APPENDIX

Notes on the Kapiti coastal erosion fiasco and problems caused more generally by a number of NZ coastal scientists

1. In these notes, I explain:

    a. what has happened in the Kapiti coastal erosion fiasco where the exact same results have morphed from:
        i. "likely"; to
        ii. "based on a worst case scenario" but worse than what and by how much were not explained; to
        iii. "very unlikely";

    b. my reactions to, and some opinions about, what has happened; and

    c. problems being caused more generally by a number of New Zealand coastal scientists who, in my opinion, are misinterpreting or ignoring the law and misunderstanding their role in the context of the Resource Management Act 1991 (RMA) and the New Zealand Coastal Policy Statement 2010 (NZCPS 2010 or in full).

2. I address:

    a. Kapiti long-term erosion/accretion;

    b. Kapiti reports/documents on coastal erosion;

    c. the problems that the independent panel of international and NZ coastal experts and a statistician (Coastal Panel)[1] engaged by Kapiti Coast District Council (KCDC) identified with the Coastal Systems Limited (CSL) reports;

    d. the practice of ignoring accretion, which is contrary to Policy 24(1)(b) of the NZCPS 2010;

    e. what KCDC has done in response to the Coastal Panel's report and an independent planning/legal report;

    f. the morphing information as to Kapiti results, where the exact same results have gone from:
        i. "likely"; to
        ii. "based on a worst case scenario" but worse than what and by how much were not explained; to
        iii. "very unlikely";

    g. some relevant statutory, and related, provisions;

    h. how some NZ coastal scientists interpret the law and approach their role;

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[1] Dr Paul Komar (USA), Mr James Carley (Australia), Dr Paul Kench (NZ) and Dr Robert Davies (NZ statistician).

i. some hints to the contrary from the Environment Court;

j. the problems with providing only very unlikely results or overstating results;

k. risk management and uncertainty - AS/NZS ISO 31000:2009 *Risk management - Principles and guidelines*; and

l. in conclusion, NZCPS 2010 provisions, the recommendations of the Coastal Panel vs conventional practice of NZ coastal experts, and what, in my opinion, submitters and decision-makers are entitled to expect from scientific reports and coastal experts.

3. By way of background, our property was not affected by CSL's 50 year lines. The 100 year line touched the seaward side of our house. We were not concerned when we received the letter from KCDC advising us of this "likely" outcome. The concerns that I have are professional rather than personal.

4. During my career[2], I have encountered many well-meaning, but ultimately misguided, concerned citizens. I have read and evaluated many scientific and technical reports and dealt with expert evidence. I did not even intend to read the CSL reports as I assumed that the reports were validly prepared and that the residents were misguided. However, due to the ongoing controversy over the reports, I eventually felt that I should at least read CSL's 2012 Update to satisfy myself that it was valid. I was stunned (and not in a good way) by what I read and ultimately discovered.

5. It has been difficult to get to the bottom of the nature of the CSL results. It has taken me far too many hours, and several years, to uncover that the CSL results are not:

a. "likely" as initially described by KCDC; or

b. "precautionary" or "conservative", terms used in the 2008 and 2012 reports; or

c. "based on a worst case scenario" as later described by KCDC; but

d. "very unlikely" as described on CSL's own website in March 2015.

6. Over time, I have also developed concerns about what other NZ coastal experts are doing. It seems that a number of them consider that it is appropriate in the RMA/NZCPS 2010 context to provide only results that are very unlikely, or overstated. That does not accord with my view of the nature of scientific results that coastal experts should be providing. In my opinion, providing only very unlikely or overstated scientific results undermines (and in the Kapiti case sabotaged) the RMA/NZCPS 2010 process.

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[2] Senior lecturer in law at Victoria University, resource management partner at Chapman Tripp, independent hearings commissioner, Principal Environment Judge (ie the chief judge) and an alternate Environment Judge of the Environment Court.

