

Study of Accessibility and Transfer of Information from
Foundation Funded Research

Synthesis Report

Supported by four case studies

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PSConsulting Ltd is an independent policy and strategy consultancy based in Wellington, New Zealand specialising in leadership, governance and institutional issues in the spheres of science and research, sustainable development, climate change and energy.

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Disclaimer

While every effort has been made to accurately reflect the views of those interviewed and contacted for this evaluation and to assure the quality of the analysis, PSConsulting accepts no liability for actions taken on the basis of this report.

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Executive Summary	

Purpose The Foundation for Research Science and Technology (FRST) commissioned this evaluation to help determine how to facilitate improved access to data and findings from the public good research that it funds. It is one stream of advice for developing access policy.

Scope This evaluation considered research findings that were public good, and some that were industry good where the greatest public and industry benefit came from dissemination to multiple users. The evaluation was based on 4 case studies (Land Environment New Zealand LENZ; Wheat Calculator; Petroleum and Mineral Exploration research; Flood research) and general interviews of research providers and users.

Accessibility The providers of FRST-funded research are making their results generally accessible within funding constraints, government policy guidelines. FRST-funded databases are generally as accessible as can be expected in a constrained funding environment and where CRIs are able to charge for their products and services and have to show a return on equity over time.

The majority of data and information requests are provided without concern being raised. More useful information is now accessible to users from CRIs than would have been the case if no revenue had been gained and invested in database maintenance and development. The data and information now available through web-based tools has released a greater value than FRST-funded data in primary form. This is a positive consequence of the CRI operating environment.

Institutional drivers The evaluation found that while the CRI operating environment drove CRI practices, the barriers to access arose because of other issues, such as under-funding, multiple funding and lack of awareness of funding sources by users. These are sufficiently significant access issues for a good number of public and industry good users of FRST-funded data and information, to justify specific solutions being suggested in the national interest. Underlying the access issues is the lack of a clear and consistent policy framework for nationally significant databases and other data collected in the course of FRST funded programmes.

Under the current policy settings and where funding is constrained, CRIs are under pressure to charge users for their investment in data and its management for access, which works well enough most of the time, but can lead to delays in release of data, time-consuming negotiations, affordability, and IP rights issues where third party data is involved. These issues are raised regularly and are sufficiently significant for a good number of public good users to warrant attention.

There are multiple funding sources for data and information generated by providers. The source of the funding and thus the ownership of the data and information, determines whether and how data and information is made available and thus whether timing or cost becomes a barrier for the user.

Practices are consistent with current government policy guidelines and FRST contract provisions. There is some variation across and within CRIs in terms of what is free and what is charged for.

However, the public and user understanding of access to publicly funded research results do not equate with the government policies governing access.

There is also a lack of awareness on the part of users about the significant share of non-FRST resources invested in the maintenance of these databases and the

development of web-based interface tools that enable data to be accessed in primary form or as derived information.

FRST funding levels have not kept pace with technology developments for the transfer of research results, nor for either NSDBs or other databases. The means of access envisaged in the FRST contracts are publications, workshops, seminars and conferences and while useful, are not the primary ways users want to access research results. Users either want direct access to data or in the majority of cases derived products that can be accessed via the web tools that CRIs have developed at their own cost.

Barriers to accessibility

The following access barriers were identified;

- Institutional drivers generating delays, affordability, time-consuming negotiations and IP issues
- Multiple-funding and ownership of data and information
- Funding levels - flat funding of programmes, NSDBs and other databases
- Lack of awareness by users of what data is available and who owns it
- Government policy inconsistency between promotion of oil and gas exploration and the drivers resulting from multiple funding of data
- Some sector specific barriers, in particular petroleum exploration and flood risk management uses

This evaluation raises two critical questions;

- Whether multiple funding for NSDBs, and the ensuing IP and charging issues, compromises the FRST investment by constraining use to less than what it would have been with 100% FRST funding and;
- What is the “right” level of FRST provision of NSDBs and are there some data collected as part of FRST-funded programmes that should also be NSDBs?

FRST will need to clearly communicate what users can expect for free and what they will have to pay for. The issue of access to FRST-funded databases should be resolved in the wider context of Government’s ongoing objectives for NSDBs (including the level of FRST funding in their financing) which are currently unclear.

Draft Principles Application of the draft Principles in FRST contracts by itself will not address the access barriers to research data and information in the current policy settings. However they would ensure consistency between FRST contract provisions and the Ministerial Operating Framework for CRIs. This would reduce any confusion over the primary objective of maximising access.

There is a fundamental tension in the system which comes as a combination of under-funding of some research programmes which produce data, the partial funding of NSDBs and the non-funding of maintenance and dissemination of non-NSDBs. .

The evaluation concluded that other actions will need to be taken to address the accessibility issues identified.

Summary of recommendations
Draft Access Principles

- The adoption and application of the draft access Principles is recommended with one enhancement, as a means of reducing confusion over the principle objective of government to maximise access to public good data databases and decision tools.

Database policy Framework

- The development of a policy framework setting out governments ongoing outcome objectives for databases with clear arrangements for stable funding for;
 - Nationally Significant Databases (NSDBs)
 - the inclusion of other databases not currently NSDBs
 - third party data and information held by CRIs which has wide public and industry good value
 - the maintenance of underlying data that supports decision tools and
 - the development of web-based tools for transfer of data and information

This would include;

- Identification of key data, databases and decision tools in the environmental, social and industry public good areas, an assessment of the adequacy of their funding levels, based on their optimal use and national significance
- Development of a revised set of criteria for assessing national significance
- Where government accepts responsibility for NSDBs full funding of data collection and updating, quality assurance, database management including digitising and curation for collections, and the development of web-based tools
- Consideration of the relative funding responsibilities of FRST, and users

Sector access

- The value of EnviroLink funding for local authority transfer of research information
- Opportunities for user co-funding of the sustainable maintenance and upgrade of decision tool development
- Crown Minerals co-funding for faster access to relevant data and information from FRST-funded programmes of relevance to the exploration industry and exploration of other similar sector based funding arrangements

Awareness of what is accessible

- A science system-wide project to develop and integrated 'bibliography' of FRST-funded and CRI-funded data and information tailored for user groups and with metadata on databases and derived products
- A clear guide on government access policies and their promotion with key user groups
- Adoption by FRST of a more proactive role through established user group channels in raising awareness of where users can get access to data and information through its website with links to CRI websites

1 Introduction

1.1 Purpose

The Foundation for Research Science and Technology (FRST) commissioned this evaluation to determine how to facilitate improved access to data and findings from the public good research that it funds. It is one stream of advice for developing access policy.

Issues have been raised with the Foundation over a number of years about barriers to accessing non-appropriable, public good information from Foundation funded research. In particular, issues have been raised by users about providers' practices with respect to access rights, ownership, the price of such information and the timing of its release, including data and value-added products.

The Foundation is also aware that there are very good examples of easily accessible and effectively used research data and information. This evaluation explores the extent to which accessibility is an issue and why, and makes recommendations to address them.

The Terms of Reference for this evaluation sought answers to the following questions;

- *“The extent to which Foundation-funded public good research information is made publicly available and the impacts of instances of inaccessibility;*
- *Barriers to making public good research information publicly accessible: What are they, to what extent are they a problem, and for whom?*
- *Differences in experience or outlook between different sectors, subject areas, and between research organisations and users*
- *Recommended actions for the Foundation, and an assessment of:*
 - *The effects of the actions (positive and negative) including the impact of draft policy guidelines on accessibility*
 - *The costs and benefits of the actions”*

1.2 Scope

The scope of this evaluation (as set out in the terms of reference) was deliberately narrow to enable detailed examination of issues directly affecting public access to FRST-funded public good research results (See Terminology in *Appendix 1*).

“The study focuses on;

- *public good research including non-appropriable research and some industry good research*
- *codified research data and results including primary results (data) and research results disseminated through publications, reports, journals and secondary (derived) databases*
- *access to data and research results with a focus on the ability to access the results*
- *areas that the Foundation can influence e.g. contract provisions; IP policy; funding that targets relationships with users; funding of dissemination activities; funding of the maintenance of databases; contracting for transfer of results; and brokering dissemination and greater awareness of research results”*

During the course of the evaluation it became clear that the issues around access mainly involved access to data and databases and their derived products, rather than access to publications and reports. While much of the evaluation concentrated on the areas where concerns had been raised with FRST, the general interviews confirmed that a number of

the issues that emerged, do have wider effects across other areas of FRST-funded programmes.

The evaluation also raised a number of issues outside FRST mandate to address by itself. Some recommendations are made for FRST to explore with other organisations such as MoRST, CCMAU, Crown Minerals and Ministry for the Environment, to enable the issues around access to databases and their derived products to be fully addressed.

1.3 Methodology

The evaluation used a qualitative approach combining case studies with more general face to face interviews, to enable an in-depth examination of the issues, their nature, how they might be resolved and the likely impacts of different strategies to address them.

The interviews were with senior management and staff of research organisations that had specific involvement in data and information access and with users, including industry sectors, local, regional and central government agencies, consultants and public interest groups who use research findings¹.

Four case studies were chosen after advice from FRST staff, and an evaluation advisory group². Draft case study reports were reviewed by interviewees for content and accuracy. The synthesis report was peer reviewed by the advisory group and an independent consultant.

Information on costs, access, and pricing policies and practice were received from interviewees and other contacts in organisations interviewed. Where available, documentation on policies, databases and accessible products were reviewed.

Interviewees were selected using a snowball approach, from suggestions made by the primary interviewees for each case study and general interviews, and from a number of others experienced with access issues relating to FRST-funded research results. General interviewees were nominated by each research provider approached for the study, and by some interviewees. 39 interviews were conducted involving 46 individuals. See *Table 1*.

Table 1 Interviews by type

	General	Flood Research	Petroleum Mineral Exploration Research	Wheat Calculator	LENZ	TOTAL
CRI	7 (11*)	1	3	1 (2)	2	14 (19)
University	3		1			4
Consultant	1	2	3			6
Industry	1		2	1		4
District Council		2				2
Regional Council		4 (6)				4 (6)
Government department		1	1	1	2	5
TOTAL	12 (16)	10 (12)	10	(4)	4	39(46)

(*) number of people interviewed

¹ A list of interviewees and contacts, and interview questions are set out in *Appendix 2* and *3*

² The criteria for case study selection and the list of case studies are set out in *Appendix 4*

2 Policy and institutional context

This section sets out the context within which FRST funds research and in which access to the results of that research occurs. In particular, it explains the ownership of data and information from FRST-funded research, the implications of that for access, and what FRST funds.

2.1 CRI establishment policies

It is useful to go back to 1992 when the government made changes to the operating environment of the research institutions that undertake publicly funded research. The change was from a wholly government funded system (through DSIR, MAF Technology, FRI, and the Meteorological Service), to a crown company model (through Crown Research Institutes-CRIs) set up under the Crown Research Institutes Act 1992.

Ownership of databases, reference collections and other assets that existed in 1992, was transferred to the CRIs and a set of operating principles established for their access, operation and disposal as follows;

- i) *CRIs shall provide access to specified national databases and reference collections substantially paid for from the public purse not excluding the points under (ii) below and consistent with providing benefit to New Zealand; and*
- ii) *In providing this access:*
 - 1 *the costs of collection, archiving and maintenance be recovered only to the extent that they have not been paid for from public good funding;*
 - 2 *the costs of actual retrieval of information from databases and collections be recovered;*
 - 3 *the information supplied be subject to copyright, so that the right to further copy the information and acknowledgement as a source is subject to normal conventions; and*
 - 4 *in situations where a third party wishes to obtain large portions of information from a database or collection for direct commercial use then it may be appropriate to negotiate a copyright, royalty or licence fee.³*

2.2 CRI ownership policies

The Crown Companies Monitoring Unit (CCMAU) at The Treasury monitors the performance of CRIs on behalf of the New Zealand government which has an ownership interest in CRIs. The expectations of shareholding Ministers are communicated to CRIs through an annual Operating Framework (See Box 1). CRIs are seen as “agents for economic transformation, by creating the value that will create advantage for New Zealand”. CRIs are required to cover the cost of their capital, a requirement established by the CRI Act 1992. The current expectation of shareholding Ministers is that this will equate to a return on equity of 9% on average over time. The significance of ownership policies for this evaluation is further discussed in Sections 3.2.1 and 3.2.5.

