

**IN THE HIGH COURT OF NEW ZEALAND  
AUCKLAND REGISTRY**

**CIV-2010-404-005092  
[2012] NZHC 2297**

UNDER the Judicature Amendment Act 1972 and  
Part 30 of the High Court Rules

BETWEEN NEW ZEALAND CLIMATE SCIENCE  
EDUCATION TRUST  
Plaintiff

AND NATIONAL INSTITUTE OF WATER  
AND ATMOSPHERIC RESEARCH  
LIMITED  
Defendant

Hearing: 16-19 July 2012

Appearances: T Sissons and BE Brill for Plaintiff  
JBM Smith and GM Richards for Defendant

Judgment: 7 September 2012

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**JUDGMENT OF VENNING J**

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**This judgment was delivered by me on 7 September 2012 at 11.00 am, pursuant to Rule 11.5 of the High Court Rules.**

**Registrar/Deputy Registrar**

**Date.....**

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### Introduction

[1] New Zealand Climate Science Education Trust (the Trust) challenges a number of decisions made, and consequent actions taken by, National Institute of Water and Atmospheric Research Limited (NIWA).

[2] The Trust and its members are interested in the issue of climate change in New Zealand. NIWA is a Crown Research Institute established for the purposes of undertaking research pursuant to the Crown Research Institutes Act 1992 (the CRI Act). Its primary area of research is in relation to environmental matters. It also advises the Crown on scientific issues related to climate change.

[3] Since 1992 NIWA has maintained a national climate data base. The data base comprises climate information including temperature, rainfall, wind and other climate parameters. In about 1999 NIWA published a statistical time series of nationally averaged annual mean surface temperature trends experienced in New Zealand since 1853 which it calls the Seven Station Temperature Series (the 7SS).

[4] The 7SS indicates that New Zealand experienced a warming trend of approximately 0.9 degrees Centigrade (C) from 1909 to 2009.

[5] After publication of the 7SS the New Zealand Climate Science Coalition (the Coalition), a society associated with the Trust, publicly criticised the accuracy of the 7SS. In response NIWA published an 11 Station Temperature Series (the 11SS) in December 2009. The 11SS comprises a spread sheet and graph showing unadjusted temperatures recorded at a diverse number of weather stations during the period 1931 – 55, 11 stations during the period 1955 – 94, and 10 stations after 1994.

[6] Also, on 16 December 2010, NIWA published a review of the 7SS covering the period from 1909 to 2008 (the review).

[7] The 11SS and the review support the conclusion that can be drawn from the 7SS that New Zealand's climate has experienced a warming trend over the 100 years to 2009.

[8] The Trust does not accept the validity of the 7SS, 11SS and the review, nor the conclusion that can be drawn from them that New Zealand's climate has experienced a warming trend. It seeks to challenge them by judicial review.

### **Procedural matters**

[9] The proceedings were issued on 5 July 2010. There were a number of interlocutory steps, particularly focused on discovery, even though this is an application for judicial review. Both the original statement of claim and the first amended statement of claim were prolix. The case was allocated a fixture for up to five days in the week commencing 16 July 2012.

[10] At a late stage the Trust instructed Mr Sissons as counsel. At the outset of the hearing on 16 July Mr Sissons sought leave to file a second amended statement of claim. I granted leave because the proposed second amended statement of claim substantially revised and refocused the former pleadings. I also granted NIWA a day to refocus its response at the end of the Trust's case. I am grateful to both Mr Sissons and Mr Smith for the assistance they have given the Court in addressing the refocused claim.

### **The decisions/actions under challenge**

[11] The Trust now challenges the following three decisions/actions of NIWA:

- (a) the decision to publish the adjusted temperature data 7SS without (the Trust says) applying the recognised scientific opinion of Rhoades and Salinger, 1993 (the 1999 decision); and
- (b) the decision to publish the 11SS which (the Trust says) contained obvious deficiencies in its data (the 2009 decision); and
- (c) the decision to publish the review of the 7SS covering the period 1909 to 2008 which (the Trust says) departed from recognised scientific opinion (the review decision).

### **The evidence**

[12] To support its application for judicial review the Trust has filed affidavits by Professor Carter, Mr Dunleavy and Mr Dedekind.

[13] Professor Carter holds a PhD in palaeontology. He is a co-founder of the Coalition. Since 2000 he has been an adjunct research professor in the Marine Geophysical Laboratory and School of Earth Sciences at James Cook University in Townsville, Australia. He has published a large number of papers and a scientific journal related to the reconstruction of ancient environments and climate change.

Since the mid 1990's Dr Carter's research has focused on climatic and oceanographic conditions in the South Island of New Zealand.

[14] Mr Dunleavy is a founding member of the Trust and Secretary of the Coalition. He is a retired journalist and has been actively involved in challenges to NIWA's version of the New Zealand temperature records.

[15] Mr Dedekind is an information technology professional with a background in computer modelling. He joined the Coalition in November 2008 and is a co-author of the Coalition's 2009 paper "Are We Feeling Warmer Yet?" He also participated in the analysis undertaken for an audit carried out by the Coalition of NIWA's findings and took final responsibility for the calculations within the audit.

[16] In response NIWA has filed affidavits by Dr Wratt, Mr Trenberth and Dr Mullan. Dr Wratt holds a PhD in atmospheric physics and is the Chief Scientist at NIWA. He is also the director of the New Zealand Climate Change Centre. All of the New Zealand Crown Research Institutes and three New Zealand Universities are members of the Centre.

[17] Dr Trenberth is a Senior Scientist in the Climate Analysis Section at the National Centre for Atmospheric Research in Boulder, Colorado.

[18] Dr Mullan has been a Principal Scientist (Climate) at NIWA since October 2004.

## **Issues**

[19] The following issues arise in this case:

- (a) the extent to which the actions of NIWA are amenable to judicial review;
- (b) the standard of review;

- (c) if the decisions are reviewable, whether, in respect of the 1999 and review decisions, NIWA acted in breach of statutory duty and/or failed to consider mandatory relevant considerations;
- (d) if the decisions are reviewable, whether, in respect of all decisions, NIWA acted unreasonably or under a mistake(s) of fact?

### **Are NIWA's actions amenable to judicial review?**

[20] To determine whether NIWA's actions are amenable to review, it is necessary to consider the statutory context in which it operates. NIWA is a Crown Research Institute (CRI) established under the CRI Act. It is a Crown entity company pursuant to the Crown Entities Act 2004 (CE Act) incorporated under the Companies Act 1993 and wholly owned by the Crown.<sup>1</sup>

[21] NIWA's purposes and principles of operation, like that of other CRIs, are set out in ss 4 and 5 of the CRI Act:

#### **4 Purpose of Crown Research Institutes**

The purpose of every Crown Research Institute is to undertake research.

#### **5 Principles of operation**

- (1) Every Crown Research Institute shall, in fulfilling its purpose, operate in accordance with the following principles:
  - (a) That research undertaken by a Crown Research Institute should be undertaken for the benefit of New Zealand:
  - (b) That a Crown Research Institute should pursue excellence in all its activities:
  - (c) That in carrying out its activities a Crown Research Institute should comply with any applicable ethical standards:
  - (d) That a Crown Research Institute should promote and facilitate the application of—
    - (i) The results of research; and
    - (ii) Technological developments:

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<sup>1</sup> Crown Entities Act 2004, s 7(1)(b) and Schedule 2 to the Act.

- (e) That a Crown Research Institute should be a good employer [as required by section 118 of the Crown Entities Act 2004]:
  - (f) That a Crown Research Institute should be an organisation that exhibits a sense of social responsibility by having regard to the interests of the community in which it operates and by endeavouring to accommodate or encourage those interests when able to do so.
- (2) Every Crown Research Institute shall, in fulfilling its purpose, operate in a financially responsible manner so that it maintains its financial viability.

[22] NIWA has shareholding Ministers. Their role is set out in s 88 of the CE Act:<sup>2</sup>

**88 Shareholding Ministers' role**

- (1) The role of the shareholding Ministers is to oversee and manage the Crown's interests in, and relationship with, a Crown entity company and to exercise any statutory responsibilities given to the shareholding Ministers, including [various] functions and powers—
- ...
- (2) The shareholding Ministers may give directions to the company only if expressly authorised to do so by this Act or another Act. ...

[23] The further powers of the shareholding Ministers are set out in s 15 of the CRI Act, and include directing the Board as to the contents of its statement of corporate intent and determining the amount of dividend payable in respect of any financial years.

[24] A shareholding Minister may only appoint a person as a director of CRI if, in the shareholding Minister's opinion, that person has the appropriate knowledge, skills, and experience to ensure the sound management of the Crown Entity company and to assist the company to achieve its objectives and perform its functions.<sup>3</sup>

[25] NIWA's board of directors is required to manage the business and affairs of NIWA and, subject to the CRI Act and CE Act, has all powers necessary to do so.<sup>4</sup>

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<sup>2</sup> Crown Research Institutes Act 1992, s 6(1).

<sup>3</sup> Crown Entities Act 2004, s 89(2)(a); Crown Research Institutes Act 1992, s 7(2).

<sup>4</sup> Crown Research Institutes Act 1992, s 86 and the Companies Act 1993, s 128(1). Section 95 sets out the duty to comply with Crown Entities Act and Crown Research Institutes Act. The duty is owed to the responsible Minister and the company.

Section 7(5) of CRI Act provides that directors must exercise powers in a manner consistent with the purposes and principles in s 5, and in accordance with the CRI's statement of corporate intent.

[26] The Board of Directors is accountable to the shareholding Ministers in the manner set out in Part 3 of the CRI Act.<sup>5</sup> The Board is required to work with the shareholding Ministers to produce an annual statement of corporate intent, setting out, among other things, the objectives of the group; the nature and scope of the activities to be undertaken; accounting and financial policies; performance targets and other measures by which the performance of the group may be judged in relation to its objectives. Any other relevant information may be sought by shareholding Ministers from the CRI.<sup>6</sup> The CRI is required to provide shareholding Ministers with annual and half yearly reports.<sup>7</sup> The responsible Minister is then required to lay before the House of Representatives statements of corporate intent, annual reports and relevant financial statements.<sup>8</sup>

[27] In summary, NIWA is a public body established by statute, with its shares held by Ministers who are both responsible to the House of Representatives and ultimately to the electorate. NIWA carries out its research functions “for the benefit of New Zealand”.<sup>9</sup> Because the findings of research undertaken by NIWA may be used in developing Government policy, NIWA's actions have the potential to adversely affect the rights and liabilities of private individuals.

