

## Project Proposal Template

Please delete all instructions in italics. Sections D to F have a limit of 4 pages (in total) and the full proposal should not exceed 6 pages, excluding the budget and references (Calibri, 10 font).

### A. TITLE OF PROJECT

Project VM4.1 A repository of knowledge: Mātauranga Māori

### B. IDENTIFICATION

#### **Project Leader:**

*Name, Institution: James Whetu, Whetu Consultancy Group*

*Postal Address: 4 Caleb Close, Ngāruawāhia 3720*

*Email Address: james@whetugroup.co.nz*

*Telephone: 021 149 3565*

#### **Investigators:**

*Name, Institution: Amy Whetu, Whetu Consultancy Group*

#### **Direct Advisors:**

*Name, Institution:*

*Deborah Edmunds, Partner, Kensington Swan*

*Tai Ahu, Solicitor and Associate, Kensington Swan*

*Brent Wood, Environmental Information Delivery, NIWA*

*Dr Hēmi Whānga, Māori and Pacific Development: Te Pua Wānanga  
ki te Ao, University of Waikato*

*Dr Rangī Mātāmua, Māori and Pacific Development: Te Pua Wānanga  
ki te Ao, University of Waikato*

#### **Indirect Advisors:**

*Group, Name:*

*Kāhui Māori: Liana Poutu, Anaru Luke, Sarah-Jane Tiakiwai*

*Caucus of Māori Researchers in Sustainable Seas and Ngā Pae o  
Māramatanga: Linda Faulkner, Dr Shaun Ogilvie, Dr Gail Tipa, Dr Dan  
Hikuroa, Dr Naomi Simmonds, Dr Shaun Awatere, Kelly Ratana,  
Kimberley Maxwell, Dr Anne-Marie Jackson, Dr Robert Joseph,  
Professor Jacinta Ruru, Marino Tahi, Darcel Rickard, Sarah-Jane  
Tiakiwai, Daniel Patrick.*

#### *Digital Meta Data Management:*

- Anton Marais - GIS Team Leader: Waikato District Council*
- Siani Walker - Acting Manager Maori Cultural Heritage: Auckland Council*

- *Maui Hudson - Senior Research Fellow and Research Developer: University of Waikato (involved in Mātauranga Māori and Indigenous Data Sovereignty initiative)*

## C. ABSTRACT

This project is an initial investigation into a digital repository concept that intends to protect, preserve and record the whakapapa of all information and/or data gathered and identified as being mātauranga Māori throughout the Sustainable Seas Challenge as a whole. The project is for one (1) year.

The idea is to recognise the source of, and rangatiratanga or authority over, the knowledge gathered for the Challenge from respective iwi, hapū, and whānau. It is intended to be a storehouse of knowledge which will be collated throughout the first phase of the Challenge and will work across the Challenge with each programme to capture all relevant data. The result will be a repository of digital data and information that will record its origins and allow future researchers, businesses or anyone of interest, to access the information and identify where it came from to assist with further research. The short duration of the project is reflective of the need to create trust and confidence in the repository concept with local Māori prior to any further investment into the development of a digital repository.

Exploring indigenous knowledge (in this context, mātauranga Māori) is one of four themes for Vision Mātauranga. This project will enable the development of a distinctive body of knowledge at the interface between indigenous knowledge and the research and science of Sustainable Seas. It will identify how indigenous knowledge interacts across different domains in an inter-disciplinary and cross-cultural manner.

## D. INTRODUCTION

‘Unlocking the innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future’<sup>1</sup> is the mission of the Vision Mātauranga policy framework. It was with this mission in mind that this project was formed, as it is imperative that both Māori knowledge, and the users of that knowledge, work together.