³ Recommendations that were adopted by the New Zealand government from *Crown Research Institutes; Research Companies for New Zealand-the report of the Ministerial Science Task Group* Wellington, June 1991

Box 1. Data management and dissemination

Shareholding Ministers expect that CRIs will have regard to the following principles in managing and disseminating data:

- Data should be managed and disseminated in a way that will maximise benefit to New Zealand in the long run
- Charges for access to data should normally reflect the cost of provision, including the cost of capital invested by the CRI
- On entering into contracts that involve the generation of new data, whether publicly or privately funded, the subsequent availability and application for national benefit should be actively considered and formally agreed
- Data should be managed in a way that retains the quality and integrity of the data over time
- Data should be publicised and made available except where:
 - Prevented by contractual arrangements
 - Release prejudices the objectives of a research programme
 - It can be demonstrated that greater national benefit is likely to accrue from alternative arrangements, or
 - It is not practicable to make data available

To manage these expectations, shareholding Ministers expect that CRIs will develop and publish transparent data management policies that are regularly reviewed.”

from *the 2006 Operating Framework for Crown Research Institutes (CRIs)*

The Operating Framework for CRIs also seeks to clarify the seemingly conflicting requirements on CRIs concerning return on capital and releasing research results in the interest of New Zealand as follows;

“While revenue growth is essential to long-term viability of CRIs, it should not be the overriding focus of a CRI”

“Shareholding Ministers are...uncomfortable if revenues are derived from competing with or crowding out the private sector”

“There is no inherent conflict in the expectation on CRIs to, amongst other things, be both financially viable and undertake research for the benefit of New Zealand. A CRI can deliver both on an “aggregate” basis. It is frequently the case that the greatest proportion of ‘benefit’ from CRI knowledge transfer is reached in the wider economy and not as a financial return to the CRI”

In other words, as one of the submissions to the 1996 report on *Revised Policies for Access, Maintenance and Disposal of National Databases and Collections* held by CRIs⁴ said;

“The commercial goals of the CRIs are a condition of staying in business in the long term..., not a core purpose of CRIs”

The access provisions in the 2006 Operating Framework were amended slightly from previous years to make it clear that there was a presumption of maximising the access to

⁴ *Revised Policies for Access, Maintenance and Disposal of National Databases and Collections held by Crown Research Institutes* - a report for CCMAU by Ian Whitehouse, Landcare Research Ltd, December 1996

research results in the public interest, except where providers could demonstrate that denying access was of greater public benefit, and to discourage profit maximisation.

The CRI model is a competitive one where institutions compete for funding on the basis of research excellence, social responsibility while ensuring financial viability. When CRIs were set up, they were encouraged to diversify their funding base with a view to encouraging greater private sector R&D expenditure that could contribute to economic returns from innovation for New Zealand.

FRST contracts for the delivery of research outcomes. Providers are funded on the expectation they have built in full costs, including inflation. A problem arises when the costs of research are greater than the rate of inflation. It should be noted that, with the exception of Nationally Significant Databases (NSDBs), full cost funding does not normally cover the costs of database maintenance. However, CRIs can retain earnings from research products they have funded themselves (not from FRST funding), and invest back into programmes to help offset unfunded costs and adjust for any research costs greater than inflation rates. FRST funds now make up around 46%⁵ of CRI funding.

The 1992 changes brought a significant shift in culture in the research institutions, with an inbuilt tension between earning enough money to be financially viable and making research results accessible for the wider public benefit. The Operating Framework is a guide, but in the absence of clear policy on what government is prepared to fund for access, it does not remove the inbuilt tension in the system. It is in this context that the issues around access have arisen.

2.3 Universities

Universities do not operate within a company model like CRIs, except in so far as they have to compete for FRST funding for research programmes. Their FSRT funding is on the same basis as CRIs. The Performance Based Research Fund for tertiary institutions (PBRF) provides a more stable funding environment for research and the universities do not have the same drivers to produce revenue. Universities do not have responsibilities for large public good databases (none hold NSDBs, although they do hold data collected as part of FRST-funded research programmes e.g. population, and migration databases) and they are generally small research groups not researching across the whole of their subject areas. The situation is however changing for universities as they gain a greater share of FRST funding for larger research programmes than previously.

2.4 Government department funding

A number of government departments have funded transfer of research results. For example, Ministry for the Environment funded a new derived land environment database and classification as a tool for regional and district councils - see LENZ case study; Ministry of Agriculture and Forestry (MAF) Sustainable Farming Fund co-funded with industry groups the development and transfer of the Wheat Calculator - see Wheat Calculator case study.

These funding streams provide an appropriate investment in research information transfer along with co-funding by industry groups. The question arises as to whether these are sustainable funding streams and whether they are matched by adequate investment by FRST in the maintenance and development of databases that underpin such tools.

⁵ CCMAU-includes both PGST and Capability Funding

2.5 CCMAU and FRST access policies

2.5.1 CCMAU access policies

Following a review of policies for access, maintenance and disposal of national databases and collections held by CRIs in 1996, CCMAU issued a revised policy framework for national databases and collections owned by CRIs. See *Appendix 5* and section 2.6.1.

The principles of direct relevance to this evaluation include;

- National databases and collections include all those that are FRST-funded and others deemed to be of national importance by the CRI
- CRIs are able to charge the full cost of data retrieval and providing physical access, while the costs of collection, archiving and maintenance, may only be recovered to the extent that they have not been paid for from public good funding
- CRIs may protect their IP so the right to further copy is limited and the source is acknowledged
- CRIs may negotiate a copyright, royalty or license fee where the data are traded by the user
- In denying access, relevant legislation should be followed e.g. CRI Act, Official Information Act, Commerce Act, policies of the FRST and other emerging policies e.g. from the State Services Commission and international policies such as the OECD Council Recommendations on Environmental Information
- Ministers must be advised of disputes regarding terms of access and use of databases and collections
- CRIs annual statements of intent must include their policy on access and a list of those databases to which the policy applies
- CRIs must advise Ministers when they cannot maintain the integrity or quality of the database and seek consent from the Minister for disposal of any database or collection

2.5.3 FRST access policies

FRST also decided in 2003 to review its policy for consistency within the context of all the collections and databases funded by FRST, not just the then 25 'nationally important' ones.

The current FRST policy applying to all databases is as follows:

- CRIs which manage FRST-funded collections and databases must make access to the raw data or collection samples available in a usable form at cost and allow non-destructive physical access to material in collections at no more than the cost of providing physical access to collection material, except where that access is not to the benefit of New Zealand.
- CRIs may not recover archiving and maintenance costs
- CRIs may add value to the data through enhancing the way it is presented or by other means and then sell it for a higher price
- CRIs may negotiate a copyright, royalty or license fee where the data are traded by the user

The policy as reflected in the generic FRST contract terms and conditions, also sets out where the contractor may deny access to the primary results of a work programme (including from any Nationally Significant Database) in order to maximise the national benefit. Those situations are if the contractor considers that:

- Making the Primary Results available would prejudice the commercial position of the Contractor; or
- Making the Primary Results available would prejudice the Work Programme

See section 4.1 for discussion of the FRST draft access principles that were tested during the course of this evaluation.

2.5.4 Provider policies

Most of the CRIs and universities interviewed had broadly similar access policies that reflected the CCMAU and FRST policies set out above. Most institutions delegate the application of their policies to the responsible scientists leaving them with a wide degree of discretion, depending on the user. An escalation decision process is built into the policies.

2.6 FRST funding

2.6.1 Nature of the research data and information

Data generated from FRST-funded programmes can be categorised into four main areas;

- data collected, and predominantly funded by FRST, as Nationally Significant Databases (NSDB)
- data collected, but only partly funded (often < 50%) by FRST as NSDBs, with the balance of the funding being derived through a stakeholder commercial contract
- data collected as part of a pure research programme under contractual arrangements to the Foundation
- data collected entirely under a commercial contract with a client but held with data collected as part of a FRST-funded programme

The arrangements and practices for the access to data and information from these four areas vary considerably and the funding and ownership of each generate the barriers discussed below.

The research considered in this evaluation comprised both public good, and some industry good data and information where the greatest public and industry benefit came from dissemination to multiple users (See Petroleum and Minerals Exploration case study).

2.6.2 Nationally Significant Databases

FRST currently supports 26 Nationally Significant Databases and Collections (NSDBs). 25 of these are held by CRIs and 1 is held by a private research institution (Cawthron Institute). With the exception of the Possum EST database, which was added in 2004, no new databases or collections have been added to the NSDB category since 1996. The full list of NSDBs is set out in *Appendix 5*.

MoRST undertook a Review of NSDBs in 2003 due to concern over their under-investment by the government because of their value for research purposes and for end-users. It was recognised that the real level of FRST investment had declined by around 11% since 1998 and thus the databases had eroded in value and outputs, at a time when demand by users was increasing, especially using technology for better access.

As a result of the review, the government granted a funding increase in the 2003/04 budget for maintenance and development costs of NSDBs of \$3.75m in 2004/05 and \$3m

per annum thereafter. The extra \$0.75 in 04/05 was for one-off development work to which FRST added \$1.8m surplus funds, bringing the development funding to \$2.55m.

Priority was given to upgrading existing NSDBs and one addition. This was a first step towards addressing the funding of databases more generally within the context of new technology developments, such as geographic information systems, remote sensing tools, modelling and visualisation tools and next-generation internet that create new ways to get value from the databases and collections. These include compiling data-layers and running more complex models with elements from a range of databases. MoRST is currently considering these issues, and the management of data, within its More Stable Funding Environment and Backbone projects.

The funding of NSDBs, until recently, has been encompassed within and supports research programmes, and is sometimes spread over more than one programme. Funding has now moved more towards direct contracting of NSDBs as “intermediate outcomes”, with performance measured on the basis of alignment with contract outcomes, such as their accessibility to users. Such direct contracting for dissemination is designed to ensure databases are funded for that purpose, and thus can be more easily accessible. However, not all databases are funded directly, and thus it is difficult to get a complete picture of all of them (FRST has not undertaken a full audit of all databases).

FRST also does not fund all databases, nor fully funds all the Nationally Significance Databases. Databases require curation, management (including digitising) and dissemination, as well as updating and where digitised, the development of computer based interfaces to facilitate access.

Where NSDBs are not funded for their dissemination, CRIs have made considerable investment from their retained earnings in database maintenance, upgrade and development. Similar investments have been made by CRIs in databases that are not NSDBs and by third parties (See Flood Research case study and the Petroleum and Mineral Exploration Research case study). The ability to make these investments and better links with end-users, have been a direct result of the CRI operating environment.

The pattern of recent funding of NSDBs has been one-off investments for maintenance and some development and inclusion of some within Outcome Based Investments to secure their funding for 12 years. This reflects a constrained funding environment in which the funding of research will always win out with the provider and the funder, if it is competing with databases and the dissemination of data and information.

2.6.3 Information transfer⁶

FRST takes a relatively passive approach to the promotion of public access to research results it funds and the transfer of research results. CRIs have set up systems to transfer quality assured data either directly through web-based tools or manually. Transfer of models and other application tools are charged for and workshops provided for users. Analytical research results are either provided as a consultancy service or published in journals and reports generally available via the web.

FRST contracts, vest the ownership of research results in the providers. With a few exceptions e.g. QMAP (See Petroleum and Minerals Exploration case study), contract milestones do not specify the research results that are expected to be made public. However, most contracts have provision for the transfer of the information by way of peer reviewed and published papers, conferences, and workshops, for example.

⁶ See Terminology in Appendix 1

FRST does not generally fund the transfer of the research results from programmes it funds. FRST has had a policy (confirmed for continuation in 2003), that environmental and other non-appropriable public good research may continue to be supported through to final transfer to and uptake by end-users. In practice this funds small-scale dissemination activity, such as workshops and seminars, due to funding constraints. Large-scale and thus more expensive activities such as digitising data, creating derived databases and user web interfaces do not get funded, since they compete with the higher priority research in a tight funding situation.