#### *The Mercury Energy decision*

[28] In *Mercury Energy Ltd v Electricity Corporation of New Zealand*<sup>10</sup> the Privy Council considered whether the decisions of Electricity Corporation of New Zealand, as a State Owned Enterprise (SOE), were amenable to judicial review. The Court of Appeal had held that judicial review was not available primarily because the

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<sup>5</sup> Crown Research Institutes Act 1992, s 7(4).

<sup>6</sup> Crown Research Institutes Act 1992, s 20.

<sup>7</sup> Crown Research Institutes Act 1992, ss 17 and 18.

<sup>8</sup> Crown Research Institutes Act 1992, s 19.

<sup>9</sup> Crown Research Institutes Act 1992, s 5.

<sup>10</sup> *Mercury Energy Ltd v Electricity Corporation of New Zealand* [1994] 2 NZLR 385.



decision to terminate had been a contractual right.<sup>11</sup> The Privy Council held that the decisions of an SOE were, in principle, amenable to review both under the Judicature Amendment Act 1972 and under the common law.<sup>12</sup>

A state-owned enterprise is a public body; its shares are held by ministers who are responsible to the House of Representatives and accountable to the electorate. The Corporation carries on its business in the interests of the public. Decisions made in the public interest by the Corporation, a body established by statute, may adversely affect the rights and liabilities of private individuals without affording them any redress. Their Lordships take the view that in these circumstances the decisions of the Corporation are in principle amenable to judicial review both under the Act of 1972 as amended and under the common law.

[29] The Privy Council made it clear that the focus must be on the nature of the decision under challenge. Their Lordships went on to conclude that, in the circumstances of that particular case, the decision to enter into or determine a commercial contract to supply goods or services should not be subject to judicial review in the absence of fraud, corruption or bad faith.<sup>13</sup>

[30] Mr Smith submitted that the attempt to judicially review NIWA's scientific functions carried out as a Crown Research Institute was analogous to the attempt to judicially review the commercial decisions of *Mercury Energy* as an SOE. He submitted that judicial review should only be available where the plaintiff, in this case the Trust, could demonstrate fraud, corruption or bad faith. He submitted that could not be made out in this case so that judicial review was not available to the plaintiff.

[31] In response, Mr Sissons submitted there were important differences between the core functions of an SOE as compared to a CRI and noted that in the *Mercury Energy* case Mercury Energy had contractual rights, so had an alternative means by which to assert its rights. The Trust has no such alternative means.

[32] There are a number of similarities between the statutory provisions establishing SOEs and CRIs. Both have a degree of independent corporate status but

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<sup>11</sup> *Auckland Electric Power Board v Electricity Corporation of New Zealand Ltd* [1994] 1 NZLR 551 (CA).

<sup>12</sup> At 388.

<sup>13</sup> At 391.

with the respective legislation providing for Ministerial and Parliamentary accountability in respect of their activities. Further, the specific legislation governing each body sets out the broad purposes they must follow. The primary purpose of an SOE is to “operate as a successful business”. To that end an SOE must be “as profitable and efficient as comparable businesses not owned by the Crown”, a good employer, and “an organisation that exhibits a sense of social responsibility”.<sup>14</sup> The purpose of a CRI is to undertake research for the benefit of New Zealand and in doing so it must pursue excellence, follow applicable ethical standards, be a good employer and exhibit a sense of social responsibility.<sup>15</sup> However, it is also obliged to operate in a financially responsible manner.<sup>16</sup>

[33] Despite the similarities in their legislative background, whether judicial review is available will also be influenced by the nature of the decisions in issue. The decisions of NIWA which the Trust seeks to impugn do not come within the category of commercial decisions identified by the Privy Council in *Mercury Energy* as unlikely to ever be the subject of judicial review in the absence of fraud, corruption or bad faith. While CRIs are expected to act commercially to the extent of operating in a financially responsible manner, the objectives set out in s 5 of the CRI Act and the primary purpose described in s 4, are of a public, rather than a commercial, nature. NIWA is publicly funded. Its activities are predominantly public services. The factual circumstances of this case differ from the *Mercury Energy* case in important respects. In the *Mercury Energy* case the Court was being invited to review a commercial decision. The decisions of NIWA which the Trust seeks to review are not, in my judgment, able to be categorised as equivalent to such a commercial decision.

[34] Further, as Mr Sissons submitted it is important that judicial review be available to ensure a remedy of some kind when unlawful decisions or actions are undertaken by a public body. In *Mercury Energy* the need for judicial review to be available was tempered because it was open to the Auckland Electric Power Board to pursue the private remedies it had under contract. There is no similar parallel in the

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<sup>14</sup> State-Owned Enterprises Act 1986, s 4(1).

<sup>15</sup> Crown Research Institutes Act 1992, ss 4 and 5.

<sup>16</sup> Crown Research Institutes Act 1992, s 5(2).

present case. Although private individuals and corporate bodies could be affected by NIWA's decisions, in the absence of judicial review, such parties could be left without redress.

[35] I conclude that, in principle, the remedy of judicial review is potentially available to the Trust in relation to the decisions.

### **The standard of review**

[36] However, the points Mr Smith made are also relevant to the next issue, which is the appropriate standard of review. The intensity or ambit of judicial review will depend on the nature of the decision in issue. In determining the nature of the decision it is appropriate to consider the nature of the public body, the particular function being performed, the context within which that function is being performed and what is said to have gone wrong.<sup>17</sup> For example, as noted in *Mercury Energy* the Privy Council considered that in the context of a commercial decision by an SOE, the applicant would need to show fraud, corruption or bad faith.

[37] On this issue, the statutory context that NIWA operates under (as set out above) is clearly relevant, particularly the obligations under s 5.

[38] It is also relevant to consider the particular function NIWA was performing in publishing the 7SS, the 11SS and in carrying out the review. Prior to the second amended statement of claim the Trust alleged, and Mr Dunleavy deposed, that NIWA had sole responsibility for the preparation and maintenance of the New Zealand temperature record. However, it has consistently been NIWA's position that, while it has maintained a national climate database and has published the 7SS since 1992, it has not designated that as an official New Zealand temperature record. Dr Wratt explains that the reference to "the New Zealand temperature record" on NIWA's website is used in a generic way to encompass a multitude of pieces of information which, together, comprise a record of New Zealand's temperature.

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<sup>17</sup> *Lab Tests Auckland Ltd v Auckland District Health Board* [2008] NZCA 385; [2009] 1 NZLR 776 at [85].

[39] In the second amended statement of claim the Trust does not allege NIWA has designated an official New Zealand temperature record but alleges that the 7SS is used by the New Zealand Government as a record of historical temperature trends in New Zealand and has important public consequences, including providing the historical base for Government policy and judicial decisions relating to climate change within New Zealand.

[40] NIWA accepts that the New Zealand Government has had, and is likely to have, regard (to an unknown extent) to the 7SS just as entities in the private sector will also do so. However, in making decisions relating to climate change, both public and private sector entities also have access to, and are likely to have regard to, other temperature information held by NIWA, including the 11SS and independent information from ship measurements of sea surface temperatures and marine night-time air temperatures over the oceans around New Zealand. In summary, NIWA contends that the Trust essentially overstates the extent to which NIWA's activities have direct public consequences.

[41] It is well established that the Court, in considering an application for judicial review, will be cautious about interfering with decisions made by a specialist body acting within its own sphere of expertise. In *Lab Tests Auckland Ltd v Auckland District Health Board* Arnold and Ellen France JJ in the Court of Appeal considered the Court was not well placed on a judicial review application:<sup>18</sup>

to assess ... the medical, economic and other complexities raised by an evaluation process such as that undertaken in the present case.

[42] In *Z v Dental Complaints Assessment Committee* the Supreme Court accepted that the fact that lawfulness “turn[ed] on expert judgment” suggested that a less searching review was appropriate.<sup>19</sup>

[43] In *New Zealand Public Service Association Inc v Hamilton City Council* Hammond J accepted that a less intensive review can be appropriate for a number of reasons. It may arise from a:<sup>20</sup>

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<sup>18</sup> Above n 17 at [340].

<sup>19</sup> *Z v Dental Complaints Assessment Committee* [2008] NZSC 55, [2009] 1 NZLR 1 at [139].

<sup>20</sup> *New Zealand Public Service Association Inc v Hamilton City Council* [1997] 1 NZLR 30 (HC) at 35.

democratic imperative; (that is, the deciders derive authority from an electoral mandate, to which they are accountable); secondly, a constitutional imperative, (that government, not Courts, decides fundamental policy); and thirdly, an imperative that Courts in many, if not most areas, lack the relevant expertise to make such assessments.

[44] The last feature is particularly relevant where, as in this context, the Trust's challenge is based on what it defines in its pleadings as "recognised scientific opinion". A less intensive review is particularly apposite where the Court is not in a position to definitively adjudicate on scientific opinions. The Trust defines "recognised scientific opinion" as established scientific opinions and methods described in internationally recognised research journals. NIWA does not accept there is any such obligation, a matter to which I return shortly.<sup>21</sup>

[45] I consider this Court should be cautious about interfering with decisions made and conclusions drawn by a specialist body, such as NIWA, acting within its own sphere of expertise. In such circumstances a less intensive or, to put it another way, a more tolerant review is appropriate.

[46] There is a further point. At times the witnesses have identified a difference of opinion about scientific methods applicable to climatology. There are a number of examples where the Court stated its reluctance to adjudicate on matters of scientific debate. In *SmithKline Beecham (New Zealand) Ltd v Minister of Health* Ronald Young J said:<sup>22</sup>

This Court's function is not to rule on the science. The important point is that Medsafe, MAAC and Dr Boyd have considered all the Plaintiffs' scientific propositions and have a credible view of the science by relevantly qualified scientists. They have considered and rejected on scientific grounds the Plaintiffs' views on safety and efficacy and related matters.

[47] Unless the decision maker has followed a clearly improper process, the Court will be reluctant to adjudicate on matters of science and substitute its own inexperienced view of the science if there is a tenable expert opinion: *R (Campaign to End All*

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<sup>21</sup> See [79], below.

<sup>22</sup> *SmithKline Beecham (New Zealand) Ltd v Minister of Health* HC Wellington CP49/02, 15 May 2002 at [80].

*Animal Experiments) v Secretary of State for the Home Department;*<sup>23</sup> *Mothers Against Genetic Engineering Inc v Minister for the Environment.*<sup>24</sup>

[48] I consider that unless the Trust can point to some defect in NIWA's decision-making process or show that the decision was clearly wrong in principle or in law, this Court will not intervene. This Court should not seek to determine or resolve scientific questions demanding the evaluation of contentious expert opinion.