Outlined in the Sustainable Seas Research Plan, mātauranga Māori is the indigenous Māori knowledge system of Aotearoa New Zealand. It includes knowledge of language, technology, systems of law and social control, the environment, spirituality, cultural practice, systems of property and value exchange, forms of expression, and much more. Sourcing this knowledge in all its forms, and then applying it in the Challenge requires:

- positive relationships between Challenge programmes and local Māori;
- trust and confidence by Māori in the information gathering process;
- trust and acknowledgement regarding the intended use of that knowledge;
- integrity of the report writing and report writer; and
- appropriate recognition of Māori knowledge ownership/authority/rangatiratanga.

It is approximated that there are 30 iwi in the focal area (as illustrated in Figure 2 of the Research Plan), with nine iwi identified in the case study area (Marlborough Sounds/Tasman Bay). Within those iwi are smaller groups functioning as hapū and/or whānau, and in their

---

<sup>1</sup> Ministry of Business, Innovation and Employment – Vision Mātauranga

capacity, perform the role as tāngata whenua. The information and data gathered for the Challenge will be received from a mixture of iwi representatives and tāngata whenua. Appropriately connecting knowledge, information and data to the correct groups is important. This will identify and provide both the broader Māori perspective and mātauranga and the locality specific perspective and mātauranga, which will also include the values that will be identified over the course of the Challenge. Additionally, the aspirations of the project will help to identify where any knowledge has been utilised within the Challenge and trace its origins. Transparency is integral to the collection of this knowledge, and its use within the Challenge.

Equally it is important that the retention, use and access to traditional knowledge respects the rights of the indigenous people and any cultural sensitivities in respect to this knowledge. An important aspect of the claims in the Waitangi Tribunal's inquiry into aspects of mātauranga Māori and supported in the Tribunal's report (*Ko Aotearoa Tenei: Te Taumata Tuatahi - A Report into Claims Concerning New Zealand Law and Policy Affecting Maori Culture and Identity*) was the loss of control of traditional knowledge by Māori and lack of protection of Māori rights to control and manage access to such knowledge. The Tribunal specifically considered the question of access to mātauranga Māori in archives, libraries and databases.<sup>2</sup> One of the recommendations was to implement new guidelines for management and access to mātauranga Māori and to support mātauranga Māori in science funding. New Zealand is also a party to a number of international treaties which require New Zealand to respect, maintain and preserve mātauranga Māori and respect the rights of indigenous people.<sup>3</sup> Consequently the goals of the repository project will need to be consistent with these principles.

Looking globally, the World Intellectual Property Organisation (WIPO) occupies a significant space with regard to protection of indigenous knowledge and intellectual property. The WIPO are collating a digital database of indigenous knowledge and working to provide for registration of that knowledge and its protection (WIPO, <http://www.wipo.int/tk/en/>). There are also multiple individual indigenous groups that have created their own portals, databases and repositories of their traditional knowledge, both as a means of sharing and also recording and providing origin for that traditional knowledge. Looking and working towards a similar output (product, process, system and service) for Māori knowledge in potential collaboration with other parties, this project has the potential to contribute to international research and ideas where New Zealand and Māori have advanced by reciprocating with a similar database.

The repository project will also undertake limited investigation as to how these international indigenous groups recorded and protected their knowledge, the engagement process regarding how they have addressed intellectual property issues, and whether a suitable resolution or solution has been found for this.

## E. AIM OF THE RESEARCH AND RELEVANCE TO OBJECTIVE

Vision Mātauranga is a cross-programme element of the Challenge, and as well as achieving the objective set for the Challenge, it must also work with each Challenge programme to find opportunities to unlock the innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future. With this in mind, it is important to find

---

<sup>2</sup> Ko Aotearoa Tenei: Te Taumata Tuatahi - A Report into Claims Concerning New Zealand Law and Policy Affecting Maori Culture and Identity, para 6.4.5.