In the recent RFP's for funding for 2007/08 onwards, FRST has requested applicants to include proposals for improvements to information transfer to users. However, the funding pool into which providers bid has not been adjusted to pay for such activities, so the research part gets priority and databases remain under-funded, since the 2003/04 funding increases were only for NSDBs and not sufficient to cover their full costs.

By comparison, some countries have funded major data and information transfer activities. For example, over the last 10 years the Australian federal government has made very large investments through Geoscience Australia in data acquisition to enable data to be transferred into the public domain. The Victorian state government has also invested \$15 million pa in geosciences data, with an estimated return of \$90 million in exploration spending by companies. Some other states of Australia have invested at even higher levels.

Other funding agencies in New Zealand are also considering funding the transfer of information⁷.

2.7 CRI funding

Where FRST funding has not kept pace with the real costs of research, and databases and programmes have not been fully funded for their maintenance and dissemination, the CRIs are able to use revenue from their own funded activities. This comes from a number of sources including;

- charging for dissemination cost on a time cost basis;
- cost recovery of their own investment in database and interface development, including a cost of capital charge;
- consultancy services to a range of clients based on their know-how
- exclusive licensing arrangements around the sale of derived products

These funding sources now make up around 60% of CRI revenue⁸. The source of the funding and thus the ownership of the data and information, determines whether and how such data and information is made available and thus whether cost becomes a barrier for the user.

⁷ NZ Health Research Council

⁸ CCMAU

3 Findings

This section addresses the questions posed in the Terms of Reference viz; the extent of public accessibility and instances of inaccessibility of FRST-funded research results; the barriers to access - what they are, how significant they are and for whom; different sector, subject, provider and user experiences.

3.1 Public accessibility

The general assumption held by most users interviewed is that all FRST-funded research results will be accessible at cost of dissemination. Provider practice is to generally make data and information available at the cost of retrieval and dissemination where possible.

In some cases, where concerns were expressed about accessibility, there was either a misunderstanding about who owns the data or information, or a lack of understanding about the access policies operating, especially for CRI data and information which is funded from a variety of sources, both public and private.

Often users were unaware of the multiple funding of research, and on being informed of the actual situation understood why CRIs charge for data and information, even if they didn't think they should.

There was a significant group of users who were opposed to the current policies and practice of CRIs that resulted in charging, negotiation of IP provisions, delays in timing of release of public good data and information. They believed that as government owned companies, CRIs should make all environmental, social and some industry good data and information available at cost of dissemination.

These views need to be considered within the context of the debate around data access and sharing internationally, where the availability of new digital technologies and concerns about publicly funded data not being readily accessible, has sparked a desire for open access to publicly funded research results. This is supported by the OECD in;

“Recognising that open access will maximise the value derived from public investments in data collection efforts”⁹

3.1.1 Extent of public accessibility

The providers of FRST-funded research are making their results generally accessible within funding constraints and government policy guidelines. CRIs have invested significant amounts of their retained earnings into making the FRST-funded primary results readily accessible for their own research and for other users. Most of this investment has gone into digitising data and information, developing derived databases and web-based tools for improved access. This has been made possible by the ability of CRIs to generate revenue from their products and services.

On the whole, a great number of requests for information and data are dealt with routinely and often automatically through web portals with no concerns being expressed by users. Some examples include;

⁹ See Appendix 7 for Background Literature on Public Accessibility

- *Cliflo* an web interface for climate databases (a development funded by NIWA), had 43 subscribers who logged 5000 data queries in the 2003/04 year
- Over a three month period NIWA made 90 transfers of free data
- Two thirds of requests to NIWA for flood related information is answered free of charge. There are 80,000 automatic website requests per annum. In addition, there are a number of users licensed to use the data for a defined purpose through a client agreement and with the condition not to pass the information on the third parties
- Up to the end of the 2005/06 FY, 8862 QMAPs and text were sold by GNS, as well as digital versions of the data primarily to industry users- the user proportions 2 years ago were public 38%, researchers 35%, government 12% and industry 15%- industry sales are now up to 25%
- Waikato University makes all its data and information from its FRST-funded oil and gas exploration contract available to exploration companies free of charge (although only some of them are digitised)
- All of the databases managed by Landcare Research are accessible through an archiving protocol which registers the level of accessibility and metadata available for data and information. Most of this is free of charge.

There are several success stories where FRST-funded underlying data was made more accessible through co-funding by a user agency:

- Landcare Research soils and land resource information through a Ministry for the Environment (MfE) funded project to produce LENZ (See LENZ case study) for use as a decision tool for biodiversity management and a range of other uses
- Crop and Food crop physiology knowledge and a model applied to produce a Wheat Calculator supported by MAF, FAR and AgriNutrients (see Wheat Calculator case study) to manage irrigation and nitrogen applications on-farm to reduce environmental impacts and to increase yields
- GNS geological and earthquake data and a seismic hazard model to produce GeoNet supported by Earthquake Commission (EQC), to enable reinsurance companies to set New Zealand earthquake premiums
- GNS mesothermal and epithermal gold prospectivity assessments funded by Crown Minerals were released on CD-ROM and distributed free
- NIWA climate data combined with Massey University data on the foot and mouth virus used to produce a dispersion model of the virus and an emergency management decision tool, supported by MAF Biosecurity

The key success factors making the LENZ and Wheat Calculator accessible were; strong user support and funding; user workshops; users who understood the value of quality controlled data; good relationships amongst the scientists and with the users.

A FRST-funded EnviroLink programme was highlighted by interviewees as a success, since it has increased access to FRST-funded research results in a useful form for users.

The practice of making data and information available generally follows the approach set out in Table 2, however it should be noted that these are not hard and fast categories except for the truly commercial IP access arrangements where access is not given.

Table 2 General approach by providers

Who can access

Access to all	Public good users especially of environmental, social data and information, including information that is made more accessible by CRI investment in web-based tools (for which they may or may not charge)
Privileged access	Where a CRI has entered into an exclusive licence where it relates to data or information relating to some collections, threatened species location, some indigenous knowledge,
Not accessible	Information where IP agreements have been signed for commercialisation e.g. plant cultivars, genomic trait information pest control trap, thrip control

Cost

Free	Primary data and information including from Nationally Significant Databases, especially for public good users, universities, students
Cost of access	<ul style="list-style-type: none"> i. Where requests for data and information need to be collated or digitised for dissemination ii. Where an investment of know-how has been applied e.g. a web-based tool has been designed for making data and information accessible with CRI funding The cost of each of these situations will be different and practice varies across and within CRIs (free to subscription plus charges)
A fee	Where the use is for a commercial purpose or where the commercial use is through an exclusive licence e.g. for exploration where there is a clear market value and where data has been digitised for access at CRI cost

This evaluation found that there was some variation across and within CRIs in terms of what is free and what is charged for. The degree to which charging creates barriers to users reflects the different CRI Board and management approaches e.g. whether the cost of capital is applied across all programmes or just those where the market is able to bear the cost.

Where there are established relationships or data sharing, as is the case with regional councils and the Water Resources Archive staff in NIWA, data can change hands free or for the cost of retrieval. However where large datasets are requested, where its use is for a commercial purpose or there is significant analysis of the data for the client, charges are applied to cover the cost of retrieval, digitising, analysis or to reflect the commercial value to which the data is to be put. (See Petroleum and Minerals Exploration research case study and Flood Research case study)

It is in this latter situation where concerns have been raised by a vocal few mainly in the area of flood, and petroleum and minerals related data. During the general interviews there were generic concerns raised about charging. Even though this evaluation did not cover all providers of FRST-funded research, the results are likely to be applicable to other environmental, social, and some industry good research where its accessibility in the public domain is of wide public benefit.

It appears that the majority of public good information is accessible to all but for some users there are access barriers as discussed in section 3.2; there were a few instances of privileged access found where data and information had a high value to a wide range of users. For example, the Petroleum and Minerals Exploration case study identifies some analyses of FRST-funded data, and private sector funded data and information that would be of public benefit for encouraging exploration of oil and

gas for energy security reasons, but which are locked up in exclusive agreements. When these data and analyses were purchased by the government the cost includes a profit element. There are other funding arrangements which could be considered which could be more cost-effective for the government and which would enable the data and information to be more readily accessible in the public domain sooner than under the current situation (See section 3.2.5).

There were also instances cited for petroleum exploration data where there were costs applied and hoops to go through before data was released. In some instances users do not wait for the data, due to the high transaction costs within a defined timeframe of a licence tendering process. These examples were primarily for petroleum and exploration and associated offshore marine geological data from GNS and NIWA where users wanted as much information as possible within a tight timeframe or where the data was not in a form that could be accessed easily or quickly because its maintenance and development is not funded.

In some instances, there are limitations put on use according to an archival protocol applied by the original researchers, for example the National Vegetation Survey, and for some FRST-funded collections for research purposes only, or to protect the location of threatened plants, for example. Some of these relate to agreements held with third parties such as iwi.

For most environmental, and some industry good research there were similar access issues raised by the predominant users of the data and information including cost, high transaction costs (need to digitise, delays and negotiations) and ownership (IP) issues being the greatest barriers identified.

In all the cases where accessibility was cited as an issue CRIs were operating within government policy and funding guidelines. The question therefore arises as to whether the policies are reasonable for environmental, social and some industry good data and information for public purposes and whether the barriers have arisen because of funding constraints on data maintenance and development which results in multi-funding and revenue generation to fill the funding gap. See section 5 Conclusions and section 6 Recommendations.

3.1.2 Funding levels

There was a general theme coming through from the majority of those interviewed (CRIs and users alike), that the company model for CRIs is affecting access to FRST-funded research results. Yet at the heart of the access issue was the concern expressed that access at cost of dissemination cannot be achieved while FRST funding remains essentially flat and funding levels are constrained, and while the costs of research go up. The CRI company model got the blame when in all cases the source of the access problem was funding levels.

Flat funding (see section 3.2.3) and limited direct funding of dissemination, means that CRIs will always need to gain revenue from commercial work (including consulting), to at least in part recoup costs of their own investment in database development, because this is a condition of CRIs remaining viable, and to ensure that databases and information are usable.

There is a tension in the system that leaves some users, with the perception that CRIs are not making research results accessible to the maximum extent possible at cost of dissemination, and consequently not maximising the national benefit as users see it. This raises the issue of whether the CRIs financial position is a greater

national benefit than releasing information to the public (See section 2.2). Many interviewed thought it was not.

The Ministerial Operating Framework has been amended to clarify that there is a presumption of access, unless demonstrated otherwise, even though the commercial goals of CRIs are a condition of staying in business. There could therefore be a case for clearer guidelines for FRST providers to ensure the access practice is more even across and within CRIs, rather than developing an objective measure for deciding whether open access has a greater benefit, compared with the revenue opportunity for CRIs. (See section 4 regarding the impact of the draft FRST access principles).¹⁰

Nevertheless, through the significant amounts of retained earnings that have been reinvested by CRIs (in the order of up to a few millions of dollars pa over a decade by each of NIWA, GNS and Landcare Research), more useful information is now accessible to users from CRIs than would have been the case if no revenue had been gained. The data and information available through web-based tools has released a greater value than FRST- funded data in primary form. This has been a direct positive consequence of the CRIs operating environment.

In addition, approximately \$25-30m has been returned to the Crown as dividends from CRIs which benefits the science and innovation system by being reinvested into CRIs for capital expenditure (CAPEX) where there is a case made.

The case studies and general interviews identified a real tension between the expectations of users and CRIs. This revolves around who should pay for the provision of access to data and information from FRST- funded programmes-CRIs, FRST, users, or a combination of all three.

3.1.3 Institutional differences

There were two primary differences between institutions practice around access viz;

- Differences between universities and CRIs due to the different institutional drivers on each type of institution;
- Different CRI practice with respect to the way they handle access to certain information

Between CRIs and universities

Universities do not have pressure on them to seek revenue from research results in the way CRIs do. None of the three universities interviewed¹¹ charge for provision of information. Any consultancy work that they undertake is not at the CRI scale.