*The expert evidence in this case*

[49] That raises a related issue, concerning a significant part of the evidence presented to the Court on behalf of the Trust.

[50] NIWA objects to much of the evidence of Mr Dunleavy and Mr Dedekind in support of the Trust's case. Mr Smith submitted that much of Mr Dunleavy's evidence was inadmissible opinion that Mr Dunleavy was not entitled to give because he was not an expert. Mr Smith also submitted that much of Mr Dedekind's evidence fell into the same category.

[51] Section 23 of the Evidence Act 2006 provides that a statement of opinion is not admissible except as provided by ss 24 or 25. Opinion is defined in the Evidence Act at s 4 as: "A statement of opinion that tends to prove or disprove a fact." I accept Mr Smith's submission that there are substantial portions of Mr Dunleavy's original and reply affidavits where he proffers opinions on matters in issue in the proceedings, particularly on scientific practices and the validity of the scientific practices of NIWA. Such evidence could only be admissible under s 24 or s 25. Section 24 is not applicable in the circumstances. Section 25 could only apply if Mr Dunleavy was an expert in the particular area of the science of meteorology and/or climate. He is not. He has no applicable qualifications. His interest in the area does not sufficiently qualify him as an expert. I also accept Mr Smith's further point that Mr Dunleavy's views are not capable of offering substantial help to this Court on the

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<sup>23</sup> *R (Campaign to End All Animal Experiments) v Secretary of State for the Home Department* [2008] EWCA CIV 417.

<sup>24</sup> *Mothers Against Genetic Engineering Inc v Minister for the Environment* HC Auckland CIV-2003-404-673, 7 July 2003 at [246].

issue that it has to determine. To that extent I agree that substantial passages of Mr Dunleavy's evidence are inadmissible.

[52] Further, I note that Mr Dunleavy has, in any event, failed to comply with High Court Rule 9.43, and could not be regarded as an impartial expert. There are passages of his evidence which are objectionable on the grounds that they are submission and not evidence as to factual matters or even opinion. One example will suffice to make the point. At para 15 of his affidavit in reply Mr Dunleavy concludes, after referring to an aspect of Dr Wratt's evidence concerning the peer review:

... This claim has no credibility, and the Court will be invited to draw an adverse inference from the respondent's unhelpful stance. The clear inference is that the reviewer found NIWA's unprecedented in-house methodology to be fatally flawed in some respect.

[53] Similar issues (as to the limited nature of his expertise), apply to the evidence of Mr Dedekind. Although in his affidavit in reply Mr Dedekind purported to comply with r 9.43, Mr Dedekind's expertise is in relation to computer modelling and statistical analysis.

[54] I accept Mr Smith's criticism of Mr Dedekind's evidence to the extent that Mr Dedekind is not an expert in the application of statistical techniques in the field of climate science. Mr Dedekind's general expertise in basic statistical techniques does not extend to any particular specialised experience or qualifications in the specific field of applying statistical techniques in the field of climate science. To that extent, where Mr Dedekind purports to comment or give opinions as to NIWA's application of statistical techniques in those fields, his evidence is of little assistance to the Court.

### **The 1999 decision**

[55] Against that background I turn to consider the Trust's challenge to the three decisions in issue.

[56] The gist of the Trust's complaint in relation to the 1999 decision is that, in compiling the 7SS, NIWA failed to apply "recognised scientific opinion" about neighbour station comparison techniques for New Zealand as provided for in Rhoades and Salinger's 1993 paper: "Adjustment of Temperature and Rainfall Records for Site Changes" published in the *International Journal of Climatology* (referred to hereafter as RS93).<sup>25</sup>

[57] It is necessary to provide some background to this issue. Dr Salinger, a former employee of NIWA, undertook a major research study of past New Zealand climate data for his PhD dissertation, which was completed in January 1981 (the thesis). In the thesis Dr Salinger reviewed the New Zealand Metrological Service temperature archives and identified a number of locations for which good quality, long-term data series were available. He examined the station histories, and developed and applied methods for calculating systematic temperature differences due to site moves and adjusting temperature records to allow for these changes (data homogenisation). From those homogenised records he identified long-term temperature trends in New Zealand. Because the year-to-year rises and falls in temperature were more alike between different locations, Dr Salinger considered only a small number of locations was required to form a robust estimate of the national variations in average temperature. Dr Salinger published sections of his thesis results in a number of international journals.

[58] Later, while working at the Meteorological Service in the 1990s, (and then NIWA from 1992) Dr Salinger collaborated with Dr Rhoades, a statistician from the Department of Scientific and Industrial Research, to further develop methods for homogenising climate records. Their work ultimately led to the publication of RS93.

[59] RS93 provides for the homogenisation of historical temperature records for periods that include known site changes where overlaps were not recorded, but unbroken monthly data from neighbouring stations is available for a period before and after the site change. The paper describes and illustrates a set of statistical

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<sup>25</sup> Rhoades DA and Salinger MJ "Adjustment of Temperature and Rainfall Records for site Changes" (1993) 13 *International Journal of Climatology* 899.



comparison techniques to identify the sign and amplitude of any adjustments which would improve the reliability of the series.

[60] At the same time as collaborating with Dr Rhoades, Dr Salinger was working with Meteorological Service colleagues to further document information on New Zealand sites with long-term climate measurements (Fouhy et al 1992). Using this information, Dr Salinger worked with colleagues from the Meteorological Service to recalculate and update homogenised temperature series and to analyse the homogenised series for variations and long-term trends. This work included the publication of a Meteorological Service report documenting and analysing homogenised temperature series from 21 mainland New Zealand stations and three offshore stations (the 21+3 temperature data), for the period 1920-1990 (Salinger 1992). The Salinger 1992 data set included all seven stations that contribute to the 7SS.

[61] Dr Salinger also published a collaborative work which drew on these studies, in a peer-reviewed international journal (Folland and Salinger 93). He also co-authored a paper about methods of homogenising temperature series, including the RS93 methodology he had developed with Dr Rhoades.

### *The 7SS*

[62] The 7SS is a data set that comprises homogenised temperature series for each of the following seven stations: Auckland, Masterton, Wellington, Nelson, Lincoln, Hokitika and Dunedin. Recordings are taken from a number of sites within those seven stations.

[63] Dr Wratt says that in producing the 7SS it is necessary to make “homogeneity adjustments” to account for movement of measurement sites to warmer or cooler locations, and for other material changes or effects. Because measurement sites were moved from time to time in the past, each homogenised “station” record is actually a composite built from records from near-neighbour sites. The 7SS also contains a national temperature series obtained by combining the anomaly data from the seven separate stations.

[64] Dr Wratt deposes that NIWA's scientists have continued to update the long-term 7SS homogenised data series based on Dr Salinger's 1992 work and the RS93 homogenisation year-by-year, as new data has become available, as part of a larger program of research funded by the Foundation for Research, Science and Technology (FRST). Dr Salinger's collaborative work reconfirmed the 7SS as a useful data set for identifying long-term national trends and year to year variability in temperature.

[65] FRST encouraged CRIs, including NIWA, to publicly disseminate results from their research. As a result, from 1999 onwards, text and graphics about temperature variations and trends across New Zealand and the South-west Pacific have been published in NIWA web pages about climate variability and change. The material includes a plot showing annual anomalies (differences from the long-term average) in the 7SS, and long-term trends in temperature inferred from the annual 7SS data. It is the publication of this material, in reliance on the 7SS, that is identified by the Trust as the 1999 decision.

*Breach of statutory duty*

[66] The plaintiff alleges that, in publishing the 1999 7SS, NIWA breached its statutory obligations including its obligation to pursue excellence.<sup>26</sup> Mr Sissons clarified in submission that the Trust's case on this point is that, by failing to use the RS93 methodology to produce the 7SS, NIWA failed to follow and apply relevant recognised scientific opinion (as defined by the Trust) and, as such, breached its statutory obligations, particularly to pursue excellence.

[67] The first issue is whether the obligation to pursue excellence is an enforceable obligation for present purposes. Mr Sissons suggested the issue was whether the language of the statute supported the enforcement of a duty or not. He posed the questions as: "Is the expression clear enough to be justiciable?"; and "Can the pursuit of excellence be given meaning"? Mr Sissons submitted both questions could be answered affirmatively and noted that the statutory wording was

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<sup>26</sup> Crown Research Institutes Act 1992, s 5(1)(b).

mandatory. Section 5 of the CRI Act requires NIWA to operate in accordance with the principles set out in the section, including to pursue excellence.

[68] While Mr Sissons accepted there would be cases around the margin, he submitted that in a clear case the Court should be able to find a CRI had failed to pursue excellence and that, on the facts of the present case, in failing to apply RS93 to the 7SS, NIWA had clearly failed to do so.

[69] In response, Mr Smith submitted that the provisions of s 5 of the CRI Act are not couched in the language of duty, but rather as “principles of operation”. He submitted that, at most, they were aspirational.

[70] Mr Sissons referred to a number of cases to support his argument. In *Howard v NZ Pastoral Agricultural Research Institute Ltd*<sup>27</sup> the Employment Court considered the effect of the respondent to be a good employer in terms of s 5(e) of the CRI Act. The Employment Court found the dismissal of the appellant in that case to be unjustified on the basis the respondent Research Institute had failed in its good employer obligations under s 5(e) of the CRI Act by failing to consult adequately with her. I do not consider that case to be of particular assistance to consideration of the requirement to pursue excellence. The requirement to be a good employer is a concept well developed and understood in the employment context.

[71] Mr Sissons next referred to and relied on the case of *Police v Keogh*.<sup>28</sup> In that case Chambers J discussed the requirement for CRIs to undertake their research “for the benefit of New Zealand” and to “be an organisation that exhibits a sense of social responsibility ...”.<sup>29</sup> However, that discussion does not specifically address the point at issue in this case and was in the quite different context of whether the ESR was to be treated as separate from the police for the purposes of prosecutorial discovery obligations. The last case Mr Sissons relied on was *Caldwell v Croft Timber Co Ltd*.<sup>30</sup> The plaintiff sued the defendant for exemplary damages alleging negligence, breach of statutory obligations under the Health and Safety in

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<sup>27</sup> *Howard v NZ Pastoral Agricultural Research Institute Ltd* [1999] 2 ERNZ 479 (EC).

<sup>28</sup> *Police v Keogh* [2000] 1 NZLR 736 (HC).

<sup>29</sup> *Ibid*, at [68].