<sup>3</sup> Ibid, Chapter 8.

methods to appropriately use and protect Māori knowledge, from both an integrity and intellectual property perspective, to ensure the successful implementation of, and outputs arising from, the Challenge. This is a key element of this research proposal. The successful achievement of the Challenge's objective requires Māori communities to feel confident that their values and perspectives being shared, not only help understand and frame the environmental and biological constraints, but also used in an appropriate manner. It is imperative that Māori as iwi, hapū and tāngata whenua collaborate, and where possible, lead throughout the duration of this Challenge, therefore it is important that Māori trust and have confidence in any methods employed within the Challenge when their knowledge is being sourced and applied within it.

There are three areas that the research project will consider:

1. *Appropriate measures (whether legal or otherwise) to protect the use of Māori knowledge in the Challenge and into the future,*
2. *The viability and appropriateness of a repository (digital or otherwise) to protect the use of mātauranga Māori, and*
3. *The viability and most appropriate method of ownership and ongoing management of a repository within the Challenge and into the future*

The research proposal is in one part aimed to find solutions to alleviate the fear of iwi and tāngata whenua that Māori knowledge will be used contrary to, and outside of, the scope of individual research projects and the Challenge as a whole. Simultaneously, the other part of the project will seek to identify an appropriate mechanism and model of ownership to enable the Challenge to use Māori knowledge in its research and outputs developed along the way. By creating a repository, it will help identify where mātauranga Māori has been sourced and then used to both support research to understand and clarify perspectives, as well as its integration with other knowledge frameworks, where it may have contributed to any distinctive product(s), process(es), system(s) and service(s) developed in the Challenge. Similarly, having in place a forum to manage the repository, will ensure the protection of Māori knowledge and prevent issues with iwi and tāngata whenua over its use and management within the Challenge and into the future, which will support the Challenge's objective.

Additionally, as the repository project is working with each research project in the Challenge, inherently this project is aligned with the Challenge objective.

## F. PROPOSED RESEARCH

This one-year project will identify and develop appropriate measures to protect the use of mātauranga Māori in the Challenge, whilst also investigating the viability and appropriateness of a digital repository that intends to protect, preserve and record the whakapapa of all information and/or data gathered and identified as being mātauranga Māori throughout the Sustainable Seas Challenge as a whole. It is intended that the repository will also work as a process of regulation and monitor the way that such data is collected and used, helping to protect both the Challenge and the knowledge that are offered by Māori.

### Project VM4.1 Objectives:

The three objectives of this project are:

1. *“to safeguard Māori knowledge (both traditional and contemporary) that has been sought, obtained, collected from tāngata whenua, kaitiaki and Māori, for their future generations”*
2. *“to explore the development of a digital repository of Māori knowledge”* and
3. *“to enable the use of Māori knowledge within the Challenge, for the benefit of the Challenge and for all New Zealanders.”*

The above three objectives are supported the by the three focus areas of research outlined in Section E:

- a. *Appropriate measures (whether legal or otherwise) to protect the use of Māori knowledge in the Challenge and into the future,*
  - ***This will achieve Objective 1 and 3***
- b. *The viability and appropriateness of a repository (digital or otherwise) to protect the use of mātauranga Māori, and*
  - ***This will achieve Objective 1, 2 and 3***
- c. *The viability and most appropriate method of ownership and ongoing management of a repository within the Challenge and into the future*
  - ***This will achieve Objective 1, 2 and 3***

Encouraging and fostering trust is a key element of the Challenge and its ultimate success, and involving Māori communities in the development of an EBM framework, will require the Challenge to have in place appropriate and trusted procedural measures, which must be supported by reliable and trustworthy advice and guidance. In addition, other elements identified as contributing to trust, the quality and quantity of contact and the management of social and environmental impacts<sup>19</sup>, as well as transparency in sharing information, credibility in negotiating and abiding by agreements, and acknowledgement of mutual benefits<sup>9</sup>.

Accessing mātauranga Māori will assist the Challenge with identification of environmental and biological constraints, similarly, mātauranga Māori may be used to enhance utilisation of our marine resources which will benefit all New Zealanders.