Kapiti long-term erosion/accretion

7. The southern part of the Kapiti coast has been affected by long-term erosion (although some predictions of erosion made in the past have not occurred).

8. The net effect of coastal processes (including the ongoing long-term sea level rise) on the central and northern parts of the Kapiti coast has not been erosion, but accretion.

9. A positive outcome of the CSL reports was demonstrating the areas of longer-term erosion and accretion, and that the trends are not linear.

Kapiti reports/documents on coastal erosion

10. The various reports/documents (including my comments on some of them) have been:

    a. 2003 Lumsden report on coastal erosion.

    b. 2005 Coastal Systems Limited (CSL[3]) review of Lumsden report which found it wanting.

    c. CSL 2008 (March 2008) Open Coast report[4] and Inlets report[5]:
        i. 50 years;
        ii. references to "precautionary" and "conservative";
        iii. KCDC puts process on hold pending updated New Zealand Coastal Policy Statement.

    d. CSL 2012 Update[6] (August 2012) to take account of the New Zealand Coastal Policy Statement 2010:
        i. 50 and 100 years;
        ii. accretion not included where report says progradation (accretion) is "expected" ie generally the central and northern parts of the Kapiti coast;
        iii. under Policy 24(1)(b) NZCPS 2010, the Council is to have regard to the "short-term and long-term natural dynamic fluctuations of erosion and accretion";
        iv. numerous references to "precautionary" and some to "conservative" strike me as unusual for a scientific report;
        v. precautionary assumption added to precautionary assumption added to precautionary assumption;
        vi. peer review of 2012 Update is 1 page "Overview comments" (Appendix H), which refers to results being "necessarily conservative (precautionary)", purportedly to comply with the 2008 MFE Guidance Manual;
        vii. flashing lights to me saying "investigate further";
        viii. and then I read the 2007 peer reviewer report.

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[3] The author of all of the CSL reports that I refer to is Dr Roger Shand.

[4] Available at http://www.kapiticoast.govt.nz/Documents/Downloads/District-Plan-Review/coastal-hazards/Kapiti_Coast-Erosion_Hazard_Assessment_Part1_Open_Coast.pdf.

[5] Available at http://www.kapiticoast.govt.nz/Documents/Downloads/District-Plan-Review/coastal-hazards/Kapiti_Coast_Erosion_Hazard_Assessment_Part2_Inlets.pdf.

[6] Available at http://www.kapiticoast.govt.nz/Documents/Downloads/District-Plan-Review/coastal-hazards/Kapiti_Coast_Erosion_Hazard_Assessment_2012_Update.pdf.

e. 2007 CSL "Summary of Peer Reviewer comments on the KCDC Open Coast Erosion Hazard Report"[7], February 2007 (2007 Compilation) - 50 years. The following quotes are from the author of the CSL reports:

> "Given the conservative manner in which all the components have been derived, coupled with the extrapolation uncertainty noted above, it is recommended that the 50 yr values be used be adopted [sic], with an understanding that they are [sic] can be applied to a 50 to 100 yr period if a hazard review is undertaken at 10 yr intervals." (page 20)
>
> "In an effort to simplify the computation method - thereby facilitating hazard update by future council staff, the method of combining hazard components has now been modified. All positive (acretionary) [sic] long-term rates of change have been set to 0. This practice is becoming more common in hazard assessment. The approach also remove [sic] the models [sic] reliance on trend continuity. This approach has effectively doubled the hazard distances along the north coast." (underlining is original, page 23)

So:

- the components are so conservative that the 50 year results could be used for 100 years, with reviews;
- with $1 billion+ of property affected, to simplify the computation method "thereby facilitating hazard update by future council staff", all accretionary long-term rates of change are set to 0; and
- the effect of putting accretion at 0 is to double the hazard distances along the north coast.

That's all rather startling.