<sup>30</sup> *Caldwell v Croft Timber Co Ltd* [1997] ERNZ 136 (HC).

Employment Act 1992 and breach of fiduciary duty. The Judge noted the Health and Safety in Employment Act contained a positive obligation to promote excellence in health and safety management by employers. Paterson J accepted that that was an identifiable statutory obligation which could be breached. Again however the case turns on its facts and relatively well understood obligations under that Act.

[72] In *Auckland Electric Power Board v Electricity Corporation of New Zealand Ltd*<sup>31</sup> the Power Board argued that the Electricity Corporation breached its statutory duty under s 4 of the SOE Act to act in a “socially responsible” manner in terminating the contract. The Court of Appeal held that the objective in s 4 to act in a “socially responsible” manner was:<sup>32</sup>

... a goal, an end to which efforts are directed. It is not expressed in the language of duty. There is nothing in the section to suggest a statutory intention that particular acts or transactions of an SOE may be isolated and subjected to judicial scrutiny. On the contrary in considering whether an SOE is achieving its objective it is necessary to assess its performance overall and over a period of time.

The Court concluded that the requirement to act in a socially responsible manner was not expressed in the conventional language of obligation. This issue was not directly addressed by the Privy Council.

[73] It could be argued that s 4 of the SOE Act describes what the enterprise ought to be rather than what it ought to do. By contrast, s 5(1)(b) of the CRI Act imposes obligations on NIWA in respect of specified actions. In appropriate circumstances, adopting a suboptimal means to discharge a duty can amount to a reviewable error of law, even in public law areas: *Manukau Urban Maori Authority v Treaty of Waitangi Fisheries Commission*;<sup>33</sup> *Zafirov v Minister of Immigration*.<sup>34</sup>

[74] However, it must be said the requirement or obligation to pursue excellence is general in nature. Excellence itself is a subjective concept not readily susceptible

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<sup>31</sup> *Auckland Electric Power Board v Electricity Corporation of New Zealand Ltd* [1994] 1 NZLR 551 (CA).

<sup>32</sup> At 558.

<sup>33</sup> *Manukau Urban Maori Authority v Treaty of Waitangi Fisheries Commission* HC Auckland CP122/95, 28 November 2003 at [123].

<sup>34</sup> *Zafirov v Minister of Immigration* [2009] NZAR 457 (HC) at [82].

to judicial assessment. In *Lawson v Housing New Zealand*,<sup>35</sup> Williams J described the phrase “that will assist in meeting the Crown’s social objectives by providing housing and related services” as an elusive concept, expressed with a degree of generality and providing “no more than broad guidance”.

[75] Similarly, in *Attorney-General v Daniels*<sup>36</sup> the Court of Appeal considered a statutory duty to provide education that was “not clearly unsuitable”.<sup>37</sup> The Court considered that the “very opaqueness of the proposed standard” negated the judicially enforceable general standard and noted the grave difficulty it presented for judicial supervision.<sup>38</sup>

[76] However, against that, in *Thompson v Treaty of Waitangi Fisheries Commission*<sup>39</sup> the Court of Appeal held that an aspirational element of a deed could still be important and considered in that case that it was incumbent on the Commission to develop a scheme which sought to give real effect to the aspiration.<sup>40</sup>

[77] While the requirement to pursue excellence may be categorised as aspirational, an aspirational objective may therefore nonetheless be important and enforceable. Under s 5, NIWA is required to give effect to the aspiration in the course of its operations. That is really to say no more than that NIWA is required to operate in accordance with the principles set out in s 5 of the CRI Act. I consider there to be some force in Mr Sissons’ submission that, while there may be shades of grey around what may be considered “excellence” in a scientific setting, a complete and obvious failure to pursue excellence would be a breach that this Court could, and should, address. However, given the excellence criteria applies to the area of scientific research, or methodology, for this Court to find NIWA in breach of that aspirational duty, any such breach would need to be clear.

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<sup>35</sup> *Lawson v Housing New Zealand* [1997] 2 NZLR 474.

<sup>36</sup> *Attorney-General v Daniels* [2003] 2 NZLR 742 (CA).

<sup>37</sup> Education Act 1989, s 3.

<sup>38</sup> Above n 36 at [82].

<sup>39</sup> *Thompson v Treaty of Waitangi Fisheries Commission* [2005] 2 NZLR 9 (CA).

<sup>40</sup> At [152]. The relevant deed provided that settlement was “ultimately for the benefit of all Maori” and that proceeds were to be held “on behalf of Maori”. The Court of Appeal observed that these objectives were aspirational in nature, in that there could not “sensibly be an objection to a scheme produced by the Commission that identifiable and direct benefit is not conferred on all those of Maori descent”.

[78] As noted, the Trust contends that, rather than apply the best recognised scientific opinion to produce the 7SS, NIWA applied the thesis. NIWA's position however, is that the methodology relied on to produce the 7SS was in fact derived from the same methodology found in RS93. There is a stark conflict between the parties on this point. It is essentially a factual dispute which does not require the Court to decide which of two tenable scientific opinions should be preferred.

[79] A further preliminary point arises. The Trust's argument on this point depends on this Court finding that NIWA departed from "best recognised scientific opinion". It defines "recognised scientific opinion" as relevant established scientific opinions and methods described in internationally recognised research journals. In Dr Carter's opinion, RS93 is the definitive paper for statistical adjustments to offset the effects of site changes in New Zealand conditions. It is implicit in his evidence that failure to apply that is a failure to comply with recognised scientific opinion.

[80] NIWA does not accept that there is such a concept as an "officially recognised scientific opinion". Dr Wratt accepts that the science community has well developed processes for addressing debates about scientific methods and interpretation through scientific conferences, and publications in the scientific literature. Dr Wratt does not consider however that there is one absolutely standard global methodology for calculating adjustments in temperature series to account for site shifts that is immutable. He supports that opinion by reference to Petersen et al (1998) which describes various methodologies. He says, as a matter of logic that must be so otherwise there would be no development. Dr Trenberth is also supportive of Dr Wratt's approach. In his opinion:

There is no one 'correct' way to calculate the specific adjustments which need to be made. ...

[81] Dr Carter, the expert for the Trust, does not directly support the Trust's definition of recognised scientific opinion. His evidence on this point is, in summary:

Applied science in any field must take into account the current state of knowledge as attested by the peer-reviewed literature. Any departures from established knowledge or authority must be noted and explained. If one

disagrees with the established literature, then the remedy is to write a critical paper with full reasoning and have it published in a suitable journal.

[82] NIWA accepts it must take into account the current state of knowledge but in this particular area considers there is no one definitive standard that is applicable.

[83] In any event, in relation to 7SS, the point is essentially a factual dispute. NIWA says it has effectively applied the RS93 methodology in compiling the 7SS. The Trust denies that.

[84] Mr Dunleavy refers to and identifies correspondence between NIWA and the Coalition as well as responses to Parliamentary questions to support his conclusion that the 7SS adjustments were based on the thesis methodology rather than RS93. He also relies on a table which compares the 7SS adjustments (pre 1975) with those taken from the thesis and the result of applying RS93 techniques (taken from the Coalition's audit) to support his conclusion that in 1991 – 1992 Dr Salinger did not replace the original thesis adjustments with others derived from RS93 techniques. While Mr Dunleavy accepts that the Salinger 92 work contained a description of homogenisation method used in other works, in his opinion it did not itself undertake or record any homogenisation process. As noted, I do not consider Mr Dunleavy's opinion evidence on matters of this nature to be admissible. He lacks the expertise to offer such opinions.

[85] Mr Dedekind notes the 7SS graph which appeared on NIWA's website in 1999 extended from 1853 to the present as did the thesis, whereas by contrast Salinger 92 indicates that the Met Service 21+3 data applied only to the years 1920-1990.

[86] In response, Dr Wratt says that Salinger 1992 does document homogenised temperature series for the period 1920 to 1990. It analyses data from 24 sites, and concentrates on the time period for which data is available for most of these sites. Folland and Salinger 1993 refers to the methods utilised in the Salinger 1992 work (which was the application of techniques outlined in RS93) as being the procedures used to homogenise the seven stations' temperature records used in the studies which led to the 1871 – 1993 series in Folland and Salinger 1993.

[87] Nevertheless, I address the factors Mr Sissons relied on during the course of submissions to support the Trust's case that NIWA applied the thesis rather than the RS93 methodology to the 7SS. The Trust refers to two letters from NIWA. First, one of 29 January 2010 written by NIWA to Mr Dunleavy in response to Mr Dunleavy's request for information. In particular the Trust relies on the following passage:

2. You sought explanations relating to the way in which original records were processed to provide the individual station records. The methodology is documented in the following publicly available sources: ...

There then followed reference to a number of source materials, including the thesis. The Trust notes no reference was made to RS93 as one of those source materials. The Trust argues from that that the RS93 methodology disclosed in the Salinger 1992 work was not applied to homogenise the data in the 7SS series. However, at the next question NIWA went on to say:

3. You asked about adjustments made to the seven station data series. Information regarding those adjustments is available from the following publicly available sources:

Both the thesis and RS93 are both referred to. NIWA's case is that it did not interpret question 2 as a request to clarify or identify what adjustments methodology was used by NIWA between 1992 and 2010. That precise question was never put. While NIWA could perhaps have expressed its position more clearly, at best from the Trust's point of view the response is ambiguous and equivocal. It falls well short of being an admission RS93 was not utilised, as suggested by Mr Sissons.

[88] Next, there is a letter to Mr Dunleavy on 18 February 2010 responding to an Official Information Act request. The Trust seeks to rely on the following passage:

NIWA's letter of 29 January pointed you to several papers including Dr Salinger's PhD thesis as explanations of the methodology behind processing the original records.

It may have been of more assistance if NIWA had gone on to clarify the application of the RS93 but the use of the word "including" is again at best, ambiguous. When



the passage relied on is read in context of the response as a whole it does not, in my judgment support a conclusion that NIWA was saying that it did not apply RS93.

[89] Next, in a publication of 9 February 2010 the NIWA “Seven-Station Temperature Series” NIWA stated:

Salinger (1981) provides the results of these three-site inter-comparisons for the 7-station series, up to about 1975. There is also a variety of statistical tests that can be applied to a single record to highlight possible changes in the homogeneity of the data (see Rhoades & Salinger, 1993).

[90] The Trust’s attempt to rely on this is opportunistic. Nowhere is there an express reference by NIWA that RS93 was not used as the adjustments methodology for 7SS. The reference to Salinger 1981 is in the context that the thesis describes and documents results from the station inter comparisons. Some of the source material from the thesis was still used as base data in later versions of the 7SS. The use of the material in that way did not, however, exclude the use of RS93 or the methodology Salinger developed in 1992 leading to RS93 as the adjustments methodology applied to the data.