The practices around access were not significantly different between universities and CRIs except with respect to databases. Waikato University has regular user group workshops and a programme newsletter for dissemination of social research results. They work closely with policy and industry users to ensure their results are accessible. Lincoln has the added advantage of owning farms which are used for research demonstration purposes for farmers, to aid uptake of results and they hold

¹⁰ Since no other countries operating a company model for research provision there are no guidelines available on how a national benefit test could be applied for access to research results in the New Zealand context. Such a test would have to be designed specifically.

¹¹ Staff with research management experience across their universities at Waikato, Victoria and Lincoln were interviewed

annual field days with farmer groups around the country to apply their research on the ground.

This approach reflects the simpler dynamic of the university-based FRST programmes, which unlike CRIs, are uncomplicated by the pressure from users to maintain large databases and develop tools for dissemination of the research results, which have a high value to a wide range of users. Universities do not generally carry such costs. Two exceptions are the University of Waikato's population and migration databases collected in the course of FRST-funded programmes, which have wide value for research and policy purposes.

However, as universities gain a greater share of FRST funding and get involved in large multidisciplinary research programmes with a number of agencies through CoRE funding¹² for example, they will increase their responsibility for large databases which are of interest to a wide range of users. Consequently, access issues that may not be an issue now for university research data and information may become so in the future.

Between CRIs

There are some differences in approach to access between CRIs which primarily arise from how the data and databases are funded. These differences relate to the degree to which they have invested their own funds (the NIWA Climate Database with significant NIWA investment-see section 3.1.4) and the degree to which FRST or other agencies fund dissemination (the GNS QMAP which is directly funded for dissemination). The EQC funding to GNS for GeoNet is a good example of a user agency funding derived products and their dissemination based on FRST-funded programmes and thus making them readily accessible.

There was evidence that such differences result in higher transaction costs relating to negotiations between CRIs over use of their data. A common refrain was:

"When you are in a hurry you just give up on that stuff"

Many interviewed thought that if such programmes were funded for their maintenance and dissemination, and competition between CRIs reduced, then some of the barriers to access could be removed. Given that the different practices primarily relate to how the data and information is funded or not funded, this makes sense.

The introduction of Outcome Based Funding (OBI's) and negotiated funding from FRST, and CoRE funding from TEC (in so far as they reduce competition between research providers and involve end users in dissemination of research results), is a move in the right direction. These funding changes however, are insufficient to address the issue of ownership of data. The adequacy of funding levels for maintenance and dissemination of FRST-funded data and the resultant effect on CRI access practice needs specific attention as a means of addressing the access issues highlighted by this evaluation.

3.1.4 CRI investment in data and information

The CRIs have made considerable investment in databases (their maintenance and dissemination, including digitising data), the development of web-based tools to make the primary data more accessible, and the development of derived new

¹² Centre of Research Excellence funding through the Tertiary Education Commission

databases that are more useful to users than the original data. Such databases are a key input to CRI research and consultancy activities, especially for public agencies at central and local government. CRIs therefore have a high stake in the upkeep of databases and their development.

For example, Landcare Research (LCR) has invested \$4.5m of its own money into databases and collections over a number of years to maintain their integrity and improve their accessibility e.g. NZ fungi collection, components of the NZ Land Resource Inventory such as soils (SMAP), Land Cover Database (LCDB) and topography. They have also received significant funding from the DOC Biodiversity fund, on the basis that the data and information is freely available.

Landcare Research has also invested in a database integration project to upgrade their NSDBs which enables better user access. It also received a one-off FRST investment in 2005. Where there is significant know-how applied to the data and information LCR will charge commercial rates for the information depending on the user and their relationship to them. Generally most of their information is free of charge.

For just over a decade the funding for the National Climate Database and Water Resource Archive remained static at \$3.538m per year¹³, (including approximately \$0.9m from other FRST contracts. Between 1994-2005 NIWA invested approximately \$1.2m per year, over and above the FRST funding to ensure that these networks (and associated data) were maintained for New Zealand's benefit¹⁴.

NIWA also allocates more than \$150K pa CAPEX, to maintain and upgrade the measurement network each year (there are 1,200 instruments deployed in the field that require maintenance and upgrade over time). In recognition of this, the programme received an additional \$1m pa from FRST, starting in 2005. However, this funding level is still well short of what is required to support the networks and currently NIWA supports >\$200K of additional routine work associated with maintaining these databases, compounding each year by inflation.

GNS has invested in a number of web-based products using their own funds to make data more accessible to users. For example the Petroleum Data Query map (PDQMap) was released in 2003 and provides a comprehensive map interface to petroleum data, free web access to an online earth science Bibliography, the Fossil Record File, PETLAB, Stratigraphic Lexicon and the Active Faults Database.

Similar investments have been made by other CRIs to maintain and upgrade FRST-funded databases in a form that enables access. In addition, they have done the same for some other databases that are not NSDBs, but part of FRST-funded programmes, and for some non-FRST-funded data and information.

FRST programme and database investments have not kept pace with the technology developments for data and information transfer now being demanded by users. All the examples above have funding shortfalls and have significant CRI investments which drive the quest for revenue. However, CRIs vary in their ability to generate revenue, due the type of data and information they produce. For example, there are market limits for sale of some products, like the LENZ, and the Wheat Calculator

¹³ Source of data: FRST audit of Nationally Significant Databases, 2003

¹⁴ The NIWA investment was used for field data collection, quality assurance, developing some internet data access, provision of data to international databases, senior scientists management time, servicing many small enquiries, software and instrument network support.

which was given away free to growers (See LENZ and Wheat Calculator case studies), and limits to the level of revenue where CRIs have mainly public good clients with constrained budgets.

The fact that CRIs have used their own funds and not FRST funding, to maintain and develop these databases, and can within government policy, charge for such products and services, should be more widely understood amongst users. Actions to better inform the users could reduce the concerns raised about any charges that are applied by CRIs.

MoRST are currently exploring the framework for data management generally with an emphasis on the new technology and standards for data management within that context. It would be timely to also explore the conclusions of this evaluation in this context.

3.1.5 Impacts of providers' access approach

The impacts of access policies are different for different groups of users. Small local authorities, students, consultants, other researchers, exploration companies, central government agencies are all impacted differently.

Price has a greater impact on the smaller users. In one example cited relating to a request to NIWA in 2002 for sea surface temperature data, a student could not afford the cost of data collation for access, nor wait while price was negotiated without it affecting the completion of the research. Permission to use the data free was given after 2 months (following an intervention by the university) with provisos on acknowledgement of source on any publications. The situation is now changed. NIWA now uses a web interface which has enabled access to the National Climate Database, to which the student has recently 'subscribed' finding the new system, very user friendly with fair costs.

Impacts of delayed release of data which has wider industry value, arising from IP agreements with one private sector company (e.g. between GNS and TGS NOPEC - see the Petroleum and Minerals Exploration case study), could be losing the Crown timely gas and oil opportunities for New Zealand's energy security

There was evidence provided that indicated under-funding of the Climate and Water Resources databases and where the system has either data gaps or outmoded technology (See Flood research case study). This was a result of funding constraints on FRST, but acknowledged to be an issue that the 2003/04 NSDB investment sought in part to address. The adequacy of the current funding needs to be further explored to reduce any risk that public authorities at central and local government may not have adequate information on which to manage flood risk and to plan infrastructure investments.

For both petroleum industry consultants and flood and water resources consultants and some local authorities, the users did not always get all the data and information that they thought should be readily available in the public domain, or they spent considerable time negotiating a price.

Most interviewees felt comfortable about instances of inaccessibility to FRST-funded research results where they were discoveries or innovations that could be patented and commercialised, such as chemical formulations or plant cultivars.

On the other hand they felt less comfortable about any barriers to access to public good data and information (usually environmental, social and natural and physical resources data and information), especially where such data and information had a commercial value to the CRI.

3.2 Barriers to public accessibility

Barriers to making public good research information publicly accessible: What are they, to what extent are they a problem, and for whom? The following access barriers were identified in this evaluation:

- Institutional drivers which give rise to competition between CRIs, pricing and consultancy issues, timing and time-consuming negotiations
- Multiple-funding and ownership of data and information
- Funding levels - NSDBs, other databases and flat funding of programmes
- Lack of awareness by users of what information is available
- Government policy consistency
- Some sector specific barriers

(Note some examples are illustrative of several of the barriers and are consequently used in several sections).

This evaluation found no cases that were outside the accepted policies and legislation that the research providers operate under. (See section 2 above).

In the instances cited where there were access barriers, they were related to:

- Legitimate charges where CRIs had invested their retained earnings e.g. in development of web-based tools to ease access to users;
- Commercial issues of proprietary information that had market value for the CRI e.g. a model;
- Where the CRI was concerned that the data would be misused in the absence of metadata and where user capability was an issue; or
- Where the release of the information might compromise benefit to New Zealand e.g. location of some threatened species.

The source of funding for data and information, and thus its ownership, along with the access policies of the government, determine the way in which access is granted to users. (See section 1). When the expectations of the users differ from the legitimate expectations of CRIs, access concerns arise.

While much data and information is accessible there are some significant barriers to a good number of important public good users of FRST-funded research results. On balance it is recommended that the issues raised in this evaluation be addressed to ensure the wide national benefit from FRST-funded data, databases and derived decision tools is being realised in the national interest.

3.2.1 Institutional drivers

There was a perception amongst a great many users that the CRI operating environment was creating barriers to the timely and free flow of information, especially for public good purposes as defined in *Appendix 1*.

The particular issues that were identified as creating a problem included:

- The way the expectation on CRIs for a return on equity over time appeared to be driving revenue from value-added public good research results

- The competition between CRIs for FRST funding and for consultancy work in some areas
- Ability to enter into exclusive licences
- The administrative costs of negotiating access to research results

However the evaluation found that while the CRI operating environment drove CRI practices, the barriers arose because of other issues, such as under-funding, multiple funding and lack of awareness of funding sources by users. The CRI operating environment has enabled greater access to public good data through reinvestment of CRI retained earnings into maintenance and development of databases in a constrained funding environment.

Revenue pressure

The pressure on CRIs to earn revenue from public and industry good research results varies across the CRIs, depending on their Board policy and management practice, and the nature of their business. This pressure was felt most keenly by senior scientists who interact directly with user groups and who try to balance the desire of their Board and management to get revenue with the benefit from making the data and information readily available for users. This has consequently created some variable practice around data and information accessibility.

In the area of flood forecasting, both NIWA and users have a similar driver-that is, to ensure there is reliable and accessible data and information to reduce the risks to property and life. Frustrations set in when users expect everything for free and tensions arise in the process of seeking data. In addition, some under-funding has resulted in repeated short term “fix ups” of systems and sites, to enable data to keep flowing, and NIWA has been falling progressively behind in application of technologies where some infrastructure has become outmoded. Dealing with the associated user frustrations adds to provider frustrations.

Nevertheless, most users found NIWA staff helpful in responding to their requests. (See Flood Research case study). Concerns were often associated with lack of user knowledge about the ownership of NIWA databases, or a strong view that all data held by CRIs should be accessible and free. This latter was driven from a view that CRIs are Crown owned and that all their funding and revenue is therefore public money. While that may be the case, it is a jump to expect such data to be free irrespective of who funds it.

Competition between CRIs

Competition between CRIs was cited as a barrier that gave rise to time-consuming negotiations from quite specific data sharing agreements, typically with limitations on use and acknowledgement of source being required. Examples are the use of the bathymetric data and associated offshore marine geological data held by NIWA and used by GNS for QMAP. The bathymetric data is not funded as a database (it is a product of a wider research programme) and it has value to NIWA for research and consultancy. Limits are placed on on-selling of the information and the data must be acknowledged. Agreements for use must be negotiated.

Such arrangements between CRIs create additional transaction costs to researchers doing the science, and to other users, some of whom have time-bound needs for data and information e.g. petroleum exploration companies. Examples were cited where users did not pursue access to the data.

Exclusive licences

The degree to which GNS and NIWA held proprietary information available from private sector contracts that might be valuable for the wider exploration community, was of concern to some exploration consultants and Crown Minerals. An example was cited where Crown Minerals paid a significant sum (more than if FRST had paid for the data collection and analysis and) for such a dataset and its analysis, to enable it to be lodged within their web-based database and thus accessible to users earlier than it would have been under the licence conditions-TGS NOPEC (See Petroleum and Minerals case study).

