



Australian Government

Department of the Environment and Water Resources

**Marine and Tropical Sciences Research Facility (MTSRF)
June 2007 Milestone Report**

**Project 1.3.5: Data synthesis and development of the Torres Strait component
of the Integrated Report Card**

**Project Leader: Mr Damian Miley, Torres Strait Regional Authority
Scientific Support: Dr Alan Butler, CSIRO Marine and Atmospheric Research**

Summary

This final report includes

- an outline of workshop and consultation activities and engagement with Torres Strait Island leaders;
- a review of previous research work in Torres Strait and its current accessibility
- a draft list of key issues identified, potential indicators suggested for those issues, and indication of their strengths and weaknesses, and of further research work needed to develop them as practical indicators; however this remains under discussion both within the Technical Advisory Group and with TS leaders;
- comments on linking between this project and the framework project for the IRC (Project 3.7.7);
- outline of activities needed in coming months to develop proposals for MTSRF research in years 2-4 to develop those indicators, develop limits and thresholds of concern, and develop systems to measure and report on those indicators.

Within the constraints of a late start, and the need for consultation (in a context where other issues dominate the attention of the people being consulted), this project has achieved its aims.

For reference: Milestone extracted from Project Schedule

The Description of this Milestone report is:

Report 2 submission:

- A 'first draft final report', detailing initial outcomes of meetings and workshops, and engagement with Torres Strait leaders and communities with reference to local considerations on draft potential indicators and thresholds for the Torres Strait. [TSRA]
- A 'first draft final report', detailing a short list of potential indicators for Torres Strait and summarising their strengths and weaknesses, including summary of progress with linking these potential indicators into the draft framework for the IRC (the exchange between Projects 1.3.5 and 3.7.7). [CSIRO]

The Final Report (of which this is a draft) is described as follows:

Report 3 submission:

Final report, detailing consultations conducted and workshops held, and explaining outcomes in terms of:

- Key issues identified. [TSRA]
- Conceptual models related to those issues. [CSIRO]
- Potential indicators and potential thresholds required to report on those key issues. [CSIRO]
- Plan for activities needed in later years to develop those indicators, develop limits and thresholds of concern, and develop systems to measure and report on those indicators. [CSIRO]
- Outline of any research needed in Torres Strait, identified during the workshops and consultations. [CSIRO]
- Update report on input into the Integrated Report Card Framework (links to Project 3.7.7). [CSIRO]

This report addresses all the above matters, though in a different order

Project Results

1. DESCRIPTION OF THE RESULTS ACHIEVED FOR THIS MILESTONE

1.1 *Meetings, workshops, and engagement with Torres Strait leaders*

A workshop was held at the DPI Northern Fisheries Centre, Cairns on 29 and 30 March, 2007. Participants represented TSRA, RRRC, and agencies involved in the former CRC-TS (CSIRO, GA, QDPIF).

The Community Liaison Officer was appointed in February 2007. He has discussed a range of matters with key leaders and communities on the islands (**Attachment A**).

The draft list of potential indicators, developed by the Cairns workshop, has now been circulated to members of the Land & Sea Management Unit's Technical Advisory Group for further input and comment. Several suggestions have been received and are being adopted for addition to the list where relevant. The Community Liaison Officer will commence discussions to ratify with Torres Strait Islander stakeholders using the updated draft list, from mid June to early August. The resulting information will then be used to develop the Torres Strait component of the IRC.

The Community Liaison Officer provided a briefing to the TSRA Executive Board members on MTSRF activities in the Torres Strait on 24 May 2007. As well as an overview of the broader role and objectives of MTSRF, the linkage with the RRRC was also explained. With regard to Project 1.3.5, a suite of example indicators covering the three main themes (Islands, Seas and People) was circulated to the members to further explain the way indicators will be used to measure the state of the natural resources in the region and any future changes that may occur. Although the brief was presented for their noting only, general in-principle support was obtained for the Community Liaison Officer to proceed with visits to outer island communities seeking their further input on relevant indicators. The project is to be presented to the Board of TSRA in late August.

The Community Liaison Officer is continuing to liaise with key stakeholders, community leaders and ordinary community members wherever possible, as he moves about the region on a variety of business. This process will continue into the future.

1.2 *Previous research work in Torres Strait*

The "desktop review" component of this project is being undertaken by Mr Vic McGrath, Community Liaison Officer. Vic's appointment only commenced in February 2007.

The Community Liaison Officer has familiarised himself with Torres Strait related reports through working with the CSIRO Spatial Data Coordinator to identify those publications requiring "Sensitivity" status as opposed to the ones available to the public. He has also liaised with the Island Coordinating Council to seek out copies of their locally produced reports for inclusion into the TSRA library.

At the Cairns workshop, the project team noted scientific data produced by previous projects, particularly but not only in the recent CRC-Torres Strait. There is a very large body of research on Torres Strait, and there is little value in trying to summarise it briefly here, but we note below several recently-created tools and sources that make this information readily accessible to future workers.

The **CRC-TS** aimed to

- Support the sustainable development of marine resources and minimise impacts of resource use in Torres Strait
- Enhance conservation of the environment and the social, cultural and economic well being of all stakeholders, in particular the Torres Strait peoples and
- Contribute to effective policy formulations and management decision making.

The CRC had three research Projects and an Education and Extension project, and a total of about 18 tasks within these. Projects were:

- Sustainable Harvest
- Understanding the Environment
- Management Strategies and Risk
- Education and Extension

The project team for project 1.3.5 was aware of the outputs and ongoing work of these Projects (some tasks have not yet made their final reports) in discussing indicators and possible future work.

1.3 Access to previous information

A large part of the work from the CRC, and earlier research, is or is becoming accessible through three mechanisms, as follows:

1.3.1 There is a **Torres Strait AFMA Research Data and Report Archive**, prepared in 2003 (AFMA Project R02/1193), and including all previous AFMA reports, in many cases also the data, and some other reports. This is available on CD/DVD and is to be made available via the web (link through TSRA website) within new CRC-TS Information System (below), as soon as copyright permission has been obtained from AFMA. This covers data and reports on many topics, as indicated by the table of contents of its publication listing:

16. Appendix 5 Publication Listing (by Topic)

- 16.1 Beche-de-mer
- 16.2 Dugong
- 16.3 GIS
- 16.4 Habitat
- 16.5 Mackerel
- 16.6 Prawn
- 16.7 Reef Resources
- 16.8 Rock Lobster
- 16.9 Seagrass
- 16.10 Traditional Fishery

1.3.2 The **Torres Strait Marine Research Repository** has recently been completed. This is a final product from the CRC-TS and focussed on the outputs of that CRC, but not confined to it. This provides easy access to publicly available

- Grey literature (research reports, presentations, etc.)
- Research Publications
- Research Data

and provides for restricted access to sensitive information upon request).

