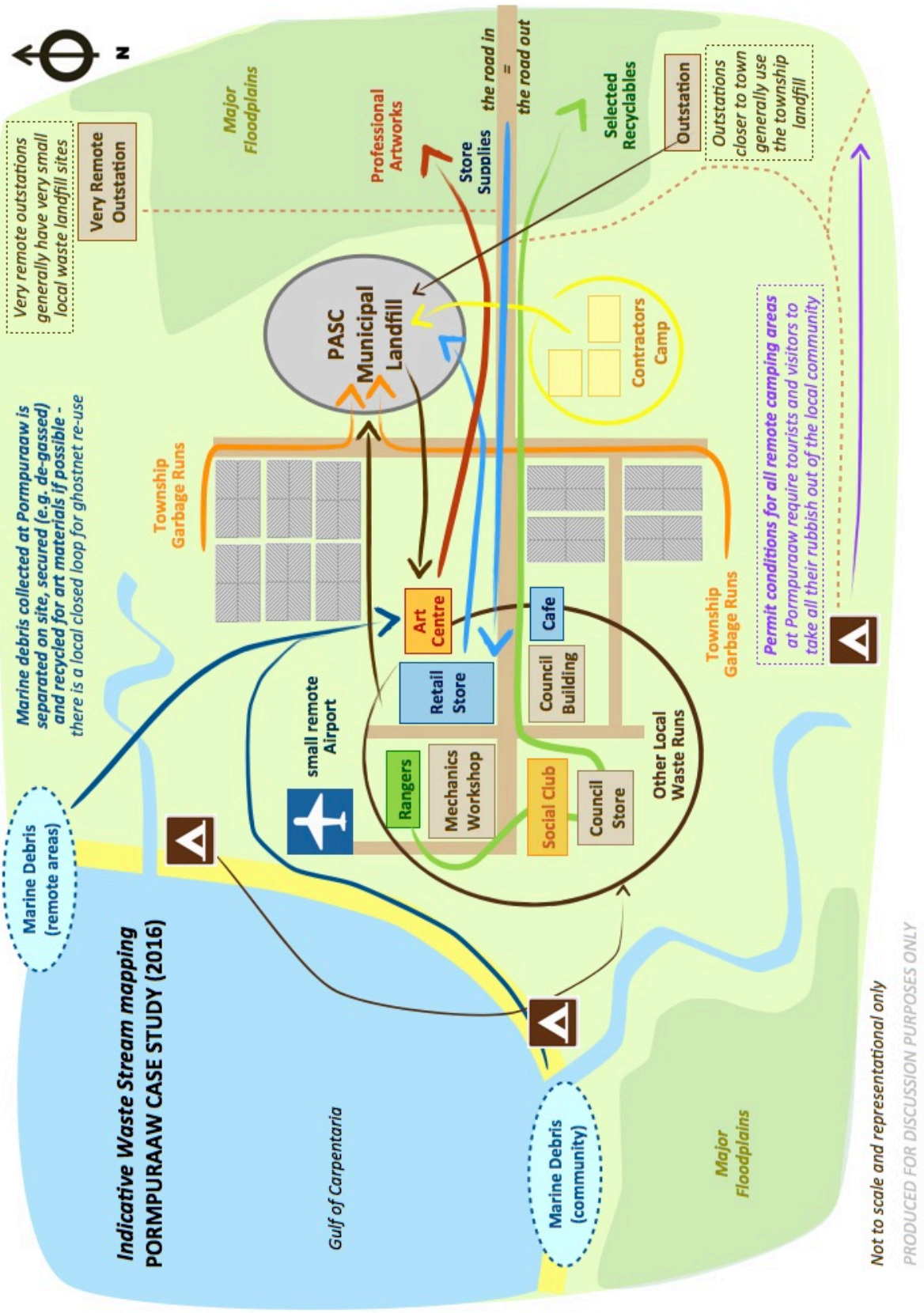
Indicative local waste stream mapping – Lockhart River (as at end 2016).