[91] The Trust also relies on a NIWA paper dated 9 February 2010 “Creating a composite temperature record for Hokitika”. Reliance on that paper as evidence that NIWA did not apply RS93 methodology to the 7SS is misconceived. Following the challenge to the 7SS NIWA embarked on a review of the temperature series. It has always been NIWA’s case that the review did not apply RS93 methodology. NIWA deliberately did not apply RS93 methodology to the review so that the results of the 7SS (applying RS93 methodology) could be tested and independently verified by the application of different techniques. Hokitika was the first station to be reviewed. The Trust’s reasoning that, as the Hokitika review did not use RS93 methodology, the 7SS did not use RS93 technology is based on a fundamental misunderstanding of the purpose of the review.

[92] The Trust also relies on a series of Parliamentary questions and answers. It has to be observed that the rather prescriptive form of debate such process prescribes is particularly unsuited to a satisfactory resolution of a difference of opinion on scientific matters. The Trust refers to a number of questions and answers which, on

my review of them, are again ambiguous at best. Importantly, the Trust did not refer to the following exchange on 19 February on the point of adjustments:

Q. [Mr Boscowen] Given that we have been through the information the Minister refers to and found no schedule of adjustments, can [you] point to where in this mass of information it is contained; if [you] cannot, can [you] commit to table in Parliament the simple schedule of adjustments?

A. Hon Dr WAYNE MAPP: The Member is correct; there is a complex range of information on the institute's website. The methodology for the site changes is as published in the peer-reviewed *International Journal of Climatology*, which has been referred to a number of interlocutors on this case. That particular article is by Rhoades and Salinger, and is called "Adjustment of temperature and rainfall measurements for site changes".

[93] Again, when read as a whole, the suggestion that the questions and answers in the Parliamentary debate show that NIWA did not apply RS93 is not made out.

[94] The Trust also relies on a table which purports to set out differences between the various adjustment methodologies. The table has been produced by Mr Dunleavy. It is an extended version of a table initially prepared by Dr Carter. Dr Wratt identified a number of errors in Dr Carter's table, including that the length of the period used in the RS93 was not 1 – 2 years, it was substantially longer. But in any event, the table does not establish whether or not NIWA applied the RS93 methodology.

[95] Next, the Coalition refers to two journal papers Folland and Salinger (1995) and Zheng et al (1997). The Trust refers to one sentence in the Folland and Salinger paper:

Accordingly, the homogenized records from the seven long-period sites in Figure 1 which cover well the land area of New Zealand were chosen to form the NZT series (e.g. Salinger, 1979, 1980, 1981).

[96] The short point, however, is that NIWA accepts the seven stations used by Dr Salinger in the thesis are the same stations used in later versions of the 7SS. In context, the sentence says nothing about the methodology applied to homogenise the data from those seven sites. Significantly Folland and Salinger (1995) also state, at p 1196:

Salinger *et al.* (1992) have made considerable efforts to homogenize maximum and minimum temperatures at 21 New Zealand climate stations, including those used here.

[97] The Trust also refers to the following attribution in Zheng et al:

We wish to thank Dr. Jim Salinger for the provision of the homogenized temperature data series and other advice.

as somehow providing evidence that Zheng et al only applied the thesis methodology.

[98] This attribution says nothing about whether or not NIWA used the RS93 methodology in compiling the 7SS. As Mr Smith submitted, there are a number of passages throughout the article which actually refer expressly to RS93 and Salinger et al 1993.

[99] In summary to this point, the matters the Trust refers to and relies upon to support its argument that NIWA did not apply RS93 methodology to the 7SS are, at best, ambiguous and equivocal. Against that there is the express sworn testimony of Dr Wratt and Dr Mullan as to the application of the RS93. Dr Wratt deposes:<sup>41</sup>

The methods outlined [homogenisation methods] are the basis for the homogenisation used for the temperature series presented in the Salinger et al 1992 report, and for the NZ temperature series used in the Mullan et al 2010 report. Homogenised time series reported in Folland and Salinger 1993, produced by Salinger and colleagues in 1992 utilising the methods documented in Rhoades and Salinger 1993, [RS93] form the basis (with annual updates for new data) for the [7SS] used by NIWA between 1992 and mid-2010. ...

[100] In summary, Dr Wratt's evidence is that, prior to the publication of RS93 and during 1991-1992 the new adjustments obtained using the RS93 methodology were applied to a set of New Zealand stations, including those used in the 7SS as stated in Salinger 1992 (using the 21+3 NZ Meteorological Service data). Dr Wratt says Salinger 1992 contains a large number of graphs of homogenised temperature data that were calculated using the RS93 methodology. The data used to plot the graphs and the adjustments implicit in their creation form the basis of the 7SS temperature series.

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<sup>41</sup> At paragraph 97 of Dr Wratt's evidence.

[101] Dr Mullan confirms he was responsible for preparing the document “NIWA’s Seven-station temperature series”, which included the so-called “Schedule of Adjustments”. This document detailed the site adjustments for the 7SS determined in 1992 by the New Zealand Meteorological Service. The Schedule was posted on NIWA’s website on 9 February 2010.

[102] So the Court is faced with a conflict between the direct evidence of Dr Wratt and Dr Mullan that the adjustments applied by NIWA to produce the homogenised 7SS series utilised the methods documented in RS93, and the indirect material relied on by the Trust.

[103] Mr Smith made two other relevant points that provide further support for NIWA’s position. Dr Salinger was NIWA’s employee from 1992 onwards. RS93 was developed and published during his employment with NIWA. It is extremely unlikely that NIWA would have funded Dr Salinger’s work which led to RS93 at the expense of other work yet at the same time would still choose to apply an outdated version of Dr Salinger’s methodology to the 7SS. Finally, as NIWA acknowledges, when testing the 7SS it did not apply the RS93 methodology. Why would NIWA expressly acknowledge departing from RS93 and applying different technology if, indeed, it had not applied it in the first instance?

[104] The plaintiff’s challenge to the 1999 decision is simply not made out on the evidence.

[105] I return to the pleadings. To support the breach of statutory duty the Trust alleges NIWA did not pursue excellence by failing to apply the RS93 methodology to the 7SS. Accepting for present purposes that could create an enforceable obligation, there was however, no particular requirement for NIWA to follow any particular scientific opinions and methods. NIWA was obliged to consider and have regard to accepted scientific practices and opinions known to it to be relevant to the compilation of the 7SS. The evidence satisfies me NIWA has done so. I do not accept the Trust’s submission that the 7SS has simply been prepared on the basis of the thesis without further refining or attempting to homogenise the data. I accept on the evidence that the homogenised time series reported in Folland and Salinger 1993

utilising the methods documented in RS93 form the basis of the 7SS. The Trust's claim that NIWA failed to observe its statutory obligations is not made out.

*Failing to consider mandatory considerations*

[106] Next, it is submitted that NIWA failed to consider whether the techniques used to produce the 7SS adjustments were consistent with recognised scientific opinion and thereby failed to consider an impliedly mandatory relevant consideration. Accepting for present purposes that there can, in appropriate cases, be impliedly mandatory relevant considerations,<sup>42</sup> this allegation fails on the facts for the foregoing reasons.

*Mistake of fact*

[107] The third ground alleges a mistake of fact. The Trust says the 1999 decision was made in the mistaken belief that:

- the techniques used to make the adjustments were consistent with recognised scientific opinion; and that
- a systematic migration of weather stations from warmer sites to cooler ones in the earlier years is the reason why:
  - (a) nine out of 10 of the adjustments favour an upwards trend; and
  - (b) the 7SS warming trend is inconsistent with the nationally averaged temperature series of 1867 and 1920 which show that the temperatures recorded then were just as high as current temperatures.

[108] To the extent that the mistake of fact alleged is that NIWA was mistaken in believing its techniques were consistent with recognised scientific opinion, and that mistake is based on the failure by NIWA to apply the RS93 methodology, then the ground of review itself proceeds on an incorrect factual basis.

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<sup>42</sup> *CREEDNZ Inc v Governor General* [1981] 1 NZLR 172, 183 (CA).

[109] The Trust's argument that NIWA was mistaken in explaining the systematic migration of weather stations from warmer sites to cooler ones as the reason justifying an upward trend in the series is based on Dr Carter's evidence. The pleading alleges nine out of 10 adjustments favour an upward trend (i.e. 90%), Dr Carter refers to exhibit A50 and says:

The analysis at A50 shows that at least 82% of the pre-1975 adjustments favour an increase in the warming trend. Of total impacts made by the 17 adjustments, more than 90% favour a warming trend.

[110] However, the document produced by the Trust sets out adjustments pre-1976 over the seven stations (some with multiple adjustments for different sites within the stations and different time periods). If Dunedin is included then the results disclose a warming trend of 13 out of 17 results which is 76%. If Dunedin is excluded then it shows a warming trend of 11 out of 13 sites, or 85%.

[111] Further, in its letter of 9 February 2010, NIWA provided a table setting out the adjustments made to the sites. In total there are in fact 34 sites that support either a warming or a cooling trend. Of those 34, 24 support a warming trend (just over 70 per cent). Dr Wratt has explained in his evidence the reason why such a warming trend is explainable when the adjustments are applied. Dr Wratt says:<sup>43</sup>

The apparent linearity of the adjustment through time is a consequence of averaging many site adjustments together when the earlier measurement sites for the [7SS] stations were, in general, in warmer parts of the region than the current sites, along with the fact that there is zero adjustment for present-day records (since these are the "reference sites" that earlier temperatures are compared to).

Then later:<sup>44</sup>

... The sites Bates used to determine his "New Zealand Temperatures were located in relatively warmer microclimates, and those used for the current [7SS] sites are located in relatively cooler microclimates, by and large. As explained in ... this was because as towns expanded, the Meteorological Service of the day would have come under economic pressure to move out of a valuable town site and relocate to a less hospitable (and colder) environment where land was cheaper. The reason the [7SS] temperature of 11.95 °C circa 1919 is lower than actual temperature measurements at the time recorded by Bates, is that the 11.95 °C value is what the present-day

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<sup>43</sup> At paragraph 282 of Dr Wratt's evidence.

<sup>44</sup> At para 283.

“colder” sites would have measured if they were operating back in 1919. In other words, ... Mr Dunleavy is “comparing apples with oranges”.