It is now available at www.cmar.csiro.au/datacentre/torres/ and will be linked as soon as possible to the TSRA website. The previously-existing AFMA data and reports archive (above) will be included as soon as permission is granted, the outputs of the recent CRC-TS are included and additional publications can be added as they appear.

The prototype opening screen of the repository is illustrated in Figure 1. The repository provides a custom Google search interface, as illustrated in Fig 2, direct access to the CSIRO Marine and Atmospheric Research metadata index (MarLIN) (Fig. 3), enables searching of other sites (Fig 4), and other Australian data centres and libraries (Figs 5, 6) and enables a Google search on selected, relevant web domains (Fig 7).

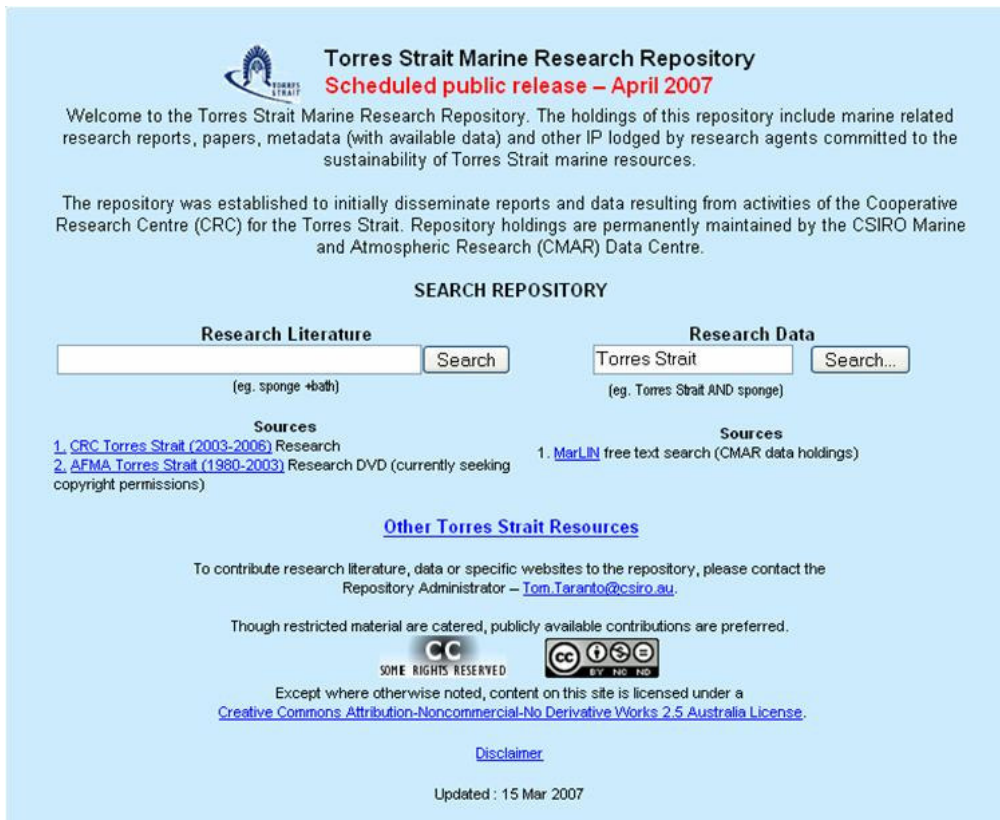


Figure 1. Opening screen (prototype) for TS Marine Research Repository.

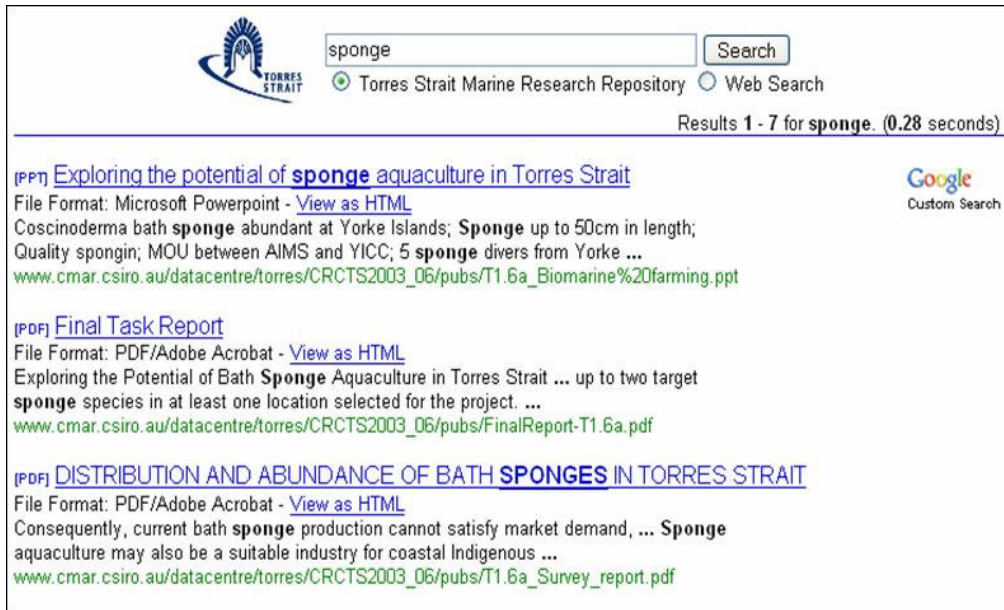


Figure 2. Custom Google search interface.

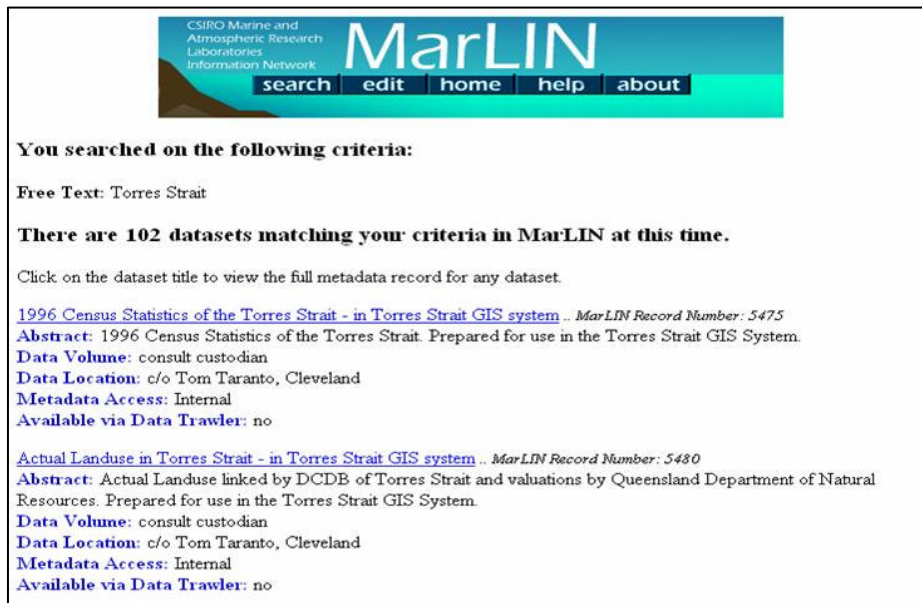


Figure 3. Access to CMAR's MarLIN metadatabase



Figure 4. Search other sites.