Goals for the project are:

1. All Challenge project leaders and their teams understand and are clear with the repository project’s purpose and importance.
2. Templates will be created for use by all researchers within projects when dealing with mātauranga Māori.
3. Guidelines will be developed to ensure contributors to the database have understood and agreed to the conditions of acquisition, retention and release.
4. There will be positive working relationship with project team leaders.
5. All mātauranga Māori and related data, is accurately captured and in accordance with the agreed project objectives and utilising the templates created for use across projects.

Tasks:

1. Ensure ethical approvals and/or considerations are in place.
2. Investigate legal and non-legal measures to both protect and enable the use of mātauranga Māori in the Challenge, and also seek to develop viable and appropriate

conceptual methods (products, processes, systems and services) to protect and manage the intellectual property of Māori.

3. Investigate international and New Zealand examples of similar repositories (old, new and proposed) of indigenous knowledge to identify any learnings and concepts that could be applied within this project. Including methods of ownership and management of data and digital methods used.
4. Seek advice and guidance from directly and indirectly engaged advisors on the conceptual challenges of collecting and storing mātauranga Māori, as well as safe guarding and enabling its use within and beyond the Challenge.
5. Investigate various meta data management systems by seeking advice and guidance from Brent Wood (NIWA) around the use and appropriateness of Geonetwork<sup>4</sup> (an existing metadata catalogue used in New Zealand by NIWA, GNS and LINZ), as well as other identified meta data management systems used by local authorities and research institutes that manages data and information.
6. Create templates for use by all researchers involved in the collecting of data, information and mātauranga Māori, the source and origin. The templates will be guided by kaupapa Māori theory and methodology whilst structured and formatted in a manner for easy transfer into metadata catalogue system (in the first instance Geonetwork). Templates will also be guided by directly engaged Legal Advisors on the project, to ensure that the process for gathering and using Māori knowledge is legally sound and aligns with the findings of WAI262 and intellectual property matters. This will include all and any consent required for use of the information within a number of parameters including individual projects, across programmes and across the entire Sustainable Seas Challenge.
7. Record the use, application and meshing or integration of Māori knowledge with other sciences within the Challenge.
8. Create opportunities to educate all lead Project Lead's and researchers in the method of data collection for the repository project and the metadata catalogue system being used. Also providing clarity to researchers of the importance and need of data origins.
9. Work with project teams to collate data on a monthly basis, receiving new datasets, information and organising into appropriate and pre-determined data or information sets.
10. Work with Principal Technician – GIS and Spatial Data Management to consider appropriate technical and digital issues in the long term. Discuss options and work with Principal Technician to investigate appropriate method of data storage, considering cloud based or web based, security and access options, should it be considered necessary. Also investigate costs and long-term management issues, to present final recommendations to the Challenge.

#### Continuance of Phase 1 after Year One:

It is anticipated that at completion of Year One, there will be confidence and trust by both iwi and project leaders in the legal measures (eg consenting provisions) to protect mātauranga Māori, and the recommended measures in the final report (identified as an output for this project) to protect, store, preserve, as well as enable, the use of mātauranga Māori, for the continuance of the following tasks in Year Two and Three:

- Liaison with project leaders and team members to support use of mātauranga Māori

---

<sup>4</sup> GeoNetwork is a catalog application to manage spatially referenced resources. It provides powerful metadata editing and search functions as well as an interactive web map viewer. It is currently used in numerous Spatial Data Infrastructure initiatives across the world. <http://geonetwork-opensource.org/>

- Progression of recommendations in final report and preparation for Phase Two

## G. ROLES, RESOURCES

### PROJECT MANAGEMENT

**James Whetu** Project Lead - Engagement with advisors and project leads where required. General oversight and advice to Project Manager.

**Amy Whetu** Project Manager and Researcher - Focus on intellectual property and mātauranga Māori legal space. General coordination, collation and information receipt. Design, development and coordination of templates and initial background research for project, international and other repository analysis.