[112] In response to Mr Dunleavy’s assertion that the 7SS understates the pre-1920 temperatures by an average of 0.1% degrees C per station, Dr Wratt says that this premise:<sup>45</sup>

represent(s) what I consider to be a continued misunderstanding by the plaintiff [and the Coalition] of what temperature records represent. Comparing temperatures averaged across the seven stations comprising NIWA’s [7SS] for the period 1971-2000, with temperatures averaged from numbers given by Bates for sites at nine New Zealand towns from several decades prior to 1920, is equivalent to comparing apples with oranges. The sites Bates used to determine his “New Zealand Temperature” were located in relatively warmer microclimates, and those used for the 1971-2000 (and current) sites in NIWA’s [7SS] are located in relatively cooler microclimates, by and large.

[113] Dr Wratt’s explanation is credible and understandable.

[114] The Trust fails to make out its allegation that NIWA has acted under a mistake of fact. Rather, such mistake that there is on this issue has, in my view, been made by the Trust and its deponents.

#### *Unreasonableness*

[115] Finally, the Trust alleges the 1999 decision was unreasonable because it was based on the mistakes set out in the preceding paragraph and there was no evidence to support the mistaken belief.

[116] For the reasons given above I am satisfied NIWA was not mistaken. There is evidence to support the position and the adjustments it has adopted. The Trust’s first cause of action cannot succeed.

#### **The 2009 decision**

[117] From 1992 to 2009 NIWA updated the 7SS homogenised temperature series as new data became available.

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<sup>45</sup> At para 207.

[118] On 26 November 2009 members of the Coalition published on their website a paper entitled “Are We Feeling Warmer Yet”? The paper claimed that “New Zealand’s temperature had been remarkably stable for a century and a half” and that the Coalition had “discovered that the warming in New Zealand over the past 156 years was indeed manmade, but had nothing to do with the emissions of CO<sub>2</sub> – it was created by manmade adjustments of the temperature. It’s a disgrace.” The Coalition advanced the theory that the trend shown by the 7SS disagreed with historical temperature measurements recorded in NIWA’s climate data base.

[119] To address the Coalition’s criticism of the 7SS, NIWA identified a set of 11 climate stations that had not experienced any significant site changes since the 1930’s and produced an unadjusted 11 station series of temperature anomalies, the 11SS. NIWA observed the resulting temperature trends to independently refute the Coalition’s claims that the warming indicated by the 7SS was an artefact of in-house temperature adjustments rather than real change. According to NIWA’s calculations, the temperature trend from the 11SS, with no homogenisation, was one degree Celsius for the years 1931 to 2008, consistent with the trend disclosed by the 7SS. Dr Wratt explained the 11SS as follows:

The 11 station series is a set of temperature data from up to 11 stations that are completely independent from the sites used in the [7SS]. The [11SS] was produced using raw data without site adjustments, to address criticism of the [7SS] claiming that the warming in that series was not a real reflection of New Zealand temperature changes but resulted from unjustified adjustments made by NIWA to account for site changes. The-year-to-year changes in temperature anomalies from the merged 11SS are remarkably similar to those in the [7SS]. ...

[120] The Trust does not accept the validity of the 11SS. It argues that Dr Salinger and NIWA deliberately identified and chose sites that would support the trend disclosed by NIWA’s 7SS. The Trust also says that:

- The 11 stations were only in existence for a continuous period between 1955 and 1994;
- several of the stations experienced site changes requiring adjustments which had not been made;



- there were gaps in the record which exceeded the world meteorological organisation's (WMO) standards;
- the data from 1955 to 1994 showed a warming trend of only .28 degrees C;
- the data from 1931 to 1954 showed a warming trend of 1.84 degrees C; and
- the combined trend of 1.24 degrees C was 25 per cent higher than the 7SS.

[121] The Trust alleges that NIWA has unreasonably continued to use the 11SS (the 2009 decision) as reliable evidence of New Zealand temperature trend despite "the obvious deficiencies in the data". Alternatively, the Trust alleges that the 2009 decision was made in the mistaken belief the 7SS contained reliable evidence of average temperature trends from 1931 to 2008 when it was in fact incomplete and unreliable.

[122] Dr Carter says that at no point is the material data representative of New Zealand as a whole and its geographical spread swings wildly and unpredictably from year to year. He considers it to be meaningless during that first 24 year period in particular.

[123] NIWA accepts that the 11 stations were only in existence for a continual period and that not all stations have annual mean temperature values for all years from 1931 to 2008 (and in particular prior to 1955) but Dr Wratt says:<sup>46</sup>

I disagree with Carter's claim that because 1955 is the first year that all 11 stations have data available for two successive years, the [11SS] is meaningless prior to that. An individual station series contributing to the [11SS] is produced by calculating the annual temperature anomalies (differences) at that station, compared to that station's 1961–1990 average temperature. As already explained ... the year to year variations in temperatures at individual stations across New Zealand (the anomalies) agree much more closely than the absolute temperatures. Thus the absence of some stations in some years does not bias the [11SS] trend, since a lesser number of stations will still be representative of New Zealand temperature variability. This is illustrated by the remarkable similarity between the [7SS] and [11SS] series ...

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<sup>46</sup> Dr Wratt's affidavit at paras 213 and 214.

[124] NIWA accepts that the data for the period from 1955 to 1994 discloses a warming trend of only 0.28 degrees Centigrade but says to restrict the period to 1955 – 1994 produces a misleading and artificial result, which is statistically uncertain. It also says that while the data from 1931 to 1954 disclosed a warming trend of 1.84 degrees Centigrade, during this period there were only three or four stations providing data for the purposes of the 11 station series and the data should not be viewed in isolation.

[125] Dr Wratt also says that his analysis of the 11SS data:<sup>47</sup>

... shows that the best fit linear trend over the period for which data is available from the majority (6 or more of the stations, 1941-2009) is equivalent to a warming of  $0.8\pm 0.1^{\circ}\text{C}$  during that 68 year period. This is a substantial fraction of the warming of  $1.0\pm 0.1^{\circ}\text{C}$  obtained over the full 78 years (1931-2009) of the [11SS] from the best fit linear trend over that period.

[126] As noted, the Trust says that Dr Salinger and NIWA selected the particular stations for the sole purpose of supporting the 7SS in response to the Coalition's criticism. The Trust refers to an email from Dr Salinger, copied to Drs Mullan and Wratt, regarding selection of the 11 stations in which he says:

I checked all the station histories in my thesis and here are the series from Prtine's sites (*sic*) – one as a combined anomaly series of 1961-80, and the other the individual mean temperature plots. ...

Interestingly, the combined anomaly series from these sites shows a trend of  $1.0^{\circ}\text{C}$  from 1931 to 2008.

The Trust also refers to Dr Wratt's comment in an email to Mr Renwick and Dr Salinger (copied to Dr Mullan) in which he stated by reference to the 11SS: (To be absolute bullet proof on this one ... )".

[127] The Trust says the above comments show that the stations were not chosen objectively, for the purposes of objective scientific research and that all Dr Wratt was interested in doing was to protect or support the 7SS.

[128] I do not consider that to be a fair representation of the position. When the chain of emails is read in its entirety it is apparent that NIWA was concerned to

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<sup>47</sup> At para 135.

obtain as complete a record as it could of stations that were quite separate from the stations used in the 7SS and which, at least in large part, did not require adjustments. The point is illustrated when the context of Dr Wratt's "bullet proof" comment is considered. In full he said:

... (To be absolutely bullet proof on this one, would it be a good idea if someone at Greta Point took exactly the same stations as Jim and checked that they got exactly the same result? I'm not doubting your calculations Jim, but I think we should subject any numbers we put out to very careful quality control).

[129] In my view that comment makes it clear that NIWA was properly focused on ensuring that the information it published was correct and could not be criticised as inaccurate. Dr Salinger's reference to pristine sites is consistent with a reference to sites that would not require adjustments. I do not draw any inference there was something untoward about his comments.

[130] Further, given Dr Salinger's previous involvement and expertise in the series, it was reasonable for NIWA to have involved him in the process of the selection of the sites.

[131] The Trust also challenges the sites chosen on the basis that several of them actually did experience site changes that required adjustments which were not made. As Mr Smith submitted, however, NIWA has never claimed the sites had experienced no site changes. The NIWA web page identified the 11SS as:

a set of eleven stations spanning in New Zealand where there have been no **significant** site moves for many decades".

(emphasis added)

Dr Carter's suggestion that NIWA had claimed the stations "have experienced no site changes" is incorrect.

[132] Dr Carter also refers to the Queenstown and Ruapehu sites as problematic. Again reference to the facts provides an answer to the plaintiff's case on this point. The comment concerning the reservations about the use of Ruapehu was made in 1937. Only one year of the Ruapehu data prior to 1938 was used in the 11SS. It would have had a minimal influence. As to Queenstown, Dr Wratt makes the point

that Dr Carter's criticism is based on a photograph of the site location but the comparison of the actual measurements of the site used in the 11SS with measurements from a separate site at Queenstown Airport from 1977 to 1997 shows the readings are consistent. That comparison does not suggest that there is a localised site effect warming for the Queenstown site as suggested.

[133] Next, the Trust says that the gaps in the record caused by the missing data exceeded the level of gaps permitted by the World Meteorological Organisation (WMO) standards. The Trust relies on guidelines published by WMO, Guide to Climatological Practices 2011 edition. The publication states that:

As a guide, normals or period averages should be calculated only when values are available for at least 80 per cent of the years of record, with no more than three consecutive missing years.

[134] Dr Wratt says that in his opinion that practice:<sup>48</sup>

regarding data for producing an annual average temperature at a given meteorological station site is not applicable to the calculation of a merged anomaly series based on data from a number of different sites as has been undertaken for the 11SS.

[135] Dr Wratt also says that it is accepted scientific practice to calculate a trend where some years are missing. What is not acceptable is to extrapolate a trend beyond the period of record. Dr Wratt refers to a technical note on the treatment of missing data in the 11 station series. As that technical note records:

There is a trade-off between getting the most out of the data we have, and increasing the uncertainty in the estimated annual value.

For the spreadsheet, we have decided to allow just one missing month in any year. This adds about 50 station-years to the 11-station series that would otherwise be missing. If two or more months are missing in any year, then the annual average is missing also.

[136] The Trust also says that data has been included even from years where up to six months of data are missing and a number of the stations have multiple years with multiple missing months. Dr Wratt, however, confirms that a one month gap approach was adopted by NIWA in the 11SS. Dr Wratt says:<sup>49</sup>

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<sup>48</sup> At para 214.

<sup>49</sup> At para 287.