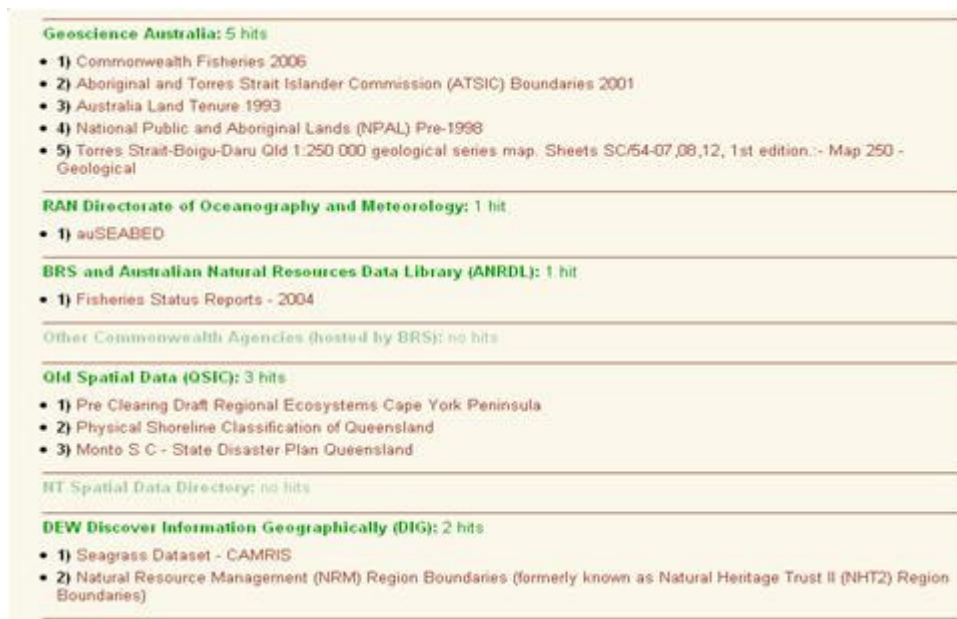


Figure 5. Access to other Australian Data Centres.

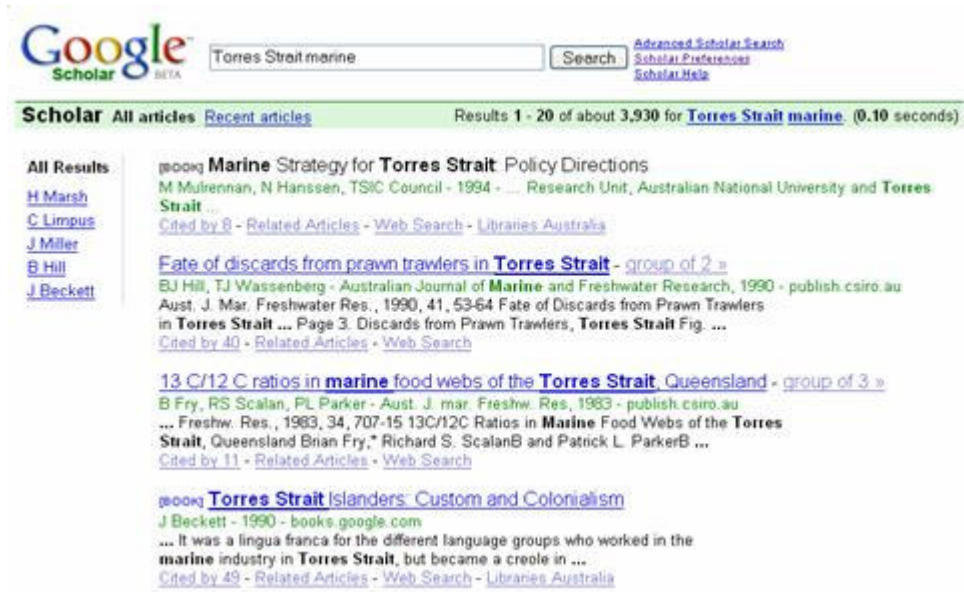


Figure 6. Search libraries.

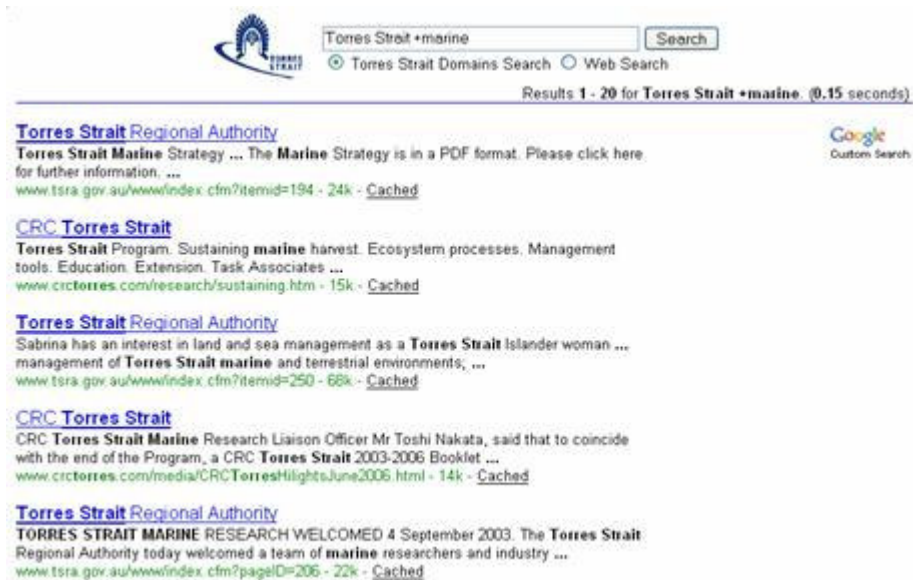


Figure 7. Custom Google search on selected web domains.

The Repository is now available at www.cmar.csiro.au/datacentre/torres/ and will be linked as soon as possible to the TSRA website (which is undergoing reconstruction at present).

1.3.3 A special issue of a scientific journal, *Continental Shelf Research*, devoted to Torres Strait research, is now being edited (Peter Harris, Rob Coles and Alan Butler editors).