This last example arose as a direct result of the desire of the CRI to undertake exclusive licences or joint ventures with the private sector to raise revenue through sale of products and thus complete industry and public good research earlier than if it had been only FRST-funded and at current levels. However, by doing so, the data and information remains inaccessible for industry users. On the other hand, Crown Minerals has been funded in the order of \$15m to gather as much information as possible and make it accessible for encouraging exploration. These two approaches seem to run counter to each other-see section 3.2.5.

This data and information held by CRIs that is not FRST-funded, is highly valuable for wider industry use, but there is no dedicated funding to maintain, develop and disseminate it in the national interest.

This issue raises the question of whether the Crown is getting value for money from its investment in purchase of data and information via Crown Minerals. It could cost the Crown less if it funded FRST/GNS for the data and information directly, since it would not have to pay for the profit element from the private sector.

Administrative costs

The significant factor that influences charging for information, relates to the extent to which a CRI has invested its own retained earnings into making the data and information more accessible to the user. Where databases are not fully funded (See Section 3.2.3) and information transfer is not funded, the only way the integrity of the databases can be maintained and their access developed is through CRI investing their own funds.

In general, where users felt that withholding, delaying or charging for access was unjustified, they were often unaware that the CRI had invested large sums of its own money into improving and maintaining the integrity of the data or that it was funded from a number of different sources.

Some commercial users of data on the other hand, had no problem with being charged a "fair and reasonable" price for information as they saw it as better value to New Zealand to have CRIs (who hold the greatest expertise in their respective areas of research) make it available in an orderly and quality controlled way with appropriate metadata attached to minimise misuse of the data. The exception related to where information needs were time-bound and extra administrative costs created a barrier.

3.2.2 Multiple-funding and ownership of data and information

The ability to seek revenue from CRI products was an expectation of users pays policies dating back to the establishment of CRIs and enshrined in the establishment policies. These policies, combined with declining funding for CRIs in real terms over time, have created a situation where primary data and making it usable for access, is now funded from multiple sources. The consequent ownership of such data and information creates a barrier to its access.

In the LENZ case study a CRI was contracted by a central government agency-MfE, for a decision tool. The IP for the data layers was retained by Landcare Research and the tool IP held by the contracting agency MfE. There is a tension between the contracting agency (MfE) and the CRI as the data layers (which MfE paid for), have revenue generating benefits for the CRI, enabling it to maintain the derived product over time. MfE had to purchase the LENZ products to overcome a price barrier to uptake and thus made them accessible to councils (See LENZ case study).

Some industry interviewees expressed caution that with the greater emphasis on end-user collaboration in FRST contracts, multiple ownership of research results can complicate accessibility of results e.g. in the early stages of some joint ventures like the Pastoral Greenhouse Gas Research Consortium (PGGRC) which is now under re-negotiation, and in the Wheat Calculator case study. In these cases IP agreements need to be managed carefully to ensure wide dissemination of results to the users. OBIs were cited as good examples of where clear IP agreements had been worked out between the parties to ensure the outputs of the research could be disseminated to users.

Agriculture industry users thought that there would be increased value for the agriculture sector from greater collaboration and data sharing across research groups and open access to data and information, rather than the research groups having exclusive use of the IP e.g. research on Johnes disease currently being carried out at two universities was cited.

This view was also held by exploration companies and their consultants, where scientists and industry could collaborate and thus improve the quality of the data and information overall. A number of interviewees mentioned the international genome project as a good example of open access to data and information in this context.

Some industry users of data and information cited successful experiences where they were an integral part of a research project with a CRI (Wheat Calculator and LENZ case studies), which helped the accessibility and usability of results. FRST-funded University of Waikato research on migration is co-funded with the Department of Labour which assists with the accessibility of research results and the use of data for policy purposes.

There was a general view that a drive by FRST for joint ventures and co-funding needs to be carefully managed, especially for environmental data and information, or industry good data and information where the benefits of wide access are greater than locking up data and information in exclusive agreements because of multiple ownership.

3.2.3 Funding levels - flat funding of programmes, NSDBs and other databases and web-based tools

As set out in section 2.5.2 above, FRST does not routinely fund information transfer activities beyond the preparation of primary data into publications and through workshops and attendance at conferences in New Zealand and overseas.

Flat funding

FRST programme funding is fixed over the programme and even though full cost funding is provided, where the costs of research are higher than the rate of inflation, the money available for the programme goes down in real terms e.g. where ships and other expensive equipment used are affected by exchange rates and personnel costs rise above the inflation rate, the amount of money for science and in particular, for the maintenance of databases, becomes smaller over time.

The pressure this exerts on CRIs become manifest where users require the information quickly for exploration purposes for example. The seismic and bathymetric marine geological data requested isn't routinely digitised as it is not funded within the research programmes, or the CRI has added value through web-based tools to assist the use of the information, and can thus charge for the costs of getting the information in a new form or where it is for a commercial client can charge a market value. In these circumstances it takes time for a negotiation on access and price.

NSDBs

The ability of CRIs to reinvest revenue for database management and the development of web-based tools has to date meant that no databases have significantly deteriorated or been lost (although there is some data that needs to be rescued-see Flood Research case study). However, the level of investment is limited by the ability of the particular CRI to earn revenue. It is easier for some CRIs than others. For example, Landcare Research, whose 'clients' are predominantly other public sector agencies responsible for public good resources, compared with GNS and NIWA where the private sector client base is relatively greater¹⁵.

While additional funding was given in 2003 to NSDBs, they are still not fully funded. In addition some databases that are not NSDBs are not funded for maintenance and development.

Other data collected under FRST funded programmes

The bathymetric and associated offshore marine geological data is a good example. NIWA receive no funding to maintain and digitise the data arising from a FRST-funded research programme or for data lodged with NIWA by LINZ from hydrographic surveys. Neither is GNS funded for offshore marine geological data maintenance, digitising and dissemination which are collected during the course of a FRST-funded research programme. This information is much sought after by exploration companies and consultants working for them, as it has much wider application than for the research purpose for which it was collected and thus fits the definition of public good set out in *Appendix 1*.

Geothermal research data and information collected in the course of FRST-funded programmes is another example. It has no natural repository, since there is no

¹⁵ Landcare Research cannot keep up with user demand within available resources for updating of the New Zealand Land Resource Inventory (NZLRI) suite of databases

licensing regime associated with geothermal resources in the way there is for petroleum and minerals data, thus no funding for the maintenance, digitising and dissemination of such information.

Maintenance and update of underlying data for decision tools

Increasingly, users want decision-tools from FRST-funded research and these require funding. At present FRST funding addresses data collection, some maintenance where the data is a NSDB, and the development of the models that can be used to design tools. Some industry users have funded tool development e.g. Foundation for Arable Research (FAR-refer Wheat Calculator case study); Ravensdown (EcoN nitrogen inhibitor); central government agencies-MAF (Wheat Calculator) and MfE (LENZ). To enable these tools to have on-going integrity they require ongoing funding of the primary data and models on which they are based. This is currently a funding gap which needs to be addressed by both FRST and users. For example, a key factor that affects the ongoing accessibility of LENZ and the Wheat Calculator include; ongoing funding of the underlying data and derived data layers, crop physiology and model development; clear IP agreement and its management; decisions around who funds the ongoing updating and maintenance of the decision tool.

Funding for web-based tools

Since some of these data were initially collected, the technologies for accessing them have changed and improved. There is user demand for web-based tools to facilitate access and these come at a cost. There is significant concern that New Zealand is falling behind other countries in its technology to access databases. Some thought our reputation is at stake in the area of database access. Two CRIs suggested that the equivalent of around 5% of their FRST revenue per annum over 5 years is needed to maintain the data (including DSIR legacy data, some data rescue and to digitise data) in a usable form, and the development of web-based tools to address the issue. Other CRIs independently confirmed this order of funding is needed for this purpose.

3.2.4 Lack of awareness by users of what information is available

Other recent user surveys undertaken by FRST have identified lack of awareness by users of what information is available and various suggested actions recommended.¹⁶

In this evaluation there was general concern expressed by users that they were not aware of what data and information research institutions held. This affected access to data and information held by providers of research. The issue was a combination of not knowing what specific information of interest might emerge from FRST-funded research, and not knowing what CRIs held that was funded by CRIs retained earnings or by third parties.

Users suggested that access to publications, conference papers and published reports would be enhanced if they could go to one place or website to see what had been published. Currently FRST does publish a research reports and abstracts database on its website at <http://www.frst.govt.nz/Database/>. However it is not particularly user friendly, nor is it targeted at sectors. Users do not find it easy to access. An upgrade that is easy to access and targeted at sectors would in part address the concerns raised. There is, however some responsibility on the users to keep abreast of research results themselves through their provider contacts.

¹⁶ Portfolio Evaluations 2001-2005 Evaluation Report FRST 2005 refers.

The FRST and PBRF drivers on researchers in CRIs and universities were described as emphasising peer-reviewed international publications. Some users find these hard to access due to their industry-unfriendly style, thus making research results and the embedded data inaccessible, and in some cases not available in a timely manner due to the time between data collection and publication of the results e.g. some petroleum exploration users.

There were instances cited where users found out at a conference that some work had been done and that they would have liked to have known about earlier, due to its significance for them. One example cited was offshore seismic and bathymetry surveys and associated marine geological data, undertaken for a FRST-funded programme, but with wider value to the exploration community.

Dissemination of information via workshops was supported as the most useful way of accessing research results from FRST-funded data and information, where there was a chance to discuss the information within users own context or where users were an integral part of the research programme. The University of Waikato policy workshops on migration research and the series of NIWA training programmes based around the Water Resources and Climate databases were a good example of this.

While CRIs in particular have actively promoted access to the range of their data and information and derived products (See Floods, and Petroleum and Minerals Exploration case studies for examples), there still seems to be a gap between user needs and what CRIs provide. Users also have a responsibility to inform themselves of what is available within their own fields- in other words it is a two way street.

However, for local government and businesses research results will not be front of mind, especially for the small enterprises. Nevertheless, it could be timely in the context of the Backbone Project for government to explore new ways of informing users of what is available from FRST-funded and related research results. There are some established channels which CRIs, universities, FRST and MoRST could use, to better inform user groups. These could include, sector organisations, chambers of commerce, economic development agencies, the Biz Info programme

3.2.5 Government policy inconsistency

Petroleum and minerals exploration data and information

The government provides significant funding to Crown Minerals to facilitate maximum accessibility to information of interest to petroleum and minerals exploration companies. This has involved funding a number of consultants and GNS, to provide information and collate it in usable forms available for the industry free of charge e.g. the Mesothermal Gold and Epithermal Gold prospectivity studies for minerals. Such information is available free to the industry.

On the other hand, the government has funded research providers to undertake research relevant to petroleum and minerals exploration, but has not generally funded them for data maintenance and dissemination of the data and information¹⁷. Neither has government funded their programmes at levels that deliver results within a 2-3 year period which would make them more useful to the petroleum exploration industry.

¹⁷ Some databases are directly funded while some are not

The consequence of this is that the industry is being charged by CRIs for some data compilation and for client-specific value-added primary public good research results, when they are being used for exploration purposes, at prices to reflect their commercial value (Note that this is within government CRI policy guidelines). This contrasts with Crown Minerals, which makes such information available free of charge.

GNS particularly and NIWA undertake exclusive contracts with industry to speed up the analysis of FRST-funded data, alongside additional industry-funded surveys, which adds value to the FRST-funded data. This results in the data and information not being in the public domain commonly for up to 5 years. In two instances (Spectrum and TGS NOPEC), Crown Minerals purchased the information at market rates to enable it to be open file in the public domain, sooner than it otherwise would have been (See Petroleum and Minerals Exploration case study).

When oil and gas exploration companies are time-limited within the Crown Minerals tendering process of 3-6 months for lodging work programmes, an administrative burden is added by negotiations over access to data. This is viewed as a barrier to access and inconsistent with the governments desire to encourage exploration. It was viewed as an inconsistency between governments ownership interest in CRIs (to remain viable through the ability to raise revenue from products and services), and its public good interest in making publicly funded research results accessible.

