

## Global Registry Initiative (GRI)

### Scenarios and Use Cases

#### Aims

This document sets out scenarios and uses cases to facilitate the definition and functional scope of the systems and services to be provided under the Global Registries Initiative (GRI).

#### Contexts

To provide focus and a degree of realism to the scenarios and use cases we have chosen to set them in and around coral reef research and the effects of climate change.

The Great Barrier Reef (GBR) is studied intensely by the international research community and the research data and publications about the GBR are carefully scrutinised by researchers (and by those from both sides of the ensuing policy debate) for indicators of global climate change and environmental degradation.

#### Connections

Coral reef research lends itself to our scenarios and use cases because it involves (at least) three interdependent fields of research that are relatively advanced in their use of Web information systems and services and who could potentially benefit from the GRI infrastructure.

1. **Conservation and Biodiversity.** GBR is particularly rich in biodiversity. Some biodiversity data and information, finds its way into international biodiversity information systems such as the Census of Marine Life and Encyclopaedia of Life. Furthermore, the Biodiversity Collections Index (BCI) has been established to register biodiversity data collections and assist their discovery. Arguably, BCI is the sort of system that GRI would seek to register and then partner with for the long term. Such use cases necessarily involve the following two fields of research.
2. **Climate change adaption.** Based on climate science, investigators in this field of research assume that global warming is real and man-made. Therefore their interest is not in establishing the truth of warming etc. rather how best to adapt to the certainty of climate change and develop systems to manage the salient risks. Very large and sophisticated systems-of-systems, such as the Global Earth Observation System of Systems (GEOSS) and Global Climate Observing System (GCOS), are being established at the global level to monitor the environment. Similarly, systems like the Great Barrier Reef Ocean Observing System (GBROOS), interoperate at regional level and share information with GEOSS and GCOS. Taken together this information is vital to uses cases in the Conservation and Biodiversity field.

3. **Genomics.** GBR investigators and other coral reef researchers have commenced the huge task of sequencing the complete genomes of selected coral reef species and this data is being registered with the systems developed by and for the international genomics research community. Similarly, commercial and open access publishers are requiring genomics data to be registered before a paper is published. Short-read genomics data is also being used by the Barcode of Life initiative for species identification and taxonomic classification. Given these developments, there will be widespread interest in systems and services that will enable researchers to link genomic to population-level data and to data derived from environmental monitoring. For example, research is underway into the connections between coral reef dieback and bleaching (i.e. key indicators of overall reef health and resilience) and the impacts of climate change.

Although closely interrelated, these three domains do not currently share much data or information because they are missing some essential cyberinfrastructure 'glue' that can link their systems and collections in seamless ways. **The Global Registries Initiative needs to provide this 'glue'.**

The research program of the ARC Centre of Excellence for Coral Reef Studies<sup>1</sup> indicates that collaborative and interdisciplinary research has become the norm on the GBR. Looking through the published journal output of the centre and following the institutional affiliations of the key authors and the sources of funding for their studies, one can observe a network of intersecting professional, social and economic affiliations and the activity of countless government agencies, non-government organisations, peak scientific bodies, and various advocacy groups (see Appendix A). This list also indicates just how 'globalised' GBR research has become.

## Use Cases

The following three use cases are fictional (any resemblance to real activities is accidental). However they attempt to describe real needs that could be satisfied if the goals of the GRI were to be realised

### Use Case 1 – Researcher looking for coral reef bleaching data

Dr Mary Smith is attempting to predict coral responses to climate change and examine mechanisms for adaptation and acclimatization. Her objective is to understand the climatic drivers of coral bleaching so as to develop strategies for control and reduction of its economic. She has asked her research assistant, John, to locate as many sources of observational data on coral bleaching around the world as he can as well as water temperature and water quality data from the same time periods.

John starts with the Research Data Australia portal where he finds a few relevant datasets from the GBR and also the Ningaloo Reef in western Australia. He realises its coverage is still very limited and there must be many

other sources of relevant Australian data from diverse sources such as the GBR Marine Park Authority, the Bureau of Metereology, the GBR Ocean Observing System, the Reef and Rainforest research centre etc. He goes to the web sites for each of them looking for where they have catalogued the data they have collected themselves or obtained from other sources. This turns out to be very laborious and not always available. They all have publication lists though so he scans the titles and abstracts looking for ones that may have used the sort of data he is interested in. He also tries Google and Google Scholar. This is great for his literature review but doesn't help him much in locating relevant datasets, unless he can find references in these texts to the data they collected or re-used.

However he finds mention of organisations that collect the sort of data he is looking for eg Census of Marine Life, the IRI/LDEO Climate Data Library, NOAA's Coral Reef Information System, NOAA's National Climatic Data Centre Coral Data Sets, Coral Health and Monitoring Program, World Conservation Monitoring Centre, International Coral Reef Action Network. He also finds some portals for searching for data such as 'Geoportal' by GEOSS (the Global Earth Observation System of Systems. He uses these search portals but they are not comprehensive and so he looks for the data catalogues on each of the organisations' web sites and also searches their web sites using keywords for the type of data he is seeking.