Editing of the Special Issue is underway and should be completed by the end of 2007. In the area of marine resources, five papers will address traditional fishing issues and one will address the sustainability of the dugong. There will be six papers on the fisheries for Rock Lobster, Barramundi Cod, Coral Trout Spanish Mackerel and Sea Cucumbers, and one additional paper investigating the potential for sponges as a new aquaculture industry – now the subject of a MTSRF project.

Providing insight into how the biophysical processes interact in the Torres Strait was a key aim of the CRC program. Three papers address sediment movement, its origin and impact on the seabed in the Torres Strait and on seagrass beds. A further two papers study water movement and wind and tide driven current to provide a picture of the dynamic nature of short and long-term sediment and water processes. Three papers study specifically the growth, productivity and nutrient status of the seagrass meadows and this is integrated as part of a major regional study by a team assessing biodiversity and benthic assemblages of inter-reef waters. (This year's MTSRF project 1.3.1 complements the work of that team). The CRC was, thirdly, concerned with integrated management strategies and risk assessment. One paper will address the risks associated with pests introduced from ballast water and as hull fouling. Another tackles the challenge of evaluating management strategies where more than one aspect of the system is affected by any decisions; the example chosen is the penaeid prawn fishery as a model to evaluate formal statistically based ecosystem based management.

The final paper describes a project that takes steps to involve the local community in monitoring a key aspect of the environment: Seagrass-Watch.

1.4 Identification of key issues and potential indicators

A workshop was held at the DPI Northern Fisheries Centre, Cairns on 29 and 30 March, 2007. Participants represented TSRA, RRRC, and agencies involved in the former CRC-TS (CSIRO, GA, QDPIF).

The program for this workshop is at **Attachment B**.

The original concept for this workshop was a broad community consultation event, but on the advice of TSRA and the LSMU, it was considered that this initial event should involve a group who understood previous scientific work in the region, who understood previous planning work that had already been done, and who could focus effectively on the needs for indicators for a report card. The intention was to take the outcomes from this workshop to a wider constituency for further discussion before arriving at recommendations.

The workshop recognised that some things are "issues" for TS people but not for environmental reporting. It also recognised that many issues (requiring environmental reporting) are identified in previous strategic planning documents, and that we should not reinvent the wheel but should use that past work. We needed to ask, which of the issues identified there are appropriate for the IRC?

The workshop took account of pre-existing information (much of which is accessible from the report and data archives outlined above) and particularly of pre-existing planning documents. It should be made clear that these planning documents are quite recent and still current. The Land and Sea Management Unit formally works to the first two of them. They include:

- **Torres Strait Land and Sea Management Strategy (2005)**
- **Torres Strait Development Plan 2005-2009, and**
- **Torres Strait Strategic Marine Research Plan prepared by the SAC (2005)**

Participants agreed that these planning documents covered very similar ground regarding research priorities (excepting that much of the SAC's plan referred to fisheries-specific questions which were outside the brief of this workshop), and so agreed that we would focus on the *Land and Sea Management Strategy (2005)*. Working through that document, we identified key issues and, for each of those issues, attempted to identify candidate indicators.

The outcomes from that workshop took the form of a large spreadsheet, which was considered merely a working tool, not a presentable product. Subsequently, the Community Liaison Officer submitted it for comment to the Technical Advisory Group established to support the Land and Sea Management Unit. It has been, and is continuing to be refined in response to their comments. It was also discussed with the TSRA Executive on 24 May and, although the brief was presented for their noting only, general in-principle support was obtained for the Community Liaison Officer to proceed with visits to outer island communities seeking their further input on relevant indicators. The project is to be presented to the Board of TSRA in late August. The proposed issues, indicators, etc., will become a key input to the process of planning Year 2 work in Project 1.3.5, during July-August 2007.

The workshop concentrated on working towards potential indicators for an environmental report card, but in the process, participants recorded topics which were considered in need of further research work even if it was not directly towards indicators. There are columns for this in the spreadsheet.

It is important that key stakeholders should understand the process, and feel some ownership of the proposed set of issues, indicators etc., before we move forward to the MTSRF Program for year 2. That consultation will necessarily continue into financial year 2006-7, and for that reason, this report provides a “work in progress”.

In many cases workshop participants articulated “conceptual models” for how an issue “works” and hence why certain indicators were proposed, during the workshop, but these were not written down in detail; it would have taken far too long and there would have been much redundancy. Instead, once sufficient community consultation has been done, it will be appropriate to document conceptual models for the (possibly shorter) list of high priority issues, and to outline the scientific work needed to convert those candidate indicators into effective indicators that are cost-effectively measurable, meaningful and able to be acted upon (i.e., have thresholds, limits and anticipated management responses).

1.5 Draft list of key issues identified, potential indicators suggested for those issues, and indication of their strengths and weaknesses.

The current draft of this list is at **Attachment C**. It has received some comments from the TSRA Executive, and some comments from TAG members, but more comments are awaited. This list is the subject of ongoing discussion.

1.6 Draft indication of further research work needed to develop the suggested indicators as practical indicators with thresholds, limits and responses

This project was never designed as a full, strategic research planning exercise for Torres Strait. Nevertheless, in discussing the development of indicators the team did identify questions that required further research which seemed, to the project team and to the island leaders we consulted, to be work of high priority. We captured these ideas as we proceeded. The current list of such ideas is included in the working spreadsheet at and remains subject to active discussion. These suggestions, as they exist at this time, are included in the table at **Attachment C**.

1.7 Exchange between Project 1.3.5 and 3.7.7

This project contributed financially to Project 3.7.7 because we needed a framework for an integrated report card which, at that time, was envisaged as being uniform for the whole of north Queensland – reef, rainforest and Torres Strait. Alan Butler has remained in touch with project 3.7.7, and its activities and results so far were reported to the Cairns workshop and gave guidance about the nature of the tasks for this project. Project 3.7.7 will provide a framework for report-card production, but the prototype developed by project 3.7.7 will be focussed on GBR Water Quality, and a different framework may be suitable for Torres Strait. In any case, the Torres Strait process is at an early stage and therefore cannot usefully link to project 3.7.7 in detail at present.

1.8 Outline of activities needed during coming months

There needs to be discussion with key stakeholders, notably the Board of TSRA, Island community leaders, and to the extent possible, the rest of the communities, to refine the attached list of:

- Key issues,
- Environmental Indicators, and
- Research needed to render those indicators “operational” (with conceptual models indicating how the indicator relates to the issue; thresholds of concern; and an indication of response that could be taken when each indicator reaches a threshold of concern), to the point where it has sufficient local support and “ownership” to be developed into a research plan for MTSRF funding in years 2-4.

In the concept of this present project, it is envisaged that that research program will be designed to develop indicators, develop limits and thresholds of concern, and develop systems to measure and report on those indicators – but it is conceivable that the consultative process may arrive at other priorities.