2016 Lockhart River community waste stream poster.

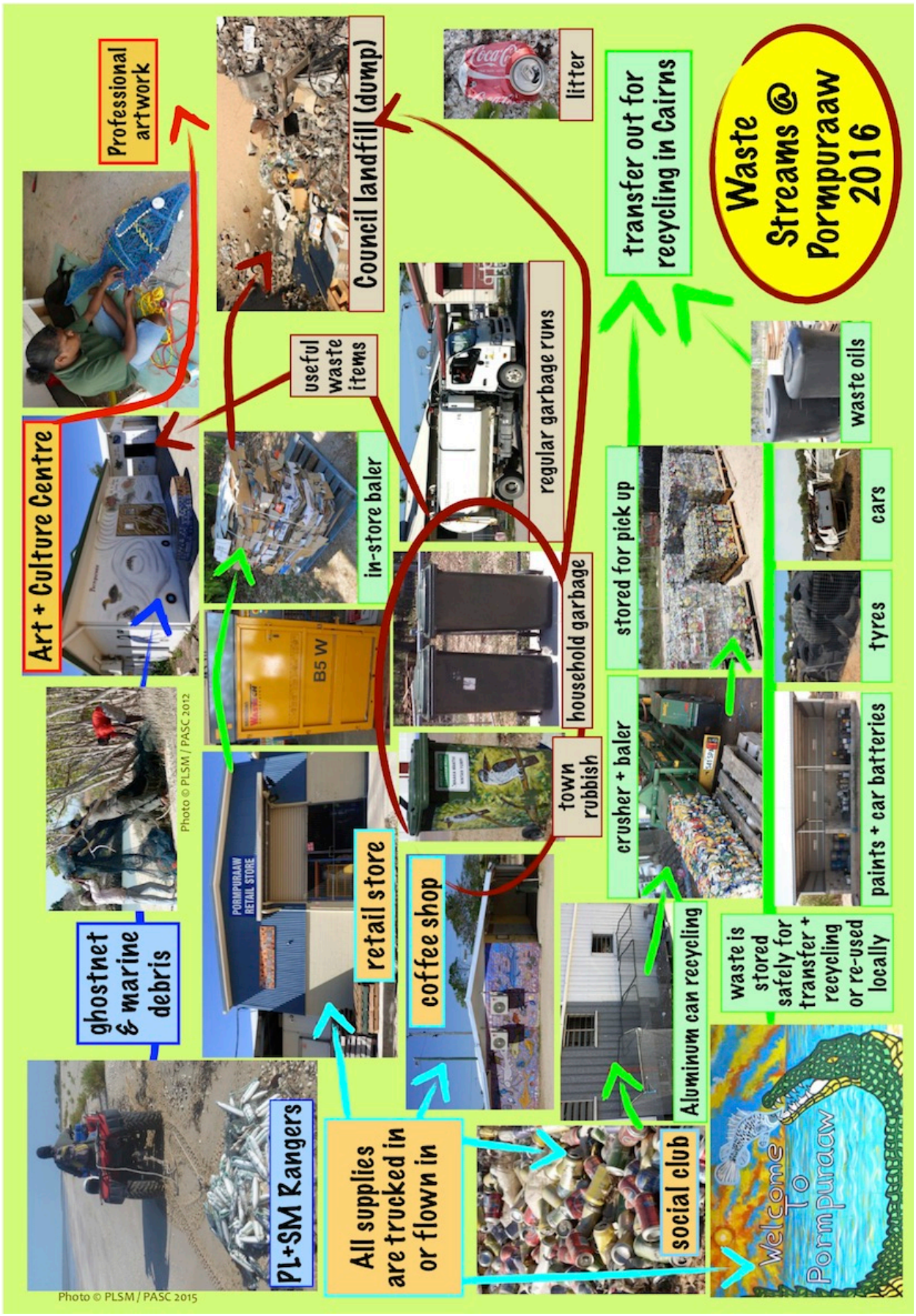


Indicative local waste stream mapping – Mapoon (as at end 2016).

2016 Mapoon community waste stream poster.



IndicativelLocal waste stream mapping – Pormpuraaw (as at end 2016).



2016 Pormpuraaw community waste stream poster.

Northern Australia Environmental Resources Hub

National Environmental Science Programme

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