This February 2007 compilation (over a year before the March 2008 reports were finished), the 3 page "Peer Review" of the 2008 Inlets report and the 1 page "Overview comments" in the 2012 Update are the only peer review documentation available and, in my opinion, demonstrate the superficiality of the peer review.

f. 29 November 2012 - KCDC Proposed District Plan notified under the RMA:
   i. will eventually replace the operative District Plan (does not just deal with coastal erosion);
   ii. CSL reports are used as the basis for no-build and relocatable zones.

[7] Not currently available on KCDC's website but I understand that KCDC may add it to the website.

g. September 2013 - CSL report on the northern shore of the Waimeha Inlet[8] produces different results:
    i. "The 1973 and 1988 aerial photo-based inlet shorelines used for the previous assessments were of poor quality so improved imagery was acquired, processed and shorelines abstracted." (page 6);
    ii. lines moved substantially seaward, if not completely off, the property of the landowner.

h. November 2013 - CSL draft (but not released[9]) report for the Mangaone Inlet produces different results:
    i. original reports - "it was not considered necessary to carry out a separate hazard assessment for a managed inlet scenario" (2008 Inlets report page 27, see also the 2012 Update page 36) for the Mangaone Inlet. That was despite the inlet being managed, the 2008 report identifying the management regime[10], the 2012 Update referring to the stream mouth cutting[11] and KCDC's terms of reference for CSL stating that managed and unmanaged scenarios should be done;
    ii. revised outcome (now providing a managed scenario) = 2 or 3 properties affected, not around 30[12].

i. January 2014 - CSL report for the Waikanae estuary in the vicinity of Kotuku Parks subdivision[13] produces different results:
    i. "Both the managed and unmanaged lines are now seaward of the Kotuku Parks boundary by about 40 m with the managed line adjustment increasing up to about 65 m in the northern sector" (page 7).

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8 Available at http://www.kapiticoast.govt.nz/Documents/Downloads/District-Plan-Review/coastal-hazards/reports/Erosion-Hazard-Reassessment-northern-shoreline-of-Waimeha-Inlet.pdf.

9 The version that KCDC has is labelled "DRAFT" and "NOTE this is a DRAFT assessment for professional review. This document is not to be forwarded without the authors [sic] permission." It is not on KCDC's website.

10 Page 27 of the 2008 Inlets report, section 3.4.1 states: "More recently, erosion and flood prevention management has been carried out when formal trigger conditions defined in the Wellington Regional Coastal Plan are exceeded. In particular, *stream mouth cutting is carried out when the channel outlet within the coastal marine area migrates either 100 m south or 300 m north of Te Horo Beach Road* …., or *w*hen *the water level increases 300 mm or more above its normal level at Sims Road*." (emphasis original).

11 The 2012 Update records "… more recently, stream mouth cutting has been carried out to prevent lateral migration of the channel." (page 36).

12 In the draft managed scenario report, our property is not affected at all.

13 Not currently available on KCDC's website but I understand that KCDC may add it to the website.

j. mid 2013 - June 2014 - KCDC appoints independent Coastal Panel - 2 international coastal experts (USA[14] & Australia[15]), 1 New Zealand coastal expert[16] and 1 statistician[17] to review the CSL reports. The Coastal Panel's report[18]:
   i. identifies numerous problems with the CSL reports;
   ii. ironically, rejects CSL's approach to the short-term component in favour of Lumsden's, but subject to qualifications;
   iii. concludes "… the hazard lines recommended by CSL are not sufficiently robust to be incorporated into the Proposed District Plan …". (section ES.1 Overview, see also page 51).

k. December 2013 - June 2014 - KCDC appoints Richard Fowler QC and senior planner Sylvia Allan to review the Proposed District Plan (PDP). Their report[19]:
   i. has significant recommendations regarding the PDP generally, but not that it be totally withdrawn;
   ii. recommends that all of the coastal hazard provisions be removed from the PDP.