1.9 Summary

The work towards an integrated report card for Torres Strait could never have been finished in one year, so this final report describes a “work in progress”. We have a list of issues and candidate indicators, and we have increased the level of understanding amongst stakeholders of what a report card would mean and how it would be used. Discussion is continuing, and it will take some time to reach an agreed final list of candidate indicators, conceptual models, and a list of research necessary to refine them into effective indicators. It is anticipated that proposals for research in years 2 and beyond, can be prepared in July and approved by end August. Even then, the process leading to an integrated report card will be ongoing.

1.10 Explanation of Activity changes

The project has had no significant activity changes apart from timing issues (below).

1.11 Problems and opportunities

The late signing of contract (late 2006), coupled with the difficulty in getting people together due to other commitments, meant that we had our first workshop only in late March.

This was effectively the start of what was originally conceived as a one-year project – so the project was challenged with attempting a year's work, largely consultative, in 3 months. The consultation process could not be "rushed through" and so completion of the full aims for the project by June was not possible. In any case, consultation about matters such as report carding and indicators is an open-ended process which will take an unpredictable amount of time. Accordingly, we are reporting progress by June, and we propose to get done, by July-August, sufficient consultation and discussion to enable the development of MTSRF project proposals for years 2-4.

1.12 Other issues

Given that the development of the cultural indicators component of this work largely stems from an earlier incomplete project which was conducted within the CRC Torres Strait program, the findings from a review of this program currently being undertaken by Dr Bill Arthur of the ANU is expected to be important and relevant to the objectives of this project. These findings will be taken into account as the work proceeds into June-July 2007.

1.13 . Communication, major activities or events

During milestone reporting period

The main communication events have been visits by the Community Liaison Officer to a number of communities in Torres Strait, a briefing to the Executive of TSRA, and email discussion of the proposed indicators etc. with the L&SM TAG. The Community Liaison Officer has been travelling constantly to the islands and has taken all opportunities to discuss this project with key stakeholders. He will continue to do so.

Forecast variations to planned milestones

No variation. This is the final milestone for project 1.3.5 in year 1.

Attachment A

MTSRF Related Activities - 2006/07

Vic McGrath – Community Liaison Officer

Land & Sea Management Unit, TSRA

Overview

Vic commenced work as the Community Liaison officer (CLO) at the LSMU on 7 Feb 2007.

He has a broad range of general information dissemination and liaison responsibilities in this role including:

- coastal erosion;
- climate change;
- NRM related grants;
- Capacity building of Torres Strait Prescribed Body Corporations (PBCs);
- Assistance with community consultations and identification of priorities and project opportunities;
- Assistance with the development of LSMU related policies and plans;
- Assistance with project monitoring and evaluation;
- Project management;
- Assistance with NRM grants;
- Liaise with LSMU Technical Advisory Group on an “as needed” basis.

The CLO works closely with all members of the LSMU team in ensuring information is presented in a coordinated manner. This includes information sharing and dissemination of MTSRF activities.

MTSRF related activities of the Community Liaison Officer in year 1

As the CLO position is part-funded by MTSRF, he is required to work with the Manager (LSMU) in achieving contractual milestones and reporting requirements for MTSRF projects. The MTSRF projects that the CLO is currently directly engaged in include the following:

Ecological Role and Potential economic Value of Sponges in the Torres Strait (1.3.2)

Contacted the two Masig Is divers separately in mid-March to describe CLO support role when they were asked to discuss any issues (eg safety equipment and training needs) and possible capacity building opportunities have been identified.

It is envisaged that these will be firmed up when the CLO liaises with the Masig Council and divers prior to or during the next field visit by the project team to involve himself within the project's operation and facilitate active community engagement and participation.

Project Communication (Community Engagement and Enhanced Delivery (1.3.4)

- Power point presentation and discussion on CLO work plan activities is scheduled for the June 07 meeting of the TSRA Board. This will include information on MTSRF projects.

- Power point presentation and discussion have been conducted during five pilot Community Planning workshops in conjunction with Local Government Association Qld (LGAQ) – 30/4 to 4/5. This project was aimed at incorporating land and sea issues within their plans including possible scientific research considerations;
- Attended NRM Management workshop which focused on coordination of service delivery on the Northern Peninsula Area by key Government Environmental Agencies and spoke on broader CLO role. (18/4);
- Introductory letters sent to the LSMU's Technical Advisory Group advising them of commencement and role of CLO. (Feb 07)
- Undertaken initial discussions on climate change matters (program 5 climate change) and become familiar with program 4 (species of conservation – turtle and dugong) program leaders; and act as a conduit between the programs and community.

Data Synthesis and Development of Torres Strait Component of Integrated Report Card (1.3.5)

- Attended IRC workshop in Cairns on 29 & 30 March to develop pilot indicators for Torres Strait projects. These were refined before being circulated to the LSMU Technical Advisory Group for their input, particularly with the terrestrial component, and also presented to the Executive of TSRA.
- The CLO is now a member of the MTSRF Torres Strait Steering Committee which has secretarial support from the RRRC, Cairns and he attended the 1st Torres Strait Steering Committee meeting there on 14 March, and attended by phone link, the second meeting on 4 May in Cairns.
- The CLO briefed the TSRA Executive Board members on MTSRF activities in the Torres Strait on 24 May 2007. As well as an overview of the broader role and objectives of MTSRF, the linkage with the RRRC was explained. With regard to project 1.3.5, a suite of example indicators covering the three main themes (Islands, Seas and People) was circulated to the members to further explain the way indicators will be used to measure the state of the natural resources in the region and any future changes that may occur. Although the brief was presented for their noting only, general in-principle support was obtained for the CLO to proceed with visits to outer island communities seeking their further input on relevant indicators.

Proposed activities for Year 2

- Continuation of presentations to remaining communities as part of the 06/07 project to incorporate land and sea issues into individual community plans;
- Transfer of CSIRO's Torres Strait Marine Research Repository to the TSRA website;
- A further two six monthly presentations to the TSRA Board on MTSRF project outcomes;
- Presentation to National Indigenous Land and Sea Conference in Cardwell, Qld (Oct 07);
- Local radio interviews;
- Regular written briefs to TSRA Environment Portfolio Rep for quarterly board meetings;
- Updates posted on land and sea section of TSRA website and quarterly newsletters;
- Information on projects displayed at TSRA booth during Torres Strait careers market in July 07;
- Further liaison with Masig community re sponge project;

- Update scientific research protocols for working in Torres Strait;
- Assist with finalisation and “road testing” of project indicators;
- Liaise closely with program 5 (climate change) and program 4 (species of conservation – turtle and dugong) program leaders; and act as a conduit between the programs and community;
- Prepare milestone reports as required.

Attachment B.

Agenda for Cairns Workshop.