**Research Assistant** - Provision has been made for a research assistant to assist the Project lead in undertaking the initial research surrounding international and New Zealand examples of similar repositories.

### DIRECTLY ENGAGED ADVISORS

The identified advisors have been directly engaged by the Project Lead to participate and advise on the:

- robustness and appropriateness of existing measures to protect Māori and the application of their knowledge and resources, and to identify and recommend new measures.
- viability and appropriateness of a repository for Māori knowledge
- appropriateness of the engagement with Māori communities, research methodology, and recommendations arising from research findings, and
- investigation of existing, new and proposed repositories for Māori/indigenous knowledge

**Deborah Edmunds** Senior Legal Advisor - Provide over-sight of legal advice, recommendations, and opinion on appropriate measures to protect, and enable, the use<sup>5</sup> (now and into the future) of Māori knowledge sourced through the Challenge.

**Tai Ahu** Legal Advisor - Provide robust guidance and legal advice, recommendations and opinion on appropriate measures to protect, and enable, the use<sup>6</sup> (now and into the future) of Māori knowledge sourced through the Challenge.

**Brent Wood** Metadata Management Advisor - Provide initial input and guidance on investigation on the various interactive data capture systems available for use as a digital repository, with particular focus on attributes, viability, and appropriateness of the Geonetwork system. Will also provide guidance and advice on the best approach for the development of a digital storage and platform for holding and accessing the data collected.

**Dr Hēmi Whānga and Dr Rangi Mātāmua** Senior Research Advisors - Will be involved throughout the project in an advisory basis as Kaupapa Māori Theory and Methodology Advisors and will also be providing input and guidance around:

- Māori feedback and comments

---

<sup>5</sup> Includes the ownership and function of the repository

<sup>6</sup> As above

- research/investigation into existing, new and proposed repositories of indigenous/Māori knowledge
- preferred methods and/or measures to protect, whilst also enabling, the use of Māori knowledge

## INDIRECT ADVISORS

The identified advisors have been identified by the Project Lead as internal forums and external advisors that are accessible by the project to support the research and investigation of a digital repository for mātauranga Māori.

**Kāhui Māori Kaupapa Maori and Vision Mātauranga Advisors** - Through the scheduled quarterly Kāhui Māori meetings, progress reports on the VM4.1 project will be provided, with the report seeking input, advice and guidance on any issues or matters arising and/or considered important by the Kāhui.

**Caucus of Māori Researchers within Sustainable Seas and Ngā Pae o Māramatanga Kaupapa Māori and Vision Mātauranga Advisors** - This caucus of Māori Researchers within Sustainable Seas and in conjunction with Ngā Pae o Māramatanga, will provide a linked and interconnected body of Māori researchers and professionals who will critique and provide feedback on the findings and/or direction of the repository and measures to protect, as well as enable, the use of Māori knowledge.

**Anton Marais** Advisor on Applied Metadata Management - Primarily to inform on the viability and appropriateness/benefits and costs of the Waikato District Council's Geographical Information System (GIS) which uses Geonetwork, and will also contribute advice and guidance on the best approach for the development of a digital storage and platform for holding and accessing the data collected.

**Siani Walker** Advisor on Applied Mātauranga Māori Metadata Management - Will share learnings on Auckland Council's measures<sup>7</sup> to protect tāngata whenua's tāonga, sites and places of cultural and historic heritage, to inform the research and investigation of viability and appropriateness of a repository.

**Maui Hudson and Dr Tahu Kukutai**<sup>8</sup> Advisors on Indigenous Data Sovereignty - Indirect involvement of these two advisors will help ensure there is linkage of the VM4.1 project with the greater concept and undertakings, especially the research, of the Indigenous Data Sovereignty programme.

## H. LINKAGES AND DEPENDENCIES

This project is reliant on, and will inform all, other projects within the Challenge. It contributes to and informs all projects with the collation and availability of all mātauranga (includes traditional and contemporary knowledge) gathered throughout the research within all projects in the Challenge.