Coastal Panel - problems with the CSL reports

11. The Coastal Panel identified a number of problems in the CSL reports, including:

a. intentionally double-counting the recession caused by sea level rise - "Purposely double counting is a decidedly unconventional approach, and should not be followed …" (page 34);

b. concern that there may also be double counting when the "catch up" term is applied to some areas where a sea wall is lost or removed (page 29). "In the modelling of the "remove sea-walls" scenario the "catch-up" term in the 100-year projection appears to be incorrectly handled. It is doubled … It should be left as is." (page 45);

c. inappropriate approach to the short-term component - "the CSL assessments of the short-term hazards cannot be viewed as being robust …". "It is the recommendation of this Panel that the analysis methodologies applied by Lumsden (2003) be adopted …", subject to qualifications (section ES.4 see also pages 37-39);

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[14] Dr Paul D Komar, Emeritus Professor of Oceanography, Oregon State University, USA.

[15] Mr James T Carley, Principal Coastal Engineer, Water Research Laboratory, UNSW, Australia.

[16] Dr Paul S Kench, Professor and Head of Department, School of Environment, University of Auckland.

[17] Dr Robert B Davies, Statistician, Statistics Research Associates Limited, Wellington.

[18] Available at http://www.kapiticoast.govt.nz/Documents/Downloads/District-Plan-Review/Proposed-District-Plan/Independent-review/Coastal_Erosion_Hazard_Assessment_Review_of_the_science_and_assessments_undertaken_for_the_PDP.pdf.

[19] Available at http://www.kapiticoast.govt.nz/Documents/Downloads/District-Plan-Review/Proposed-District-Plan/Independent-review/Independent_Review_of_the_Kapiti_Coast_PDP.pdf.

d. failure to include accretion where it exists -

    i. "The Panel recognises that CSL is correct in this [setting accretion at 0 in accreting coasts] being a common practice … although in the case of the [Kapiti] Coast it represents a rather extreme assumption that future rates of rising sea levels will overcome the positive balance provided by the sediment budget. The question of this being a valid assumption, that the cuspate foreland would soon disappear under rising sea levels, could be addressed by an evaluation of the sediment budget …" (page 30). (CSL did not do a sediment budget).

    ii. "Along with revised open coast assessments, scenarios of change [for inlets] under accretionary coast conditions should be considered" (section ES.5, see also pages 44 and 53);

e. in relation to the dune stability component, "More elevated portions of the coast (south of about Raumati) are subject to more complex slope stability processes than the simple dune stability model used in CSL (2008a). Issues include (but may not be limited to) the sand grain size adopted and the assumption of dry sand. It is recommended that specialist geotechnical engineering advice be sought regarding slope stability in these areas" (page 40);

f. the inlets reports produced a "first approximation" of inlet erosion hazards (repeated several times on pages 43 and 44 of the Coastal Panel's report, although neither the CSL 2008 Inlets report nor the 2012 Update described the inlets approach as a "first approximation"). Weaknesses in the inlets approach include a number of matters (see pages 43, 53 and section ES.5) including:

    i. the approach masks the variability in the alongshore dynamics of inlet entrances;

    ii. the approach assumes that the lagoon shorelines will migrate landward, which ignores the likely primary control on such shorelines;

    iii. it assumed the coast will be erosional/recessionary, despite evidence that some parts of the coast and inlets have been in net accretion in the past; and

    iv. how the inlet and open coast hazard zones are merged should be reconsidered and a transparent procedure invoked;

g. a number of statistical technique issues (page 45):

    i. "It is recommended that studies such as these involve an experienced statistician, preferably one familiar with time-series analysis. There seems to have been only limited involvement of a statistician in the CSL analyses";

    ii. "…the simple regression analysis, linear or not, used in the CSL analyses is likely to be inappropriate for the data sets considered here.";

iii. "From a statistical perspective, it is recommended that "best estimates" rather than precautionary values be adopted, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate. Alternatively, one could give several scenarios based on best, worst and mid-way cases.";

iv. "An economic assessment of the consequences of planning restrictions needs to be undertaken before imposing them, since the restrictions may have been made on the basis of calculations which may be excessively precautionary. One needs to balance the cost to property owners of any restrictions with the actual risk (and its time scale) and one can't do this if there are hidden "precautionary" adjustments."