AGENDA

MTSRF Project 1.3.5 – TS data synthesis and development of IRC

Thursday March 29, 0830 for 0900 – Friday March 30, 1200

Location: DPI Northern Fisheries Centre, Cairns.

	Item (Presenters named, but all participants to take part in discussion)	Source documents * copies provided at workshop ** please BYO copies
Day 1 0830	Coffee available	
0900	Welcome – Alan Butler Introduction to objectives of project and aims of this workshop	
0915	The science-management interface and the role of Report Cards – Alan Butler A view of where we came from in proposing this project, how it relates to the IRC Framework project (3.7.7) and what needs to be achieved by this project in year 1 (i.e., in the next 3 months!)	Alan's ppt Review of IRC approaches being done by Project 3.7.7
0945	Short Break	
1000	The identification of "issues" for an IRC – Alan Butler <ul style="list-style-type: none"> • Some things are "issues" for TS people but not for environmental reporting. Put them aside. • Many issues (requiring environmental reporting) are identified in previous strategic planning documents. Which are appropriate for the IRC? • The idea of Ecosystem Services as a guide to selecting the key ones for reporting (and later, for integrated management actions). • Monitoring and evaluation as part of an adaptive management cycle – targets and management actions that are relevant and achievable 	Alan's ppt ** Land and Sea Management Strategy for Torres Strait ** Torres Strait Strategic Marine Research Plan prepared by the SAC ** TSRA Development Plan 2005 - 2009
1045	Break – coffee	
1115	What we know – Alan Butler Outline of previous scientific research in TS – especially recent CRC-TS work and where it leads. Other scientific attendees to contribute freely.	Alan's ppt TS AFMA report and

	Item (Presenters named, but all participants to take part in discussion)	Source documents * copies provided at workshop ** please BYO copies
	<p>This session begins as an “information summary” but moves to discussion of issues and work needed, informed by the IRC approaches outlined above.</p>	<p>data archive</p> <p>Information system from CRC-TS (under development)</p> <p>Special Issue of <i>Continental Shelf Research</i> (in preparation)</p>
<p>1230</p>	<p>Break – lunch</p>	
<p>1400</p>	<p>Identification of issues and the process for developing the TS IRC – the TSRA perspective – Vic McGrath</p> <p>The above sets the scene for (1) what IRCs are about; (2) where we are with the science; and (3) the relevant processes and protocols.</p> <p>This session sets the scene from the perspective of Torres Strait Islander people, including:</p> <ul style="list-style-type: none"> • Emerging community priorities, concerns and issues; • Incorporating traditional ecological knowledge in monitoring and management approaches; • Existing management tools and initiatives; • Research protocols, the proposed R&D Plan for TSRA, and the negotiation of research approaches and outcomes to promote coordination; • Promoting the application of research findings in a community-based management and monitoring context. 	<p>* Vic’s ppt</p>
<p>1445</p>	<p>Short Break</p>	
<p>1500 – 1700</p>	<p>Identification of issues for the TS IRC – discussion – all participants – Alan Butler leader</p> <p>Time to focus (out of the many possible issues) on the issues that will be identified in this project’s report and targeted for further work.</p> <p>Flexible discussion, with approach to be agreed by participants on the day, and breaks as agreed.</p> <p>At close, agree on plan for day 2.</p>	
<p>1830 (TBC)</p>	<p>Workshop Dinner (To be confirmed)</p>	
<p>Day 2 0830 - 1200</p>	<p>What next?</p> <p>Detailed agenda for this day, to be agreed by end of Day 1.</p> <p>“Further work” (above) must include (lead person in brackets):</p> <ul style="list-style-type: none"> • Outlining conceptual models (Alan); 	

	Item (Presenters named, but all participants to take part in discussion)	Source documents * copies provided at workshop ** please BYO copies
	<ul style="list-style-type: none"> • thus identifying candidate indicators (Alan) • Discussion with management agencies, not all present at this workshop. This may alter the above lists. (Alan, Vic) • Identifying research needed to develop indicators, thresholds, etc. (Alan) • Assisting in the production of community education and awareness-raising materials (Vic) • Community liaison and research protocols (Vic) • Reporting (Damian, Alan) <p>We hope to get some way with the first 2 points above during this workshop. More importantly, we must assign duties and deadlines over next 2 months.</p>	

Attachment C.

Table C1 identifies potential indicators, based on issues identified in the Land and Sea Management Strategy for Torres Strait, November 2005. During a workshop in Cairns, a group of marine scientists particularly examined the "Sea" section, and a group of community representatives and an economist examined the "Islands" section and the "People" section. Subsequently, the spreadsheet was circulated for comment to members of the Technical Advisory Group for the Land and Sea Management Unit. Those comments are still being received, and indeed this matter will be the subject of ongoing discussion into July 2007, but the table reflects comments received to date.

Notes:

1. "Who to develop" entries are merely suggestions as to which agency might be competent to develop an indicator - e.g. to establish ways of measuring it, and ways to interpret it - thresholds of concern, etc. Naming agencies does not imply any commitment.
2. Many indicators like "number of incidents", would be reported but do not need "development" in a research sense. In the "who to develop" box we simply record R (for "reportable") – it will be necessary to determine who would report. In some cases there is already a statutory or operational obligation.
3. Whilst considering *indicators* for a report card (the primary interest of this project), we also noted *other work* (not specifically about indicators or report card development) that is needed in the Torres Straits. These are recorded in the table under "Other work needed" and, like the potential indicators, should be considered a "work in progress" and subject to continuing discussion. Again, the "who to develop" column merely records suggestions as to who might do such work and does not imply any commitment.
4. For the Priorities assigned to these issues in previous discussions and consultations, see p.49 of the Land and Sea Management Strategy.

Table C1. Current DRAFT list of issues, and potential indicators, related to key issues identified in the TS Land and Sea Management Strategy.

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
1. ISLANDS					
1.1 Land Resources					
1.1.1 Coast					
Coastal erosion	net loss of island area	DNRW, TSRA, DPI, EPA, QPWS	Fine scale modelling to predict	Combination CSIRO, GA, JCU for different components	Fine-scale modelling can address a number of the issues below
	number of inundation incidents	R	Connect TS hydrodynamic modelling and sediment modelling, to Climate scenario modelling	Collaboration CSIRO and GA	Report card might carry a brief verbal account of the nature of the incidents.
			distinction between effects of currents / sediment movements and sealevel rise and human activities	Collaboration CSIRO and GA	

Assess biological impacts of scenarios developed from the above: e.g. effects on upwellings, lobster and prawn recruitment, sediment movement

variety of agencies, especially CSIRO and QDPIF, building on above scenario work

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
1.1.2 Landscapes					
Land erosion	number of erosive "incidents"	Explore whether EHOs in Councils would be interested in reporting to TSRA LSMU/ICC ISU staff?			NOTE: in many such cases the report card might carry a paragraph describing the incidents and their consequences
1.1.3 Infrastructure					
1.2 Water					
1.2.1 Surface Water					
1.2.2 Groundwater					
1.3 Biodiversity					