---

<sup>7</sup> The Māori Heritage Team has a project in collaboration with the iwi of Tāmaki Makaurau to integrate their knowledge (mātauranga Māori) and values into heritage assessments and resource management decisions.

<sup>8</sup> Dr Tahu Kukutai is associated and works alongside Maui Hudson on the Indigenous Data Sovereignty programme. Although primary advice will be from Maui Hudson, it is important to recognise Dr Kukutai's involvement as well as potential opportunity of her input into the research.



The project is dependent on the data and information that is collected, being done so in a certain way and utilising the templates that will be created during the project. The outputs will be accessible and be able to be utilised by the Challenge at large.

## I. COLLABORATIONS

As the project is connected to other research projects within the Challenge, inherently the project is collaborating with other organisations, agencies, and institutes.

Additionally, the repository project includes collaborative support from Kensington Swan, who have a strong Māori legal and Intellectual Property team to support the project where required. With NIWA, it is their expertise with metadata management and systems, and the University of Waikato, with guidance and advice on appropriate kaupapa Māori research methods, and additional advisory support is being provided.

## J. INTERNATIONAL LINKAGES

As stated earlier, the World Intellectual Property Organisation (WIPO) occupies a significant space with regard to protection of indigenous knowledge and intellectual property. They are collating a digital database of indigenous knowledge and working to provide for registration of that knowledge and its protection (WIPO, <http://www.wipo.int/tk/en/>).

There are also multiple individual indigenous groups that have created their own portals, databases and repositories of their traditional knowledge, both as a means of sharing and also recording and providing origin for that traditional knowledge. Examples of these include: -

- <http://catalog.northslope.org/catalogs/11479> - Sources of Documented Yukon North Slope Traditional Knowledge;
- <http://www.nativeknowledge.org> - Alaska Traditional Knowledge and Native Foods Database; This project was funded by the Environmental Protection Agency and the National Science Foundation in Canada.
- <http://herb.umd.umich.edu/> - Native American Ethnobotany Database compiled by the University of Michigan-Dearborn; and
- <http://ip.aaas.org/tekindex.nsf> - TEKPAD (Traditional Ecological Knowledge Prior Art Database).

In some capacity, the repository project will undertake initial investigation as to how these international indigenous groups recorded and protected their knowledge, the engagement process regarding how they have addressed intellectual property issues, and whether a suitable resolution or solution has been found for this.

UNESCO has also developed a code of practice for use of indigenous knowledge. Their policy and the database created has the intention of tracing projects where indigenous knowledge has been used to create a sustainable and effective business case or model. They note that their interest is not in the knowledge itself per se but in the ways that knowledge has been adapted, applied, and disseminated (Guchteneire, Krukkert, and Liebenstein, date unknown). This work will be of interest for this project both in a practical sense (ie how they have created and recorded their database) but also with regard to what and how they have recorded o

differentiated which knowledge was traditional and how it has been utilised and/or transformed within the project.

The World Bank Group also works in this space of utilising and recording indigenous knowledge for the benefit of local and global communities. This includes databases, registrations, and portals.

Although the World Bank Focus is on Development, there are some synergies that can be drawn, particularly in the area of challenges and opportunities (Gorjestani, Indigenous Knowledge for Development, Opportunities and Threats, date unknown). This work will be researched further as part of this project and will provide further analysis and consideration as to how and what the most effective method of recording the data/traditional knowledge, there may be.

#### K. ALIGNED FUNDING AND CO-FUNDING

Nil.

#### L. VISION MĀTAURANGA (VM)

This project focuses heavily on the 'protection' of traditional knowledge throughout the programme. It also addresses how the knowledge will be 'utilised, developed and or represented' in the way the ethics and engagement process will take place and the consent/agreement with the parties. This will help protect the Challenge at large and ensure utilisation of the knowledge and data is in accordance with the wishes of the original source as well as any protecting the Challenge and its legal obligations.