12. As already noted, the Coastal Panel concluded:

> "… the hazard lines recommended by CSL are not sufficiently robust to be incorporated into the Proposed District Plan …". (section ES.1 Overview, see also page 51).

13. The Coastal Panel also said (page 47):

a. "Adaptive management provides a realistic alternative to excess speculation regarding definitive future coastal hazards."; and

b. "The assessment of coastal hazard zones should consider a range of plausible scenarios (e.g. low, mid, high, or best estimate and extremes)."

Practice of ignoring accretion is contrary to Policy 24(1)(b) of the NZCPS 2010

14. I return to the Coastal Panel's comment that:

> "The Panel recognises that CSL is correct in this [setting accretion at 0 in accreting coasts] being a common practice … although in the case of the [Kapiti] Coast it represents a rather extreme assumption that future rates of rising sea levels will overcome the positive balance provided by the sediment budget."

15. It may be that a practice of ignoring accretion has developed over time among New Zealand and/or overseas coastal experts. However, such a practice cannot override the express provision introduced in New Zealand in Policy 24(1)(b) of the NZCPS 2010 that a Council is to assess hazard risks having regard to:

> "short-term and long-term natural dynamic fluctuations of erosion <u>and accretion</u>" (emphasis added).

16. If coastal scientists in New Zealand had developed a practice of ignoring accretion, such a practice should have stopped as of 3 December 2010 to enable Councils to fulfil their obligations under the NZCPS 2010.

What KCDC has done in response to the Coastal Panel and the Planning/Legal reports

17. KCDC has:

a. withdrawn the coastal hazard provisions of the PDP;

b. put a disclaimer, outlined in red, on the CSL reports on the KCDC website:

> "Disclaimer: before reading this report you need to be aware that an independent panel of coastal experts has found that the information contained in this report is not appropriate for planning purposes. A further independent planning report has subsequently recommended that the Council withdraw from the Proposed District Plan the coastal hazard management areas associated with this report and undertake further work in regard to the underlying methodologies for use in relation to future planning for the [Kapiti] District. The information contained in this report should not therefore be relied upon.";

c. removed the projected shorelines maps from KCDC's website;

d. withdrawn the information on the LIMs but included a general comment about coastal erosion;

e. stopped using the CSL reports as a basis for putting a notice on a property title under the Building Act if a building consent is granted for construction of a building, or major alterations to a building, on land that is subject or is likely to be subject to coastal erosion. KCDC's letter dated 19 December 2013 to property owners said that the endorsements that had been put on title would be reviewed and, where necessary, removed at no cost to the owner. Further building consents are being dealt with under the operative District Plan or on a case-by-case basis, not the PDP or CSL reports;

f. started reviewing all of the PDP and taking steps for further relevant coastal erosion work to be done;

g. written to CSL about misleading statements on the CSL website. The letter dated 12 February 2015 said:

> "… For the record the Council does not accept that the independent panel identified "very few issues" and that the CSL report is "fit for purpose"…
>
> It is therefore difficult to see how any reasonable person could conclude that the CSL report is "fit for purpose"… The Council will not hesitate to make its views known to any person making inquiries about the work CSL carried out for the Council on coastal hazards…
>
> The Council wishes to make it quite clear to you that it disassociates itself from the statements made on the CSL website regarding the Kapiti erosion assessments."

18. As of March 2015 (the website records that the page was updated 15 March 2015), the information in the Kapiti Erosion Hazard Assessments tab on the CSL website became more misleading further to KCDC's letter, not less. The CSL assertions are misleading, contain errors of law and fact, and should not be relied upon.