The apparent inconsistency and frustration with access provisions for petroleum exploration data and information was a key issue highlighted by this evaluation. Information access is falling between two stools at present and given the time bound nature of oil and gas exploration and its importance for New Zealand, a better system needs to be designed. There are a number of ways these issues could be addressed as set out further below in this section.

Other inconsistencies between government policies

Government departments cited examples of inconsistencies between CRI and government departments approach to IP issues and thus accessibility to data free of charge. When FRST contracts CRIs for research they hand over the new IP; when government departments contract CRIs the department keeps the new IP. Some confusion has arisen over flood risk management analyses when CRIs use existing data they hold for further analysis that may not be funded by FRST. Thus the ownership of the data used determines who holds the IP and whether charges apply.

The LENZ example cited in section 3.2.2 highlighted an inconsistency between Landcare Research's need for and ability to seek revenue (Crown ownership policy) to top up under-funding of data maintenance, and MfEs desire to see wide dissemination of a useful product it had funded by removing a price barrier to councils (government IP and FRST access policy).

DOC Biodiversity funding (TIFBIS¹⁸), for relevant database management by Landcare Research has free public access to databases as a condition. If CRIs had funded this development themselves through their own revenue, they could charge for access.

3.3 Suggested ways of removing barriers

¹⁸ Terrestrial and Freshwater Biodiversity Information Systems

3.3.1 *Petroleum and minerals exploration*

In the petroleum and minerals exploration area some changes could be considered to enable more timely access to the data and information of value. This could be done by additional funding either from FRST (through new funding) to reduce the time taken for the petroleum research programmes to deliver, or by Crown Minerals co-funding the research programmes with FRST, through GNS as preferred provider. This would enable the relevant data and information to be accessible free of charge through the Petroleum Library at Crown Minerals and would also reduce the time taken to undertake the research.

In addition there is a case for direct funding of the maintenance and dissemination (including digitising) of the bathymetric and associated offshore marine geological data collected as part of FRST-funded programmes by NIWA and GNS. Ideally this data and information could become a Nationally Significant Database given its comparable value to other similar databases like QMAP and the Climate Database. This would reduce the amount of time taken away from research to deal with data requests, reduce the costs associated for the users and result in the data being more accessible.

3.3.2 *Flood research*

In flood research where IP issues arise there is a real need for clear communication of the nature of the funding streams for climate and flood risk management data and information, to improve understanding of who owns what information. In addition, there is a need for full funding of the relevant programmes including maintenance and dissemination.

3.3.3 *Decision-tools*

The development and maintenance of decision tools for users require further consideration of who should pay for them. The development appears to fall within the relevant government department interest while the maintenance of the underlying data would fall within the interests of FRST given their stewardship role of databases of national significance.

3.3.4 *Funding*

Increased funding of research programmes by contracting directly for the maintenance and dissemination of data is also needed to remove the pressure for revenue generation to make up for the under-funding, and thus remove the associated costs involved in accessing the data and information. There are a number of ways that this could be done.

- a) For existing data and databases, a new contestable fund could set up to recompense CRIs for past investment in database maintenance and development, for the removal of existing backlogs in processing historic data and for some data rescue

Two CRIs indicated their estimate of the cost of this at around \$2m pa for 5 years for each of NIWA, GNS and Landcare Research. However analysis of this would need to be done once the data and databases concerned were identified.

- b) For existing and new programmes which collect large databases of public good value for a wide range of users, FRST funding should be at a higher level to enable the full funding of data collection, maintenance (including digitising), and the development of web based tools to enable useful products to be accessed. This could be done either by;

- A new ring fenced contestable fund or
- New funding, so FRST can directly contract maintenance and dissemination of data as part of all programmes

The best option would be the one which ensures the funding is directed at database maintenance and development. The practice to date where there is under-funding is for the science to win out over the database maintenance. The ring-fenced option therefore is likely to be the most stable. However further analysis is needed to assess these options, the likely level of funding needed and which data and databases should be funded in this way.

4 Impact of FRST draft access principles

4.1 The draft principles

The Foundation's draft access principles are;

1. ***Public good primary results and codified information should be made available to the maximum extent possible at the cost of dissemination, so long as that access maximises the national benefit.***
2. ***Where possible, research organisations would identify in advance the public good outputs that should be publicly accessible.***
3. ***Disclosure by research contractors to the Foundation when release of public good outputs or primary results is denied and reasons for the denial.***
4. ***Provide for a dispute resolution and escalation process where there is a difference of views between the Foundation and research contractors over access to public good outputs***

The two exceptions to the principles proposed by the Foundation are:

1. ***Where release may result in loss of, or significant reduction in, commercialisation opportunities and returns to New Zealand, including damaging commercial partnerships between research contractors and firms or industry groups;***
2. ***Where release may have significant adverse effects on the environment, existing New Zealand industry, or on the cultural values or heritage of groups of people.***

The difference between these draft Principles and the current FRST contract conditions (See section 2.4.3), is that the Principles would mean data and information must be released unless the provider can show that doing so will not maximise the national benefit. In other words, commercial and research programme reasons for denying access must be shown to be in the maximum national interest compared with release.

Since there is no objective measure of which action maximises the national benefit, the Principles would be difficult to administer and likely to meet opposition from CRIs, which rely on the ability to earn revenue to top up research programmes and to meet return on equity targets, that is unless additional funding of database maintenance and development was provided.

4.2 Interviewee feedback

Overall the interviewees were supportive of having a clear set of principles widely known by all parties. Most supported the principles, but did not think they would change the current practice given the policy settings that CRIs work within. Generally the industry-based CRIs were less enthusiastic about them since they could potentially reduce revenue earning opportunities for CRIs.

4.2.1 Principle 1

Most interviewees suggested that the wording of Principle 1 should stop at “*cost of dissemination*”, because defining “*so long as access maximises national benefit*” was thought to be too difficult to define. Some users thought the clause could be used to bar release of information, since it might be argued that the use of the IP for CRI research, consultancy and innovation, *ipso facto*, maximised national benefit.

AgResearch and Crop and Food Research were the two CRIs with greater reservation about Principle 1, especially if it was to be applied to patentable commercial IP.

In situations where the national benefit was best served by industry good data and information being made accessible, then a range of data and information with barriers to accessibility (cost, timely provision, negotiations) would be more freely available but only if the cost of maintenance, development and dissemination of the data and information were paid for by the government.

4.2.2 Principle 2

Principle 2 elicited several responses. CRIs, universities and some users indicated that the precise outputs from research cannot always be predicted at the outset of a programme. Others commented that Principle 2 raised the issue of the need for a better system to publicise what research results are produced.

4.2.3 Principle 3

With respect to Principle 3 some users thought the onus should be on users to notify FRST and that FRST should have a channel for those denied access to seek redress. Other users thought that CRIs should seek FRST permission for denial of access. This view was held by a few users who were opposed to providers having ownership of publicly funded research results and who were unaware that FRST transfers ownership of research results to CRI's by contract. Disclosure of delays in releasing data and information was also suggested as an addition to Principle 3.

4.2.4 Principle 4

Most commented that a Principle 4 would be necessary in any situation where disputes occur and was good practice anyway.

4.2.5 Exceptions

With respect to Exception 1, there were mixed reactions where environmental data and information was concerned. Most users saw such information outside of the commercial environment since the value was primarily for the public good.

This exception was supported for commercial patentable results of research such as plant cultivars and genomic trait information.

It was not supported where there was time-bound demand for information such as in the petroleum exploration industry; where there was a greater value seen for open access to information, such as in the agriculture sector for disease control or biosecurity, where industry and research providers need to work together collaboratively. Again there was a view that the value of these uses was for the wider public good and national benefit.

Providers on the other hand generally supported the exceptions if the current funding levels stayed as they are. However, if the cost of maintaining and developing data and information and their dissemination was funded, then environmental and social research could be excluded from exception 1.

With respect to Exception 2, there was guarded support especially for limiting access to threatened species location and personal identifiable information for example.

Generally users did not support exceptions to the general Principle 1 as they supported accessibility of public good information at cost of dissemination.

Most of the research providers interviewed held the view that they already make their FRST-funded information available to the maximum extent possible at cost of dissemination. Where they don't or delay release, or charge for access, this was viewed as justified within CRIs, government policy and consistent with FRST contracts. This occurred mostly where;

- CRIs had added value to the FRST-funded data and information from their own funds
- the data or information was owned by a third party
- they had an exclusive licence
- they had to spend time putting data or information in a suitable form for release e.g. digitised in a usable form or
- access was for commercial purposes

While the CRI practice can be viewed as strictly within the policy, the broader intent of the government policies and contract provisions is to maximise the public benefit through availability of data and information. This is reflected in the statement in the government Operating Statement to CRIs regarding the greater proportion of the benefit from CRI knowledge transfer being reached in the wider economy and not as a financial return to CRIs. (See section 2.2 above). The level of funding for data maintenance and development is at the root of the tensions around access to FRST-funded research results.

4.3 Consequences of applying the principles and the exceptions

The consequences of applying the Principles to each case study, is as follows.

4.3.1 *LENZ case study*

Application of the Principles would not have affected access to LENZ, but could have been applied to the FRST-funded underlying data and classification methodology, which fed into LENZ. However, these data by themselves would not have been as useful as the LENZ, which has applied the input data to derive a new set of data layers and a classification and produced a powerful tool for decision-making.

The ability to release the value of the data and information in this case came from the MfE funding of the LENZ underlying data layers, the classification tool and its dissemination to all councils. The major accessibility issue that arose from the LENZ case study was the lack of a systematic funding system to maintain and update the derived database and classification. The Principles would not have addressed this issue.

4.3.2 *Wheat Calculator case study*

The Wheat Calculator was made fully accessible to users at no cost. The application of the Principles to the Wheat Calculator development would have made little difference to how the information was made accessible. The information was made available to the growers through a decision tool. The ability to maximise accessibility to the information, came from the Crop & Food Research and industry funding Foundation for Arable Research (FAR) and Ballance AgriNutrients, and through the MAF Sustainable Farming Fund (SFF).

4.3.3 *Petroleum and Minerals Exploration case study*

The Principles would make little difference to current accessibility of data and information relevant to petroleum and mineral exploration. This is because GNS and NIWA routinely add value from their own funds to the primary research results and

have the ability to charge for that added value under prevailing pricing and charging policies. In addition, FRST and Crown Minerals have also contributed to adding value to primary results generated by CRIs, and in some cases some of the information has private sector data embedded in the value added information to which ownership issues affect accessibility.

The Principles would not cover data and information that are funded by private sector clients to produce what might be of interest to users, or that CRIs hold as part of exclusive licence agreements with other parties. All of these categories of data and information are of interest to the industry users and unless funded by Crown Minerals or FRST are not accessible in the public domain in a timely way.

4.3.4 Flood Research case study

Since the Principles would apply only to FRST-funded data and information in the public good area, they would make very little difference to accessibility and the current practices of NIWA for flood related data and information for the following reasons;

- Findings from FRST-funded work are already available for free or at cost of dissemination
- Charging to recover the cost of CRI investment is only applied to work that has had a contribution from CRIs own funds
- FRST, in most cases, has not funded the work that improves accessibility of findings e.g. construction of derived, user-friendly datasets and web interfaces and therefore charges apply

4.4 Suggested approaches

The general consensus from the interviews was that the Principles alone would make little difference to the accessibility of FRST-funded data and information as they are currently funded.

The draft FRST access Principles are a shift from current FRST contract provisions for research it funds and if implemented would bring those provisions in line with the Ministerial Operating Framework for CRIs. Both have a presumption of maximising access, except where CRIs can demonstrate that denying access was of greater national benefit.

This would suggest that FRST should change its contract provisions to be consistent with the Operating Framework to remove any confusion between the two. However, doing so will not address the access issues raised in this evaluation but it would make it clear to providers and user alike that maximum access is the objective, except in some very specific circumstances.

An enhancement of the principles to exempt all environmental, social and some industry good data and information from the Exception 1, should also be considered given the wide public benefits from maximum accessibility to such data and their derived products. The fear by some CRIs that this would affect their ability to gain revenue from consulting, has to be put in the context of CRIs being the main locus of expertise and quality assurance for analyses done using their data. It is concluded therefore that they are unlikely to be greatly affected by such an exemption.