Eventually John assembles a very useful and comprehensive list of the types of observational data they will need for their research. He dreams though of a single search portal where he could have discovered these. He also discovered a number of very useful data registries/catalogues which together referenced nearly all of the datasets he selected. His job would have been a lot easier if someone had presented him with this list at the start.

John complains to anyone who'll listen that it shouldn't have been this hard and why couldn't he have used the keywords on a Research Data Global portal and found what he was looking for.

## Use Case 2 – Reef research and data index

The ICT specialist, Penelope, at the Australian Research Council's Centre of Excellence for Coral Reef Studies wants to reduce the stress for mates like John and Mary by providing them with better tools to find the information and data they need. If she had a list of all the machine-accessible catalogues of relevant research and data for all of the discipline areas covered by the research program at her centre, knew what query protocol they supported, what format they returned their results in, and what filters could be used to select only the relevant subset, she could mash-up all these sources into a single index tailored for just their needs.

The data sources would be global as well as Australian and by demonstrating this search tool at an International Reef Research Forum she would get the

sort of feedback necessary to make it more general in coverage – a Global Reef Research portal. This would bring great kudos to the Centre, to Penelope and to the Australian Research and Innovation sector as a whole.

### Use Case 3 – IPCC report on climate change – where is the data ?

If opinion polling is to be believed, the ‘Climategate’ controversy and the ongoing flaws uncovered in the latest IPCC report on Climate Change, have lowered the level of public trust in science.

Setting aside some of the irrational and unsubstantiated claims of the climate change ‘denialist’ camp; some of loss of trust has arisen as much from poor data curation and access failure as to incorrect interpretations.

As a risk management strategy the IPCC has created a task force to comb through the report, identify all of the research referenced, and check the provenance of the underlying data used in the analyses and that it is easily available.

A global climate change research and data index would be very useful to speed up the process of locating the researcher(s) and institution(s) who produced the raw data supporting each reference, a description of how the data was collected, provenance and transformation history (curation), and the means of access to the data.

## Appendix A: Stakeholders in GBR studies, policy and advocacy

Organisation		Control Body	URL
Agence Française de Développement	AFD	French Government	<a href="http://www.afd.fr">http://www.afd.fr</a>
ARC Centre of Excellence for Coral Reef Studies		Australian Research Council	<a href="http://www.coralcoe.org.au">http://www.coralcoe.org.au</a>
Atlantic and Gulf Rapid Reef Assessment	AGRRA		
Caribbean Coastal Marine Productivity Program	CARICOMP		<a href="http://www.uwimona.edu.jm/centres/cms/caricomp/">http://www.uwimona.edu.jm/centres/cms/caricomp/</a>
Convention on Biological Diversity	CBD	Inter-governmental	<a href="http://www.cbd.int">http://www.cbd.int</a>
Coral Reef Alliance	CORAL		<a href="http://www.coral.org">http://www.coral.org</a>
Coral Reef Targeted Research	CRTR		<a href="http://www.gefcoral.org">http://www.gefcoral.org</a>
Coral Reef Unit	CRU	UN Environment Program	
French Coral Reefs Initiative	IFRECOR	French Gov.	
Global Coral Reef Monitoring Network	GCRMN		
Great Barrier Reef Marine Park Authority	GBRMPA	Australian Gov.	<a href="http://www.gbrmpa.gov.au/">http://www.gbrmpa.gov.au/</a>
Great Barrier Reef Research Foundation	GBRRF		<a href="http://www.barrierreef.org/">http://www.barrierreef.org/</a>
Intergovernmental Oceanographic Commission	IOC	UNESCO	<a href="http://www.ioc.unesco.org">http://www.ioc.unesco.org</a>
International Coral Reef Action Network	ICRAN		<a href="http://www.icran.org">http://www.icran.org</a>
International Coral Reef Initiative	ICRI		<a href="http://www.icriforum.org">http://www.icriforum.org</a>
International Society for Reef Studies	ISRS		<a href="http://www.fit.edu/isrs/">http://www.fit.edu/isrs/</a>
National Center for Atmospheric Research	NCAR	US Gov.	<a href="http://www.ncar.edu">http://www.ncar.edu</a>
National Oceanic and Atmospheric Administration	NOAA	US Gov.	<a href="http://www.coralreef.noaa.gov">http://www.coralreef.noaa.gov</a>
RAMSAR Convention on Wetlands	RAMSAR	Inter-governmental	<a href="http://www.ramsar.org/types_coral.htm">http://www.ramsar.org/types_coral.htm</a>
Reef and Rainforest Research Centre	RRRC	Australian Research Council	<a href="http://www.rrrc.org.au">http://www.rrrc.org.au</a>
Reef Check Foundation	RCF		<a href="http://www.ReefCheck.org">http://www.ReefCheck.org</a>
United States Coral Reef Task Force	USCRTF	NOAA	<a href="http://www.coralreef.gov">http://www.coralreef.gov</a>
World Bank Environment Department	WBED	World Bank	<a href="http://www.worldbank.org">http://www.worldbank.org</a>
World Conservation Monitoring Centre	WCMC	UN Environment Program	<a href="http://www.unep-wcmc.org">http://www.unep-wcmc.org</a>



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<sup>i</sup> ARC Centre of Excellence in Coral Reef Studies Research Program  
(<http://www.coralcoe.org.au/research.html>)