Morphing information as to Kapiti results

19. Over time, the CSL results have morphed from:

    a. "likely" and "likely risk of significant erosion or inundation" (KCDC letter of 25 August 2012 to affected residents); to

    b. "based on a worst case scenario" (KCDC letter of 18 January 2013 to affected residents) - worse than what and by how much were not explained; to

    c. "Very unlikely" (CSL website March 2015).

20. 25 August 2012 letter to affected residents - the coastal hazard assessment:

> "... predicts where the shoreline is <u>likely to be</u> along [Kapiti] Coast within 50 and 100 years…
>
> Around 1,800 properties - including most beachfront properties in the district - are <u>at likely risk of significant erosion or inundation</u> (flooding) within 100 years. Up to 1,000 of these may be affected within 50 years." (emphases added)

21. 3 September 2012 - the then Mayor's column "A Moment with our Mayor" in the *Kapiti Observer*:

> "Around 1800 coastal properties in Kapiti are <u>likely to be at significant risk</u> of coastal erosion within the next 100 years and up to 1000 of these within the next 50 years.
>
> …
>
> We have also been briefing a number of other significant stakeholders including local real estate agents, lawyers and valuers.
>
> At this point it is not known what effect this will have on property values, although an economic study in Whakatane District shows this information did not have a long term impact.
>
> Council's current policy is to maintain and protect roads and public health infrastructure (water supply, stormwater and sewerage) in the short term. However, we will progressively move public infrastructure away from areas of high risk.
>
> I completely empathise with residents who are anxious about this new direction and encourage you to visit our website …
>
> Have a good week." (emphasis added)

22. KCDC was obviously under the impression that the CSL reports were providing information as to what was likely to occur. Busy telling real estate agents, lawyers and valuers. Considering what to do about infrastructure. Considering the effect on property values. Empathising with affected residents.

23. 5 months later, on 18 January 2013, - KCDC letter to affected residents - the assessment is:

> "based on a worst case scenario"

but worse than what and by how much were not identified.

24. March 2015 - CSL website's newly-created key to the Kapiti projected shorelines maps describes the results as:

> "Very unlikely".

25. So, between August 2012 and March 2015, the exact same results have morphed from likely to very unlikely. In my opinion, that is appalling.

Some relevant statutory, and related, provisions

26. The CSL reports were prepared for RMA purposes, including the NZPCS and district plans. Under s 75(3)(b) of the RMA, a district plan must give effect to the NZCPS 2010.

27. The NZCPS 2010 states:

> "This NZCPS is to be applied as required by the [RMA] by persons exercising functions and powers under the [RMA]." (page 7).

28. It is therefore the role of the Council (or the Environment Court) to apply the NZCPS 2010 as required by the RMA, not the role of coastal scientists.

29. Policy 24 states the functions of the Council in relation to the identification of coastal hazards:

> "**Policy 24 - Identification of coastal hazards**
>
> (1) Identify areas in the coastal environment that are potentially affected by coastal hazards (including tsunami), giving priority to the identification of areas at high risk of being affected. Hazard risks, over at least 100 years, are to be assessed having regard to:
> (a) physical drivers and processes that cause coastal change including sea level rise;
> (b) short-term and long-term natural dynamic fluctuations of erosion and accretion;
> (c) geomorphological character;
> (d) the potential for inundation of the coastal environment, taking into account potential sources, inundation pathways and overland extent;
> (e) cumulative effects of sea level rise, storm surge and wave height under storm conditions;
> (f) influences that humans have had or are having on the coast;
> (g) the extent and permanence of built development; and
> (h) the effects of climate change on:
> (i) matters (a) to (g) above;
> (ii) storm frequency, intensity and surges; and
> (iii) coastal sediment dynamics;
> taking into account national guidance and the best available information on the likely effects of climate change on the region or district." (emphases added)

30. I have often seen Policy 24 set out incorrectly. The mistake that people make is indenting the words at the end ie "taking into account … the likely effects of climate change on the region or district" so it looks like those words are part of (h). But they are not part of (h). They form the ending of what is a long sentence that effectively reads:

> "Hazard risks, over at least 100 years, are to be assessed having regard to [(a) to (h)] taking into account … the best available information on the likely effects of climate change on the region or district."