5 Conclusions

Data and databases

During the course of the evaluation it became clear that the issues around access mainly involved access to data and databases and their derived products, rather than access to publications and reports. While the focus of the evaluation was on the areas where concerns had been raised, the barriers to access that emerged do have wider effects across other areas of FRST-funded programmes where data is collected that have wide public good value.

While most databases of user interest are held by CRIs, the issues raised around their access will be equally relevant to universities as they gain an increasing share of FRST-funding and become involved in large research projects through FRST and TEC CoRE funding, for example. Further analysis of the recommendations of this evaluation will need to consider the situation for universities.

Accessibility

The providers of FRST-funded research are making their results generally accessible within funding constraints and government policy guidelines. FRST-funded databases are generally as accessible as can be expected in a constrained funding environment and where CRIs are able to charge for their products and services and have to show a return on equity over time.

More useful information is now accessible to users from CRIs than would have been the case if no revenue had been gained and invested in database maintenance and development. The data and information available through web-based tools has released a greater value than FRST-funded data in primary form.

The evaluation found that while the CRI operating environment drove CRI practices, the barriers arose because of other issues, such as under-funding, multiple funding and lack of awareness of funding sources by users. These are sufficiently significant access issues for a good number of public and industry good users of FRST-funded data and information, to justify specific solutions being suggested in the national interest.

Funding sources

The source of the funding and thus the ownership of the data and information, determines whether and how data and information is made available and thus whether cost becomes a barrier for the user.

The case studies and general interviews identified a real tension between the expectations of users and CRIs. This revolves around who should pay for the provision of access to data and information from FRST-funded programmes- CRIs, FRST, users, or a combination of all three.

Policies and practice

CRI policies and practices concerning the release of data and information from CRI databases are consistent with government policies and contract provisions set out by CCMAU and FRST. In all the cases where accessibility was cited as an issue, CRIs were operating within government policy and funding guidelines. There was some variation across and within CRIs in terms of what is free and what is charged for.

User understanding and awareness

The public and user understanding of access to publicly funded research results do not equate with the government policies governing access.

Another problem is the lack of awareness on the part of users about the significant share of non-FRST resources invested in the maintenance of these databases and the development of web-based interface tools that enable data to be accessed in primary form or as derived information.

Institutional drivers

Under the current policy settings and where databases and their dissemination is not fully funded, CRIs are under pressure to charge users for their investment in data and its management for access, which works well enough most of the time, but in a significant number of nationally important cases, leads to delays in release of data, time-consuming negotiations, affordability, and IP rights issues where third party data is involved. These issues are raised regularly in several areas of significance for New Zealand e.g. oil and gas exploration, flood risk management and around other environmental and some industry good areas.

Multiple funding and funding levels

There are multiple funding streams for both NSDBs and non-NSDBs which create IP and cost access barriers to users due to their ownership. The question arises whether multiple funding for NSDBs, and the IP and charging issues that result, compromises the FRST investment by constraining use to less than what it would have been with 100% FRST funding. Ring-fenced funding should be considered.

This leads to another more fundamental question, albeit somewhat beyond the scope of this evaluation: what is the “right” level of FRST provision of NSDBs and are there some data collected as part of FRST-funded programmes that should also be NSDBs? Whatever the answer is, FRST will need to clearly communicate what users can expect for free and what they will have to pay for.

Policy framework

The issue of access to FRST- funded databases should be resolved in the wider context of Government’s ongoing objectives for NSDBs (including the level of FRST funding in their financing) which are currently unclear. This includes making links with the MoRST More Stable Funding and Backbone Projects that are looking at new generation infrastructure to support and link databases.

In the short term, one possible solution to removing current cost and IP barriers would be for FRST to recompense CRIs for past investment, fund the removal of existing backlogs in processing historic data and some data rescue, and commit to a defined future level of funding to ensure accessibility of data and information from FRST-funded databases. This would also need to be matched with increased ring-fenced funding for the ongoing maintenance and development of existing and new databases.

Users, including other CRIs, would then get information in a timelier manner and without the administrative costs associated with negotiating access and prices. Potential wider uses could result. There would also be greater consistency within and across government policies.

FRST funding levels

The FRST funding levels have not kept pace with technology developments for the transfer of research results, nor for either NSDBs or other databases. The means of access envisaged in the FRST contracts are publications, workshops, seminars and

conferences and while useful, are not the primary ways users want to access research results. Users either want direct access to data or in the majority of cases derived products that can be accessed via the web tools that CRIs have developed at their own cost.

Draft Principles

Including the draft Principles in FRST contracts would not reduce the barriers to accessibility of FRST-funded research results that have been identified. There is a fundamental tension in the system which comes as a combination of under-funding of databases and their dissemination (under-funding of some research programmes which produce data, the partial funding of NSDBs and the non-funding of maintenance and dissemination of non NSDBs), the consequent need for CRIs to gain revenue to make up the shortfall and the lack of understanding by users of who owns what data. Addressing these issues would achieve more for accessibility of FRST-funded data and information, than by FRST only adopting the draft principles.

There is however, a case for changing the FRST contract provisions along the lines of the draft access Principles to ensure consistency with the Ministerial Operating Framework. An enhancement of the principles to exempt all environmental, social and some industry good data and information from Exception 1, should also be considered.

6 Recommendations

It is recommended that;

6.1 Draft access principles

6.1.1 The draft access principles (enhanced to exclude environmental, social and some industry public good data and information from Exception 1, but making it clear where wide access is not appropriate-Exception 2) be included in FRST contract provisions to bring them in line with the Ministerial Operating Framework.

Note that this alone will not address the access issues identified by this evaluation and that other actions will also be needed to address the access issues.

6.2 Policy framework for databases

6.2.1 A policy framework be developed setting out governments ongoing outcome objectives for databases with ring-fenced and stable funding for;

- Nationally Significant Databases (NSDBs)
- The inclusion of other databases not currently NSDBs (including some DSIR legacy data, and data and information collected as part of FRST-funded research programmes)
- The maintenance of underlying data and models that support decision tools
- Data and information held by CRIs that has been funded by third parties but which has wide public and industry good value
- The development of web-based tools for transfer of data and information

6.2.2 This would include;

- Identification of key data, databases and decision tools in the environmental, social and industry public good areas and an assessment of the adequacy of their funding levels, based on their optimal use and national significance
- Development of a revised set of criteria for assessing national significance which should be based on the wide benefit for New Zealand that much of the data and derived products have and identification of where wide access is not appropriate
- Where government accepts responsibility for NSDBs there should be ring fenced and full funding of data collection and updating, quality assurance, database management including digitising and curation for collections, and the development of web-based tools for easy access to the data and information
- Consideration of the relative responsibilities of FRST, government departments, local government and other players and include what will be funded and the rights of access

Such an approach is essential if New Zealand is to have ready access to the results of its public good investment over many years. The value of data, databases and decision tools in New Zealand is very high, due to the wide public good and industry public good benefits. The cost of these recommendations could be in the order of 5% per annum over 5 years of current FRST funding to each of GNS, NIWA, and Landcare Research in particular, depending on the state of current data, databases and decision

tools and projected ongoing costs of maintenance, development and dissemination. This would address the flat funding, under-funding and multiple funding issues that result in barriers to those seeking access.

6.3 Sector access

6.3.1 FRST note the value of EnviroLink for the transfer of research results it funds and for adding value to it, noting that financial support from user agencies and industry groups play an important role in the transfer process as well since it ensures user uptake. These programmes are providing much needed information transfer and analysis for local authorities where resources are tight

6.3.2 FRST explore with a range of user-funders (e.g. MfE, DOC, MAF/SFF, FAR, Dairy Insight) some additional ways that tools developed out of FRST-funded programmes can be sustainably maintained and upgraded over time e.g. LENZ and other environmental decision tools, agriculture sector calculators

6.3.3 FRST explore with Crown Minerals a way it could co-fund with FRST, the provision of relevant GNS and NIWA research outcomes more quickly, and make the resulting data and information accessible through the Crown Minerals Resources Library and thus enhance its accessibility for exploration purposes. The EQC funding of GNS for GeoNet could form a useful model in this respect.

6.3.4 FRST explore with other government sector agencies and the relevant CRIs (such as MFish and NIWA; Biosecurity NZ/MAF and Crop & Food, HortResearch, AgResearch) whether there is a need for similar arrangement as recommended in 6.3.3 above to be considered for other industry public good data.

6.4 Awareness of what is accessible

6.4.1 FRST and MoRST, with CRIs, undertake a science system-wide project to develop an integrated Science Bibliography of FRST-funded and CRI-funded research outputs, which is tailored for user groups and with appropriate metadata on databases and derived products. It should be in a user-friendly and accessible form, so there can be better understanding of what data and information is available and from whom.

6.4.2 MoRST prepare a clear guide about government policies regarding access to research data and information, explaining how research is funded, by whom and what is owned by CRIs and what they can charge for. Given the confusion found in the course of this evaluation, a short document that is widely available and proactively promoted through established user groups, is essential to addressing the range of user expectations regarding access and its cost.

6.4.3 FRST adopt a more proactive role in raising awareness of availability of primary data and information through its web site, web links to CRI data and information, and through targeted sector activities with user groups

Appendix 1 Terminology

For the purposes of this study FRST has defined:

- **Public good research-** findings that provide the most benefit to New Zealand through wide dissemination to multiple users. This is in contrast to research that will accrue the most benefit to NZ through commercial development, often requiring exclusive IP agreements. Findings from environmental research and social research commonly fall into this “public good” domain. In addition, research findings of relevance to industry may be “public good” if the greatest industry benefit will come from dissemination to multiple users, rather than from exclusive IP agreements
- **Research findings-** include both primary data and more processed findings such as research articles. This study is restricted to codified findings, e.g. databases, images, publications. Research information that is only present as tacit knowledge is not the subject of this study
- **Dissemination-** the activities related to providing access to the primary results of research programmes on an ongoing and sustainable basis. This would include the development of web-based tools for enhance access to research results especially data and derived products
- **Information transfer-** the generic term used by FRST for dissemination of research results through to the uptake by users and includes workshops, seminars, field days and open days. While the more expensive development of web-based tools to aid access by users is included in the definition FRST does not currently fund such activities routinely
- **FRST-funded-**includes research programmes and databases funded by FRST via contracts with providers. It may include some maintenance of databases, measuring devices for data collection and development of web-based tools for some environmental programmes, however not fully nor consistently
- **CRI-funded-**investments by CRIs of retained earnings from the sale of products or services. These include investments in maintenance of databases and the measuring devices that collect data, digitising data and the development of web-based tools to make data more accessible to users

Appendix 2 Interviewees and contacts

Due to the resource constraints, it was not possible to interview representatives from all CRIs or universities, or from private research providers and research associations which receive FRST funding.