... NIWA scientists realised that this very strict approach [of not incorporating site anomaly data for years with any missing monthly data] led to the rejection of some useful data, and that for the reasons outlined in the plaintiff's exhibit A61 it would be acceptable to include site anomaly data for years in which there was only one missing month following the procedure outlined in that exhibit. This was the approach taken in preparing the spreadsheet made available over the web, and transparency was ensured by explaining this in the technical note.

[137] To the extent these matters involve differing contestable scientific opinions the Court cannot resolve them. However, I have to observe that Dr Wratt's evidence appears credible and reasonable and, if necessary, I would accept it in preference to the evidence for the Trust on this point.

[138] It follows that I do not find the Trust's criticism of the 11SS to be made out on the facts. It cannot be said that NIWA acted unreasonably in concluding that the 11SS contains sufficiently reliable evidence of average temperature trends in New Zealand during the period 1931 to 2008 to support the publication of the 11SS on its web site.

[139] For the same reasons nor can it be said that NIWA committed any mistake of fact in considering that the 11SS contains sufficiently reliable evidence of average temperature trends from 1931 to 2008 to support publication of the 11SS on its web site. The plaintiff's second cause of action must fail.

### **The review decision**

[140] On 9 February 2010, following challenges to the 7SS (primarily by the Coalition), NIWA placed two further documents on its website, both prepared by Dr Mullan. The first was described as a schedule of adjustments. It disclosed a list of the location states and values of the 7SS data adjustments. The second was a station report describing how the long-term temperature series for Hokitika was calculated. NIWA then agreed to prepare and place on the web similar documents for the other six locations used in that series. Together these reports comprised the review which NIWA carried out of the 7SS. NIWA also approached the Bureau of Meteorology in Australia which agreed to undertake an independent external peer review of the methodology and documentation of the 7SS.

[141] Dr Wratt was responsible for overseeing the review which was led by Dr Mullan. The review involved independently recalculating the site temperature adjustments based on considerations of the underlying data and metadata (records about instruments, site conditions and changes). It led to an updated and revised edition of the 7SS. The results were published by NIWA in December 2010 in a publicly available report (Mullan et al 2010). The Mullan et al 2010 report was placed on NIWA's website on 16 December 2010 (the review decision) along with a letter of support from the Bureau of Meteorology.<sup>50</sup>

[142] The review led to some changes in the individual adjustments for site changes at a number of the seven stations. However, the combined revised 7SS series was almost identical to the original 7SS combined series. In short, the review supported the warming trend over the past 100 years in New Zealand disclosed by the 7SS.

[143] The Coalition produced a critique of the review accompanied by its own audit. The audit purported to apply the statistical techniques used in RS93 while leaving the remainder of NIWA's methodology unchanged.

[144] In response to the critique Dr Mullan recalculated most of the sites changed temperature adjustments applying the RS93 methodology. He concluded that the Coalition had incorrectly calculated the adjustments and if the RS93 methodology was applied correctly it resulted in adjustments close to those calculated in the review using the alternative method that NIWA had employed.

*Departures from scientific opinion/breach of statutory duty*

[145] The Trust alleges that, in breach of its statutory duty (to pursue excellence) NIWA departed from recognised scientific opinion by:

- (a) choosing not to use the RS93 methodology;

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<sup>50</sup> NIWA does not seek to rely on the Bureau of Meteorology's peer review for the purposes of the proceeding. NIWA's position is that to produce the material sought by the Trust relating to the peer review would be inimical to the future relations between NIWA and other international agencies such as the Bureau of Meteorology if their candid exchanges were to be subject to scrutiny and litigation.

- (b) not following any other recognised scientific opinion;
- (c) using isolated stations for comparisons when comparison stations should be “neighbours”; and
- (d) using data which is or might be contaminated by urban heat island (UHI) or shelter effects, contrary to the methods described in RS93 and Hessel (1980). In particular the contaminated data affected station results at Auckland, Wellington, Lincoln and Nelson.

[146] The Trust’s first complaint is that NIWA chose not to use the RS93 methodology when carrying out the review of the 7SS. The Trust contends that the statistical techniques employed in the review methodology fail to accord with peer review literature as they do not conform to RS93 and submits that the way the review deals with statistical comparisons in UHI/shelter issues that are known defects of the original 7SS is highly unsatisfactory and contrary to recognised scientific opinion and best practice. It does not consider the review followed any other recognised scientific opinion.

[147] NIWA accepts it did not apply the RS93 methodology to the review. It deliberately did not do so, as it had applied that methodology to the initial 7SS. As discussed, NIWA considers that RS93 is not the only authority for internationally accepted temperature data series homogenisation. For periods when there is not an overlap between observations at the initial site and the new site most methodologies depend on comparisons with other stations. While the RS93 methodology is one of the means to provide those comparisons, the methodology used in NIWA’s review is another.

[148] Dr Wratt deposes that the underpinning concepts used by NIWA were similar to the RS93 methodologies. In general, both the review methodology and RS93 utilise site metadata to identify times of site and other changes for which adjustments might be necessary, and comparisons with other sites with overlapping records to determine the required magnitude of these adjustments. Dr Wratt says the homogenisation method used in the review, together with the calculated adjustments

to account for site stations were fully documented in the NIWA authored reports for each of the seven stations. The draft reports for each of the seven individual 7SS stations were merged into one report approved for public release in December 2010 by himself as chief scientist.

[149] Dr Wratt goes on to depose:<sup>51</sup>

Some of the temperature adjustments calculated to account for site changes at the individual seven stations were different in the Mullan et al Review report from those resulting from the analyses of Salinger and his colleagues in 1992 and the subsequent annual updates. This led to some generally small changes in the 100-year temperature trends calculated for individual stations. However the 7SS temperature series obtained by combining the results for the seven stations was very similar to the series from the Salinger-based [7SS]. The overall long-term trend calculated from the revised [7SS] from 1909 to 2009 of  $0.91 \pm 0.29$  °C per century was the same to the second decimal place as that from the Salinger-based [7SS].

[150] NIWA's position is the review was undertaken professionally, the methodology was appropriate and the review provided independent verification of the pre-1910 version of NIWA's 7SS and the trends calculated from it. NIWA says the results and conclusions of the review are robust.

[151] The debate raises an issue of science, namely whether the methodology NIWA used was available to it.

[152] I refer briefly to aspects of the evidence on this issue to highlight the debate. Dr Carter contends the review methodology is flawed, unprecedented, outdated and unpublished. He says adjustment calculations made in the review are not based on methods substantiated in scientific literature. Dr Wratt responds to that by saying that the methodology is not unprecedented as it draws on widely accepted use of comparison stations to calculate adjustments at times of site changes.

[153] Mr Dedekind suggests that in all material respects the methodology of the review is unchanged from the thesis. Dr Carter also considers that the statistical comparison techniques used in the thesis to be very similar to those described in the review and refers to a table to support this point. However, Dr Wratt does not accept

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<sup>51</sup> At para 44.



this and explains the differences between the review methodology and the thesis in his evidence. He says the 2010 NIWA review methodology was a step forward from that utilised by Salinger for his thesis work. Dr Wratt identifies a number of errors in the table relied on by Dr Carter. He also answers Mr Dunleavy's reliance on an earlier letter and says the review project was established to review the site change adjustments by independently recalculating them based on consideration of the underlying data and metadata.

[154] Dr Trenberth supports NIWA's position. He deposes that the methods and results of NIWA's research have been appropriately documented and published. The results have also been accepted by bodies who have assessed them such as the inter governmental panel on climate change. Dr Trenberth notes that it is always possible to improve the homogeneity of such records as further or more information comes to light, such as the discovery of lost documents or identification of biases and certain instrumentation which is why the changes are referred to as "adjustments" rather than "corrections" but in his opinion, any such future adjustments are likely to be tiny.

[155] The difference between the parties is reflected in their approach to the Hokitika review. Mr Dunleavy says that the review was commenced with Hokitika "as an example of the methodology used in the original 7SS". He says the very purpose of publishing the Hokitika 10 and having it tabled in Parliament was to illustrate the methodology used to derive the accompanying schedule of adjustments. However, Dr Wratt says that while the review commenced with Hokitika, this was not done as an example of the methodology used in the 7SS, rather the review was a response to challenges to the adjustment methodology and resulting temperature trends produced by NIWA. In conducting the review NIWA deliberately adopted an alternative methodology. NIWA's website itself states that the effect of the review was to show that "either approach gives an accurate trend result".

[156] Dr Mullan says the document "creating a composite temperature record for Hokitika" (which he authored) "was produced as a proof of concept" example of how separate temperature records could be adjusted to produce longer homogenous time series. The Hokitika records were chosen as an example following criticism by

the Coalition of the large adjustment applied to the pre-1912 observations. The document was never intended as a worked example of the RS93 methodology.

[157] It is unnecessary for this Court to resolve this scientific debate. On the evidence I accept it is more than arguable that the purpose of the NIWA review was to independently recalculate site change temperature adjustments from the underlying data and metadata and to document how those recalculated adjustments were produced and what their values were. I accept that NIWA could have recalculated the temperature adjustments in a different way yet still have arrived at a similar result which would strengthen the robustness and validity of the previous results.

[158] Next, the Trust challenges NIWA's use of statistical comparisons between weather stations which are far apart and in different climates zones. Mr Dunleavy says that RS93 limits comparison stations to near neighbours "subject to the same local weather patterns". He contends this limitation is not observed in the review. Mr Dunleavy says each of the 7SS stations are located in dramatically different climate regions which, in his submission meant that NIWA's process of choosing comparative stations resulted in errors.

[159] Dr Wratt does not accept that the site change adjustments in the review are flawed because of the distance between the stations or that the distances accepted by NIWA are inconsistent with the scientific literature. The issues raised by Mr Dunleavy regarding "neighbours" are addressed in the review. Dr Wratt says the selection of comparison neighbour stations must be made with common sense. In his opinion:

The most important aspect of comparison station selection is the correlation between the temperature variations at the comparison and target sites, which is a purely objective measure. The NIWA staff undertaking the 2010 [7SS] Review assembled short technical summaries of inter-station correlations for each site as part of the underlying work, but these were not included in the NIWA Review report.

Dr Wratt is of the opinion that as New Zealand covers a very small part of the globe many weather patterns affect most or all of the country. He says:

This is apparent when comparing temperature records from ‘widely separated’ locations. For adjusting Australian temperature data, Torok and Nicholls select “neighbour stations, within six degrees latitude and longitude of the candidate station”. Some of these so-called neighbours were subsequently discarded if they were climatologically dissimilar to the candidate station. Thus, a strong correlation between the temperature time series is more important than simply physical separation.