The Vision Mātauranga themes that are contributed to are primarily Theme 1: Indigenous Innovation and Theme 4: Mātauranga. The nature of the project means that the repository will be a source of knowledge that can be accessed to help contribute to and provide distinctive research that can be used to explore and support indigenous knowledge and innovation.

The organisation that will be undertaking this project is a Māori organisation, working with predominantly Māori consultants and advisors or specialists in Māori law, kaupapa Māori research, and Māori resource management. The data and information sets that are the subject of this project will all be received or offered by Māori who have at least some first-hand knowledge of the information they are dealing with or its origins.

#### M. COMMUNICATION AND OUTREACH

The method utilised within this Challenge is seen as one that will help to ensure cross-programme Challenge integration and communication and to ensure programmes are informed of research being undertaken in other projects and will help prevent silos developing. Communication is integral to the effectiveness of the project and will be significant in the formative stages of the project and in the information and education phase where project leaders will receive direct support and ongoing communication as they undertake their quantitative and qualitative research within their projects.

By default the project will be explained to each and every person or group who contributes mātauranga Māori, traditional knowledge or data-sets to individual programmes or projects, increasing awareness of Vision Mātauranga and the Challenge within the community and particularly iwi and hapū communities.

It is assumed that there may be further direct discussion with iwi, hapū or individuals wanting further clarification about this aspect of the Challenge and/or wanting to access the information into the future and therefore further opportunities for engagement will increase.

#### N. CAPACITY BUILDING

Informally we have identified a number of Māori post-graduate and PhD students that may be of assistance within this project and where we will focus mentoring and their capacity building. We will continue to engage with these students throughout the project.

#### O. ETHICS APPROVAL

Ethics approval as such would not be required but all practices will be undertaken in accordance with our own organisational ethics guidelines and practices. Due to the nature of the project all information that is collated will have been received from participants who have all completed a standard information briefing and discussion prior to giving fully informed consent. In addition, should the project from which the participant was originally engaged, require ethical approval prior to undertaking the research, then this will be undertaken within the bounds of the original project.

## Q. REFERENCES

- 1 Comiso, J. C., Kwok, R., Martin, S. & Gordon, A. L. Variability and trends in sea ice extent and ice production in the Ross Sea. *Journal of Geophysical Research: Oceans* **116**, C04021, doi:10.1029/2010jc006391 (2011).
- 2 WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore, <http://www.wipo.int/tk/en/> date accessed, 26 October 2015.
- 3 Gorjestani, N., *Indigenous Knowledge for Development, Opportunities and Threats*, Indigenous Knowledge for Development Programme, date unknown, [http://www.worldbank.org/afr/ik/ikpaper\\_0102.pdf](http://www.worldbank.org/afr/ik/ikpaper_0102.pdf) date accessed, 26 October 2015.
- 4 Database of Indigenous Knowledge and Practices <http://www.worldbank.org/afr/ik/datab.htm> date accessed, 26 October 2015.
- 5 de Guchteneire, P., Krukkert, I., and von Liebenstein, G., Best Practices on Indigenous Knowledge, Joint Publication of the Management of Social Transformations Programme (MOST) and the Centre for International Research and Advisory Networks (CIRAN), date unknown, <http://www.unesco.org/most/bpikpub.htm#preamble> date accessed 26 October 2015.
- 6 Yukon North Slope Traditional Knowledge Database, <http://www.taiga.net/webdata/aklaviktk/>
- 7 Alaska Traditional Knowledge and Native Foods Database, <http://www.nativeknowledge.org>
- 8 Native American Ethnobotany Database compiled by the University of Michigan-Dearborn, <http://herb.umd.umich.edu/>
- 9 Traditional Ecological Knowledge Prior Art Database (TEKPAD), <http://ip.aaas.org/tekindex.nsf>