General

Robin Falconer- GNS
Ray Wood Scientist- GNS
Angela Henderson- IRL
Rob Murdoch, Murray Poulter, Barry Biggs- NIWA
Richard Gordon, David Cloquet- Landcare Research
Nick Lees- Crop & Food
Stephen Goldson- AgResearch
Charles Daugherty- Victoria University of Wellington
Roy Bickerstaffe- Lincoln University
Richard Bedford- University of Waikato
Mark Lesley- Fonterra
Brian Cox- East Harbour Management Services

Case Studies

LENZ

Daniel Rutledge, Gary Barker- Landcare Research
John Leathwick- ex Landcare Research now NIWA
Theo Stephens- DOC
Kirsty Johnston- Ministry for the Environment

Wheat Calculator

Peter Jamieson- Crop and Food
Derek Wilson- Crop and Food
Tabitha Armour- Foundation for Arable Research

Further information was provided by;
Kathryn McCusker- Sustainable Farming Fund (MAF)

Petroleum and Mineral Exploration

Mike Isaac- GNS
Mark Rattenbury- GNS
Ian Wright- NIWA
Peter Kamp- University of Waikato
Mark Aliprantis- Crown Minerals, MED
Mark Webster- Tag Oil
Mac Beggs- Geosphere Ltd
Ian Brown- IRBrown and Associates
Simon Henderson- Glass Earth Ltd
Simon Eaton- Shell BP Todd

Further information was provided by;
Tony Christie- GNS
John Spittal- LINZ Hydrographer
Laurel Simm- Ministry of Foreign Affairs and Trade (Legal Division)

Flood Research

Barry Biggs, Charles Pearson, Ross Wood- NIWA
Brin Williman- Marlborough District Council
Graham Doull, Marianne Watson- Horizons Manawatu
Peter Blackwood- Environment Bay of Plenty

Mike Ayde, Gary Clode- Hawkes Bay Regional Council
Tony Oliver- Environment Canterbury
Terry Archer- Buller District Council
Terry Day- TJ Day and Associates Ltd
David Hamilton- David Hamilton and Associates Ltd
Trecia Smith- Ministry for the Environment

Further information was provided by;
Brent Cowie-Cowie Resource Management Ltd

Further information

Further general policy and database information was also provided by;

Allan Hewitt Landcare Research
Jerry Cooper- Landcare Research
Ed Butler- CCMAU
Adrian Wimmers- CCMAU
Eric Pyle- MoRST
Richard Elwin- MoRST
Seth Campbell- FRST
Andrea Knox- FRST (contact for this evaluation)

Appendix 3 Interview Questions

The following questions were posed in the *case study* interviews;

- Which components of the research and dissemination of findings/data were FRST-funded?
- Where do viewpoints of users and research organisations diverge, and why?
- What were the factors that contributed to the satisfactory or unsatisfactory resolution?
- What could the FRST have done to improve accessibility of the data/findings, or what could the FRST do in future?
- What would be the likely cost of any suggested Foundation actions to improve accessibility?
- Over and above the research funding, what costs have been incurred in successful instances of making data/findings accessible?
- What have been the positive and negative consequences for New Zealand of publicly accessible data/findings, and of non-accessible data/findings?
- Considering both financial and non financial aspects, how do the costs and benefits of public accessibility compare?

The following questions were posed in the *general* interviews;

- To what extent are FRST-funded public good data/findings in their area accessible, and have any problems in gaining or offering access been encountered?
- Do different collections of data/findings have different accessibility needs, and is this related to subject area, user or data/finding type (e.g. large ongoing data collections versus small discrete sets of data/findings)?
- What are the barriers to accessibility and how much of a problem does each barrier pose?
- What factors have enabled successful generation of accessibility?
- How might accessibility of public good data/findings be improved?
- What would be the positive and negative effects of a draft set of the Foundation access principles and do they suggest any changes to them?
- What would be the likely costs to research organisations and users resulting from the suggested FRST principles on accessibility?
- What costs have been incurred in successful instances of making data/findings accessible?
- What have been the positive and negative consequences for New Zealand of publicly accessible data/findings, and of non-accessible data/findings?
- Considering both financial and non financial aspects, how do the costs and benefits of public accessibility compare?

Appendix 4 Case study criteria and case studies

The following situations were covered;

- Instances in which making data/findings publicly available may have been in conflict with benefit to the research organisation
- Instances in which FRST funding contributed to the generation of data/findings, but where further work that made them more useful for users, was funded through other, non FRST sources
- Instances in which co-funding partners' IP agreements had an effect on the accessibility of data/findings
- Instances in which data/findings have and have not been stored in an accessible form
- Instances in which making the data/findings accessible required significant and costly processing
- A range of areas of public good research, including: environmental research, social research¹⁹, and industry good research

The case studies were;

- *LENZ-Land Environment New Zealand* is a derived integrated database and environmental classification for making a wide range of conservation and land management decisions based on some FRST-funded data
- *Wheat calculator*- is a management decision support tool built from a wheat crop simulation model that evolved from publicly funded basic crop physiology science to manage crop productivity and nutrient inputs
- *Petroleum and Minerals Exploration research*-includes data and information that informs processes that determine where oil, gas and minerals will be found including physical and chemical analyses, logs of drill holes and seismic surveys, maps, cross-sections or models, commonly in digital form, and reference collections of fossils and rocks both land-based
- *Flood research*-includes FRST-funded research and databases including river flow and climate data used for flood risk management, disaster preparedness and response and understanding climate variability and change

¹⁹ In one general interview that covered social research there were no unique access issues raised, beyond the handling of personal or identifiable data, where rigorous protocols are used by social researchers.

Appendix 5 Nationally Significant Databases

supported by FRST

No.	Name	Org
1	National Earthquake Information Database	GNS
2	New Zealand Fossil Record File	GNS
3	New Zealand National Paleontological Collection and Database	GNS
4	Research Herbarium for Plant Biosystematics	LCR
5	New Zealand Arthropod Collection, New Zealand Nematode Collection and Specimen and Information Database	LCR
6	New Zealand Fungal Herbarium and Associated Database	LCR
7	International Collection of Micro-organisms from Plants and Associated Databases	LCR
8	Land Resource Information System (includes New Zealand Land Resource Inventory, National Soils Database and Digital Soil Map Database)	LCR
9	Ngā Tipu Whakaoranga-Ethnobotany Database and New Zealand Flax and Living Plant Collections	LCR
10	Regional Geological Map Archive and Database	GNS
11	National Petrology Reference Collection and PET Database	GNS
12	New Zealand Volcano Database	GNS
13	New Zealand Geomagnetic Database	GNS
14	Crop Germplasm Resources Unit	CRF
15	National Collections of Fruit Crop Germplasm	HRT
16	New Zealand Freshwater Fish Database	NIW
17	NIWA Marine Benthic Biology Collection	NIW
18	National Climate Database	NIW
19	National Forest Herbarium and Database	FRI
20	Margot Forde Germplasm Centre	AGR
21	National Groundwater Monitoring Programme	GNS
22	National Vegetation Survey Database	LCR
23	Solar UV-B Radiation Database	IRL
24	Water Resources Archive	NIW
25	Cawthron Microalgae Collection	CAW
26	Possum EST database	AGR

Appendix 6 CCMAU Access policy

Refer to <http://www.ccm.au.govt.nz/pdfs/key-document-databasepolicy.pdf> for the full policy framework

REVISED POLICY FRAMEWORK FOR NATIONAL DATABASES AND COLLECTIONS OWNED BY CRIs

ACCESS

1. CRIs will provide access to the data or information that forms the "primary building blocks" of National CRI Databases, and allow non-destructive, physical access to material in National CRI Collections **except** where that access is not to the benefit of New Zealand.
2. National CRI Databases and Collections include:
 - (i) ALL PGSF-Funded Nationally Important Databases and Collections (as identified by the Foundation for Research, Science and Technology) that are owned by CRIs, and
 - (ii) other databases and collections that the CRI deem to be of national importance (and so covered by this policy framework).
3. In providing access to National CRI Databases and Collections, CRIs are able to charge the full cost of data retrieval and of providing physical access to collection material. The costs of collection, archiving and maintenance, of data or material in the National CRI Databases and Collections, may be recovered only to the extent that they have not been paid for from public good funding.
4. Information or data supplied by the CRI, may be protected by copyright so that the right to further copy the information, and acknowledgement as to source, is subject to normal conventions.
5. A CRI may request that users obtain the written consent of the CRI where data or material provided from a National CRI Database or Collection is subsequently to be released, sold or otherwise traded. Such consent will not be unreasonably held. A CRI may negotiate a copyright, royalty or licence fee where data or material is to be traded by the user.
6. In considering cases where access to databases and/or collections would be denied or restricted the CRI should take into account:
 - the CRI Act (1992) including Section 5 (Principles of operation)
 - the Official Information Act (1982)
 - commercial legislation, such as the Commerce Act (noting that Section 36 prevents a firm from using a dominant market place position to stifle competition)
 - the policies of the Foundation for Research, Science and Technology on funding of databases, and on intellectual property from the PGSF
 - emergent policy and trends in New Zealand and internationally on increased availability of public information (for example "Draft Policy Framework for Government Held Information" SSC 1996) and for integrating databases and information (for example, ERIN - the Australian Environmental Resource Information Network).

7. CRIs must advise the Ministers of any dispute regarding the terms of access and use of any National CRI Database or Collection. The CRI will make all reasonable attempt to settle the dispute by full and frank discussion with the disputing party. In the absence of any agreement within 30 days of notification of a dispute, the matter will be referred to the Ministers. The Ministers will appoint a person with relevant expertise to resolve the matter. This person will recommend to the Ministers the actions required to resolve the dispute. The decision of the Ministers will bind the CRI with regards to resolving the dispute.
8. CRIs must include in their annual Statement of Corporate Intent
 - their policy for access to their National CRI Databases and Collections, and
 - a list of the databases and collections that the policy applies to. If applicable, the list should indicate which are Nationally significant PGSF Databases and Collections.

MAINTENANCE

9. A CRI must immediately notify the Ministers if it believes it can not reasonably maintain the integrity and quality of any National CRI Database or Collection.
10. A CRI must include in its SCI policies dealing with maintenance of National CRI Databases and Collections.

DISPOSAL

11. A CRI can not dispose of any National CRI Database or Collection without prior written consent of the Ministers.
12. In disposing of any database or collection the CRI should have regard to the CRI Act (particularly Section 5) and the Archives Act (1957).

Appendix 7 Background Literature on Public Accessibility

New Zealand:

1. Ministerial Science Task Group (1991) *Crown Research Institutes-Research Companies for New Zealand-The report of the Ministerial Science Task Group*
2. FRST (1993) *Nationally Significant Public Good Science Fund Databases and Collections*
3. CCMAU (1996) *Revised policies for access, maintenance and disposal of national databases and collections held by Crown Research Institutes* prepared by Ian Whitehouse Landcare Research
4. MoRST (1998) *Science Database and Collection Issues: Oceans of data, vulnerable collections and terabytes of power-a scoping study* prepared by Ian Whitehouse Landcare Research
5. FRST (2004) *Summary information from an "audit" of nationally important databases and collections, 2003. Draft Report*
6. MoRST (2004) *Review of environmental science data within Landcare Research and NIWA* prepared by Julian Carver, Seradigm Knowledge Management.
7. FRST (2005) *Portfolio Evaluations 2001-2005 Consolidated Evaluation Report*
8. MoRST (2005) *Research data saving and sharing discussion paper* prepared by Julian Carver, Seradigm Knowledge Management
9. MoRST (2005) *Research e-data saving and sharing workshop summary. Proceedings of a workshop held in Wellington on 15 June 2005* prepared by Julian Carver, Seradigm Ltd and Carl Davidson, No Doubt Research
10. National Library of NZ (2005) *Institutional repositories for the research sector: feasibility study* prepared by John Rankin, Affinity
11. MfE (2006) *The science and communication needs of flood management practitioners* prepared by Dr Brent, Cowie Environmental Management Services Ltd

International:

12. JCSR (2003) *E-Science Curation Report. Data curation for e-science in the UK: an audit to establish requirements for future curation and provision.*
Available:
http://www.jisc.ac.uk/uploaded_documents/e-ScienceReportFinal.pdf
Appendices available:
http://www.jisc.ac.uk/uploaded_documents/e-scienceAppendices.pdf
13. Arzberger *et al* (2004) Promoting access to public research data for scientific, economic, and social development. *Data Science Journal* **3**: 135-152
14. OECD Committee for Scientific and Technological Policy (2004) Science, Technology and Innovation for the 21st Century. *Meeting of the OECD*

Committee for Scientific and Technological Policy at Ministerial Level, 29-30 January 2004 - Final Communiqué.

Available:

http://www.oecd.org/document/15/0,2340,en_2649_34487_25998799_1_1_1_1,00.html

15 Biotechnology and Biological Sciences Research Council et al (2005) *Large-scale data sharing in the life sciences-data standards, incentives, barriers and funding models-The Joint Standards Study* prepared by the Digital Archiving Consultancy (DAC), The Bioinformatics Research Centre, University of Glasgow (BRC), The National e-Science Centre (NeSC)

16 Medical Research Council UK *Statement on data sharing and preservation policy* at;

<http://www.mrc.ac.uk/PolicyGuidance/EthicsAndGovernance/DataSharing/PolicyonDataSharingandPreservation/MRC002551>