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
1.3.1 Ecosystems					
	fire scar mapping (number of fires per yr)	May be covered under RE Mapping project as part of analysis of spatial datasets. May be reported by Rangers, where applicable.			
	Net area revegetated per island	TSRA Landcare Officer may be able to provide data in some instances for Mer, Masig and Erub			
	number of islands mapped at an appropriate scale and prioritised for restoration activities	R - RE Mapping at a 1:25,000 scale is to commence shortly for select TS islands			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
1.3.1 Ecosystems					
			Impacts of development on terrestrial flora and fauna		Sustainable Land Use Planning project with six TS communities to commence in the near future
			intertidal wetland surveys		Dr Craig Miller, CSIRO has expressed interest in carrying out wetlands surveys on select islands
	Change in composition of bird fauna (all or selected species)		Plot/transect counts		Different suites of birds are good indicators of different pressures, based on mobility/dispersal characteristics; some known to be sensitive to landuse impacts
	Change in composition of mammal/reptile fauna		Pit/Elliott trapping; search; counts; track counts; scat counts; hair tube		A direct measure of components of biodiversity, some known to be sensitive

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
1.3.1 Ecosystems					
	Riparian/aquatic condition		Rapid assessment techniques? Possibly remote sensing		Important habits for many biota; indicates problems with sediment and nutrient loads
	Distribution and abundance of feral herbivores		Plot/transect counts; scat counts; aerial surveys		Sometimes a major & uncontrolled source of grazing pressure
	Distribution and abundance of feral predators		Spotlight transect counts; scat or track counts		Predation may be a critical factor in the decline of many fauna species and important management factor for some threatened species
	Distribution and abundance of invasive weeds (terrestrial & aquatic)		Locality records; plot or transect counts		May be an important threatening process
	Extent of clearing of native vegetation (by land & vegetation type)		Aerial photographs, satellite imagery; data compiled by agencies. Clearing applications		Major threatening process. Can be enhanced with measures of patch size/ connectivity/ fragmentation.

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
1.3.1 Ecosystems					
	Frequency and extent of fires		Annual fire mapping by agencies. Remote sensing		May be a major threatening process but needs to be related to desirable fire regime for each landtype. Examine role of fire in changing habitat elements of landscape
	Landscape pattern change		Site-based assessment; probably at broad scales using remote sensing		Indicates potential loss of landscape function and habitat degradation. Link to biodiversity needs validation.
1.3.2 Species					
	Change in distribution or abundance of significant fauna species (eg. threatened spp./waterbirds)		Specific monitoring programs		A direct measure of components of biodiversity
	Status of threatened species and ecological communities		Specific monitoring programs, usually by agencies		Important component of biodiversity. May be an indicator that pressures are ameliorated in wider landscape.

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	Status of particular "icon" plant species		Specific monitoring program, usually by agencies		May be useful surrogates for broader biodiversity components or clearly demonstrate impacts of landuse pressures. May be chosen because of community concern, interest or knowledge

2. SEA

2.1 Sea Resources

2.1.1. Social cultural and heritage

Pipeline & other seabed infrastructure	Decision support mechanisms in place for range of issues (eg mining, boat ramps, aquaculture, pipelines etc etc.	R	Develop information base and decision support tools and clarity around referral processes and responsibilities	DEWR ?	Satellite imagery acquisition - Quickbird & Ikonos - Spot 5 images
	Detailed EIS - what proportion of infrastructure decisions had proper EIS?	R	Develop spatial information base (GIS based, readily accessible)	TSRA and RRRC partners	TSRA LSMU is to coordinate an information management project funded under the NHT in the near future.

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	How many current datasets are accessible to decision makers and to communities - in useable form (e.g. spatial form - GIS - www accessible)?	R			
	Do relevant communities adequately understand environmental issues and basis for decisions?	Social researchers - JCU?			
	Number of incidents per year	R			
	Number of response mechanisms in place.	R			
	Number of local islanders involved in marine management	R			

2.1.2 Shipping

Impacts of shipping	Number / Frequency of shipping movements	R - AMSA?			
	No of navigational incidents	R - AMSA?			Now recorded by DoT. See note above

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	area of habitat affected	QDPI?			
	adequacy of contingency plans	R			
	adequacy of responses	R			
2.1.3 Water Quality / Pollution					
	Distribution and extent of marine debris/ghost nets on TS shorelines and reefs (eg. Geographic scale of problem, number of islands affected, etc)	aerial surveys - DPI. Community monitoring under Ranger programmes and CDEP, where applicable.			TSRA is working in partnership with QDPI&F and the Carpentaria Ghost Nets program to undertake aerial surveys of marine debris and support community based monitoring of nets in the Inner Island region.
	rate of accumulation of debris - e.g. number of intact nets each survey, how long debris takes to re-accumulate after cleanup	Community monitoring - social researchers and L&SMU?	Use flow models to predict where debris will go / come from, hence targeting indicator measurement	GA, CSIRO	Have Gulf circulation and TS hydrodynamic models that could be used to predict, seasonally.
	Decision support mechanisms in place for range of land-based pollution issues.	R			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	Note activities in PNG W of the Fly	??			
Heavy metals	dietary habits of people	Social researchers - JCU?			Heavy metals is an issue but not fast-changing enough to be a report card indicator
	metal levels in people	??			
	number of rubbish dumps remediated & stabilised	R			some items above apply (ship incidents etc)
	No of incidents such as fuel spills, other spills, toxic disposals.	R			
	number of sewerage systems and their treatment level	R			
2.2 Sea Biodiversity					
2.2.1 Ecosystem health					
Lack of information	Availability of information in accessible spatial form, explaining ecosystem structure and function	R	Make existing information accessible (see above)		
	Number of planning decisions that identify a lack of information as critical	R			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	Number of formally identified research priorities that have been addressed / remain unmet	R	Fill high priority gaps - see SAC strategic plan and related documents		
	Changes in relative abundance of spp - e.g. low numbers of pearl oysters	QDPI, CSIRO, JCU, community monitoring schemes?	See comments above regarding coupled climate-change models and biological consequences		
Capacity to respond					Science agencies are fully committed and unable to redirect scientific capacity to emergency issues (or to emerging planning issues)
Introduced marine pests	Reports of introduced spp in new locations	QDPIF?			
	Number and location of surveys conducted. Searches targeted at what spp/groups.?	R - QDPIF?			
	Number of surveys that do not find introduced spp	R - QDPIF?			
	Number of quarantine officers with detection skills	R			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	Are risk management plans implemented?	R			
	Number of vessels of various types visiting ports. Vessel type, length of stay.	R			
	Number of people aware of marine quarantine (as result of DPI documents, etc.)	social researchers - JCU?			