[160] In short the NIWA methodology focused on requiring a high correlation between temperature variations (monthly and annual) at comparison stations.

[161] Again, the Trust’s case depends on this Court finding the NIWA’s use of the seven stations for comparison was not open to it. However, there is credible evidence that scientific opinion supports NIWA’s approach. This Court cannot resolve the debate.

[162] The next argument raised by the Trust was that the data was contaminated by UHI and shelter effects. The Trust contends the review methodology fails to properly consider and test for such non-climatic site effects and correct for known or suspected data contamination caused by UHI or sheltering. As a result a false warming trend was produced. In Mr Dedekind’s opinion, NIWA’s errors in this regard account for most of the warming trend shown in the 7SS during the 20<sup>th</sup> century. The Trust notes that RS93 recommends avoiding stations “likely to be affected” by shelter or urbanisation. While corrections may be made to allow for UHI/shelter the Trust relies on the proposition in the Hessel (1980) paper that:

quantitative assessments of sheltering and urban heat island effects cannot be satisfactorily resolved unless either or both can be shown to be negligible.

The Trust also says that the station metadata recorded in Fouhy et al 1992 shows serious instances of sheltering by trees at Auckland, Wellington, Nelson and Lincoln. In Dr Carter’s opinion at least six of the 7SS station probably suffered UHI effects at some stage during the 20<sup>th</sup> century. Mr Dedekind opines that the raw data from all seven of the stations have experienced non-climatic contamination.

[163] In particular the Trust objects to the inclusion of the Albert Park (Auckland) and Kelburn (Wellington) sites. The Trust relies on the Hessel (1980) paper which

identified and discussed the effects of gradual non-climatic effects on New Zealand weather records specifically in relation to the Albert Park and Kelburn sites.

[164] In response Dr Wratt deposes that, contrary to Mr Dedekind's assertion, there are no "usual methods of assessing day time and night-time temperatures for progressive change that can establish a non-climatic signal". Dr Wratt acknowledges the "Wang" test used by NIWA for the Wellington site is designed to identify sudden discontinuities but says it was used appropriately in the circumstances. Dr Wratt also disagrees with applying the general conclusions about UHI/shelter effects quoted by Dr Carter from Hessell's 1980 paper. Dr Wratt says that Hessell (1980) is by no means the sole authority on that issue for New Zealand temperature records. Dr Wratt refers to an email that Hessell sent to Mr Dunleavy, the plaintiff's solicitor, Mr Brill and Dr Wratt regarding his 1979 and 1980 papers in which he states:

My two papers quoted above, were written 30 years ago since when climate studies aided by increased staffing, knowledge and technology have made big advances. I think there is little to be gained by further discussion of old methods.

[165] NIWA contends that the review scientists did not ignore the possibility of non-climatic effects. Dr Wratt says the New Zealand climate station sites are chosen as far as possible to meet WMO guidelines regarding distance from sheltering obstacles and are visited regularly by inspectors who note any significant changes to exposure of the instruments and the station files. The scientists undertaking the review examined site history material and gave consideration to non-climatic site effects. The UHI effects were known and considered. An introduction to UHI effects is discussed in the review. The NIWA scientists carrying out the review were well aware of the issue and the international literature on the subject.

[166] I refer to the specific sites in issue.

### *Auckland*

[167] Dr Wratt says that investigations in the review of possible non-climatic warming for part of the Auckland Albert Park record give somewhat contradictory results. While there may have been an excess warming trend of about 0.3 degrees

Celsius this is by no means certain and there is independent evidence that the northern part of New Zealand warmed more rapidly than other parts of the country. Given all of this the authors of the review chose to retain the Auckland time series in the 7SS without UHI adjustments but to be very transparent in their report about doing so, noting that further research may be desirable.

### *Wellington*

[168] Dr Wratt similarly explains why NIWA does not accept that the temperatures recorded at Kelburn weather station were contaminated during the review. He points out the plaintiff incorrectly asserts that “NIWA makes no mention of any urbanisation or sheltering issues in their document” for Wellington. Information from station histories regarding sheltering is specifically discussed in the review. However the NIWA research team found no evidence for a significant shelter related change and considered there to be no indication of the gradual non-climatic factors claimed by Mr Dunleavy.

### *Hokitika*

[169] Dr Wratt says that, in reliance on Fouhy et al (1982), NIWA were justified in keeping the Hokitika site.

### *Lincoln*

[170] Dr Wratt notes that careful consideration of, and correction for, site effects associated with shelter belts and changes in land use were undertaken for Lincoln.

### *Nelson*

[171] Mr Dunleavy raised certain issues regarding the early Nelson data. Dr Wratt addresses those and says he is of the view that comparisons of the Nelson site in issue with four other stations for the period 1910 to 1918 give no indication of the gradual non-climatic factors claimed by Mr Dunleavy.

[172] In summary on this point, the Trust alleges generally that NIWA failed to properly deal with the UHI/shelter issue which had the effect of other stations acquiring derivative warming from the inclusion of the Albert Park (Auckland) and Kelburn (Wellington) sites. Dr Wratt disagrees. He says that the excess temperature trend identified by the Trust for the Auckland series is incorrect. Further, even if it was correct, the effect it would have on the other sites would be negligible. Dr Wratt is of the view that Dr Carter has misinterpreted the scientific literature in making the claims he does.

[173] Again, in large part the evidence on this issue identifies a scientific debate which this Court is not in a position to determine one way or the other. However, in my view, the scientific approach adopted by NIWA is tenable.

[174] Related to this issue is the splicing of data issue. That involves data for an earlier site being adjusted up or down by an amount that represents the estimated climatic difference between the two sites. It is important to establish a site is free of UHI/shelter impacts, or, if possible, is accurately corrected for such effects, before its data is spliced with a successor site, otherwise progressive non-climatic effects will be conveyed to the earlier site at peak value and maintained at that static level throughout the lifetime of the site.

[175] The Trust says that potentially contaminated data from Auckland and other sites has been used to drive adjustment calculations at other stations. Dr Carter refers to the issues by reference to the Mangere and Albert Park stations in Auckland. Dr Wratt says that NIWA gave relevant consideration to the splicing process. For the reasons that Dr Wratt gave, however, he does not accept that it is by any means certain that the Albert Park data exhibits as much as 0.3 degrees Celsius warming. There is independent evidence that the northern parts of New Zealand warmed more rapidly than other parts of the country. Given this, the authors of the review chose to retain the Auckland time series without any UHI or sheltering adjustments for Albert Park but were, as Dr Wratt says, transparent in doing so.

[176] There is a further related point. In August 2006 a Coalition member, Mr Hughes, issued a press release pointing out that the published global records of UK's

climate research unit indicated a century long New Zealand warming trend which is only about a third of that shown in the 7SS. Dr Wratt, however, says there were clear causes for the differences. Dr Wratt's evidence is that there was more air flow than normal from the south and south-west over New Zealand in the earlier part of the 1945 period and an increase in flow from the east and north-east in the second part. Since flow from the south brings cool air to New Zealand one would expect relatively cooler conditions in the earlier part of the period and warmer conditions in the latter part. It is apparent that these matters will be affected by the starting date for the data set.

[177] The plaintiff's case on this cause of action is largely based on the accuracy of the critique and its audit and the inaccuracy of the review. NIWA contends that the Coalition's application of RS93 methodology in the audit is incorrect.

[178] NIWA refers to eight lines of evidence that indicate New Zealand has warmed significantly over the period 1909 to 2009:

- the consistent results of the recalculated 7SS following the review, which was consistent with the results recorded in the original 7SS series based on the Salinger 1992 work, plus subsequent annual updates;
- peer review for the pre-2010 versions of 7SS, including by the editors of International Journal of Climatology;
- the analysis and calculation of the trends using the Salinger post-1992 7SS by a separate set of scientists within NIWA;
- trends from the independent 11SS, which disclosed that with no homogenisation the warming trend was 1.0 degrees Centigrade for 1931 to 2008;
- results from the 21+3 station series;

- trends from ship measurements and surrounding oceans;<sup>52</sup>
- retreat of New Zealand glaciers;
- observed global climate changes. The IPCC 2007 assessment concludes warming of the climate system is unequivocal. It reports the 100 year linear trend (1906 to 2005) and global surface temperature is +.74 degrees Centigrade  $\pm 0.18$ .

[179] There is a stark difference between the parties on the accuracy of the review as opposed to the critique and audit. NIWA claims the audit misapplies RS93 methodology by using comparison periods of plus or minus one or two years. The Trust rejects these criticisms.

*Breach of statutory duty*

[180] The plaintiff alleges that by departing from recognised scientific opinion NIWA breached its statutory obligations, including its obligation to pursue excellence. I am satisfied on the evidence that NIWA applied credible scientific methodology and, as such, did not breach any obligation it may have had to pursue excellence. The first alleged breach is not made out.

*Failure to consider mandatory considerations*

[181] Next, the Trust says that NIWA failed to consider mandatory relevant considerations in departing from recognised scientific opinions. I am satisfied NIWA did apply tenable scientific methodology to the review process. This claim cannot be sustained.

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<sup>52</sup> In 1995 Folland and Salinger analysed measurements made from ships located near New Zealand. Night time marine air temperatures in the region had increased by about 0.7 degrees Centigrade since the beginning of the 20<sup>th</sup> century and sea surface temperatures were slightly less than that.



### *Mistake of fact*

[182] For the same reasons the allegation of a mistake of fact based on departure from recognised scientific opinion must fail. The Trust's alternative proposition, that the decision to publish the review was based on mistaken belief it had been compiled using internationally recognised scientific methodology, is not made out. On the evidence I am satisfied that the methodology applied by NIWA was in accordance with internationally recognised and credible scientific methodology.

### *Unreasonableness*

[183] Finally, the plaintiff alleges that in deciding to publish the review without following recognised scientific opinion and without an independent peer review NIWA acted unreasonably. The plaintiff cannot make out this allegation. The review was in accordance with recognised scientific opinion. The review was peer reviewed.

[184] The Trust's third cause of action fails.

### **Summary/Result**

[185] The plaintiff does not succeed on any of its challenges to the three decisions of NIWA in issue. The application for judicial review is dismissed and judgment entered for the defendant.

### **Costs**

[186] The defendant is entitled to costs. Given the time involved and the steps taken, costs on a category 2 time band C would seem appropriate. However, if the parties are unable to agree I will receive memoranda and deal with the issue of costs on the basis of such memoranda.

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Venning J