2.2.2 Marine Species

Traditional fishing and hunting

a. fishing - finfish, lobster

Needs reporting but indicators will arise from work of AFMA / QDPI&F etc.

AFMA, QDPIF

Number of PNG people exercising traditional fishing rights in TS

??

Impacts of other activities on traditional fishing - commercial (recreational?) fishing for lobster, finfish

??

Amount of IUU fishing and its impact on traditional fishing

AFMA

Number of people participating in traditional fishing

??

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	Development and success of community management plans for trad fishing	R			
	Shifts in location of effort (e.g. associated with climate change, sealevel rise)	??			
b. turtle & dugong	Needs reporting but indicators will arise from work of Threatened Spp program, AFMA etc.	AFMA, JCU			
	Number and success of community management plans for trad fishing	R			
Rare and endangered species: dugong, turtles, rays, sharks, syngnathids, seasnakes, black coral	reported injuries / fatalities due to debris	R			
	Management plans in place	R			
	Estimates of IUU catch (all spp)	AFMA			
	Community management plans for protection of breeding sites and management of turtle egg harvest	R			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	Population estimates of feral animals (pigs and dogs) on nesting beaches	??			
	Available area of undisturbed beaches for nesting (coastal development - lights - sealevel rise - erosion - take by visitors from PNG)	??			
Commercial fisheries	Sustainability indicators for target spp - see AFMA etc.	AFMA			

2.2.3 Marine Habitats

Disturbance of garden bottom and coral reefs. (1) garden bottom	Development of plan for appropriate use of seafloor (e.g. over what habitat trawling should be permitted; guidelines for design of channels, port works etc.)	CSIRO. Can be specific about examples w.r.t. trawling, by time of this report (from CRC projects)			DAFF \$1M to look for new trawl grounds?
	percent area of each habitat type exposed to trawling / actually trawled.	ditto			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	Sea temperature?	??			
	Movement of sediment - e.g. mobile seafloor dunes.	GA			Sediment movement may be largely oscillatory so far but what if climate change alters the amount of time of NW vs SE winds?
	For the above - indicator might be meteorological ... days of monsoon vs trades		Establish network of (1) meteo stations (relevant to seagrass loss, sediment transport etc.) T, rainfall, sea level, cloud cover, wind speed & direction, and (2) moorings for current speed and direction, turbidity, wave height, water T.		A conceptual model discussed in the workshop was that at present, sediment moves east during monsoons, then west during trades, about the same amount, hence no net movement. If relative lengths of monsoon and trades changed, this would affect sediment, seagrass, island erosion etc.
(2) coral reefs	reports of bleaching events	community monitoring? Fishers' reports? Social researchers?			Meaning of "Bleaching" needs to be redefined and calibrated locally. Initially, community and fishers' reports can help with this.
	reports of other coral deaths	ditto			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	reports of Crown-of-Thorns starfish	ditto			
	number of infrastructure developments that affect coral reefs (e.g.reef-cutting for vessel access; airport construction)	R			
	sea temperature	??			way of reporting TBA - e.g. day-degrees above some threshold or average
	algal blooms	??			Community monitoring? Remote sensing?
seagrass	Net area, spp, biomass changes in seagrass	??			Sampling should focus on key hotspots where some change appears possible (e.g. near construction of barge landings)
	reports of location and extent of subtidal dieback (e.g. from lobster fishers)				Community monitoring? Following reports, might formally survey and measure extent
	reports of location and extent of intertidal dieback (from chance reports)				Following reports, might formally survey and measure extent

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	reports from seagrass watch (list the things they will report; density, health estimates, seeding, damage from anchors, trampling etc. ...)	QDPIF			<p>Extreme events are important, e.g. high temperature at low tide. Might consider reporting those (from SGW data) to detect climate trends</p> <p>One conceptual model for seagrass loss is that windy days on spring tides create turbid conditions for long enough to kill seagrass. Might a. ask climate scenario modellers for predictions and / or b. report such events as part of report-carding.</p>

2.2.4 Climate Change					
	Models & scenarios available at appropriate spatial scales for TS	R			See above about seagrass watch reporting: Might consider reporting extreme events (from SGW data) to detect climate trends
	See above about met stations and moorings				

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
3. PEOPLE					
3.1 Ailan Kastom					
3.1.1. Cultural heritage					
1a information base	Proportion of significant sites and areas mapped				
	Adequate systems in place for TS islander people to record, manage and protect cultural information and places	TSRA, MTSRF	Community mapping of significant cultural land and sea scapes	MTSRF	technical geo-spatial data sets could be linked to this through existing MTSRF initiatives
1b community engagement	number of TS and Aboriginal people engaged in environmental monitoring and research				
3.1.2 Traditional knowledge					
	number of projects incorporating a traditional knowledge component		identification of natural resource data sets that can benefit from traditional knowledge	MTSRF, TSRA, JCU	e.g. dugong and turtle management project
					need to look at Dermot Smyth's draft report on cultural indicators

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
					refer also to Annabel Jones CRC Guidelines Climate change - needs explaining locally - many misconceptions exist
3.1.3. Community					
awareness and communication	number of mechanisms through which islanders can access information about their land and sea scape environment (support planning activities)???				support decision making and planning - community based
	Extent to which TS people are consulted on NRM issues ???				external initiative or specific development activity
	number of awareness raising events held and other feedback to communities about research findings e.g. TSBS				general environmental awareness
	number of community education programs of relevance to NRM				e.g. talks to schools, councils
planning	number of council community plans incorporating land and sea management components	TSRA, LGAQ			

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
Employment and economic development opportunities	number of employment opportunities generated in NRM activities number of sustainable resource based economic development initiatives/ventures ???		Development of an eco-cultural tourism development strategy	MTSRF	
science and research	amount of funding for NRM research in TS number of NRM research projects in TS number of research agreements negotiated with TSRA/communities (may be two separate indicators)??? number of projects that comply with research protocols developed by TSRA				
environmental health	decision support structures in place for development and management of environmental health infrastructure (e.g. sewage, dumps) ???				qualitative indicator good/bad/ok

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
	number of studies investigating/monitoring health impacts associated with e.g. waste dumps, sewage, pollution of marine environment ???				ex post after event e.g. dump site flooding, leaching into water table
water supply	proportion of island communities with adequate water supply (i.e. not requiring emergency water supply).		investigation of adequacy of existing supply - what is the population limit for each island based on water supply under current management and alternative management strategies		islands currently developing water management plans
	number of communities with sustainable water plans in place				
3.2 Capacity					
3.2.1 Regional capacity					
3.2.2 Local capacity					

Issue	Indicator	Who to develop	Other work needed	Who to develop	Notes and Comments
3.3 Institutional Environment					
3.3.1 Governance					
3.3.2 Education					
3.3.3 Science and Research					