31. Setting out Policy 24 incorrectly affects its meaning.

32. Policy 24 effectively says that the Council's function is to:

> "(1) Identify areas in the coastal environment that are potentially affected by coastal hazards (including tsunami), giving priority to the identification of areas at high risk of being affected. Hazard risks, over at least 100 years, are to be assessed having regard to [(a) to (h)] taking into account national guidance and the best available information on the likely effects of climate change on the region or district." (emphases added)

33. Risk is defined in the NZCPS 2010 as:

> "Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence …". (emphasis added)

34. So, to carry out its functions under Policy 24, a Council needs to:

a. identify areas potentially affected by coastal hazards, with the hazard risks being assessed taking into account the likely effects of climate change;

b. give priority to the identification of areas at high risk of being affected;

c. in assessing risk (likelihood x consequences), consider the likelihood of coastal erosion occurring and the consequences.

35. Policy 25 of the NZCPS 2010 deals with "areas potentially affected by coastal hazards", so "potentially affected" is used on its own there. However, it is my view that it should be read in the context of Policy 24, which specifically deals with the "[identification of] areas … potentially affected by coastal hazards" and also refers to the likely effects of climate change (and hazard risks), so that Policy 25 addresses areas identified by Policy 24.

36. Policy 27 of the NZCPS 2010 identifies the range of options the Council should assess for reducing coastal hazard risks in areas of significant existing development likely to be affected by coastal hazards. These areas should also have been identified by the Council during the Policy 24 process, as a subset of the other areas.

37. The first part of Policy 27 states:

> "**Strategies for protecting significant existing development from coastal hazard risk**
>
> (1) In areas of significant existing development likely to be affected by coastal hazards, the range of options for reducing coastal hazard risk that should be assessed includes: …" (emphases added)

38. Affected Kapiti properties = $1 billion+.

39. Providing only "very unlikely" results, especially in Kapiti (or in other areas of significant existing development):

a. does not provide KCDC (or any Council) with the appropriate scientific information that it needs to carry out its tasks;

b. does not enable the community to participate in the RMA process with appropriate scientific information; and

c. wastes resources as it does not enable the Council to focus attention on the areas where options for reducing coastal hazards are actually needed ie the areas likely to be affected.

40. Policy 3(2) of the NZCPS 2010 states:

> "In particular, adopt a precautionary approach to use and management of coastal resources potentially vulnerable to effects from climate change, so that:
> (a) avoidable social and economic loss and harm to communities does not occur;
> (b) natural adjustments for coastal processes, natural defences, ecosystems, habitat and species are allowed to occur; and
> (c) the natural character, public access, amenity and other values of the coastal environment meet the needs of future generations."

41. Some coastal scientists seem to have interpreted this provision as applying to them and therefore think that their scientific assessment of coastal hazards should be precautionary. Indeed, according to CSL's website as at March 2015, a number apparently consider that their results should be "very unlikely".

42. I have had a coastal expert (not any expert referred to on the CSL website) confidently tell me to my face that they need to provide precautionary results, and look at me like I was an idiot for thinking otherwise.

43. However:

a. the provision is referring to what Councils are to do (not coastal scientists);

b. it relates to "use and management of coastal resources" so, planning and resource consent matters, not identification of the hazards which is addressed in Policy 24;

c. it uses different wording from Policies 24 to 27 ie "potentially vulnerable" so it is arguable whether it should be read in light of Policy 24 or not which makes it all the more important for coastal experts to prepare assessments based on objective science so that no matter what way the law is interpreted or what specific policies apply, the decision-maker has the relevant scientific basis for the decision;

d. it refers to adopting a precautionary approach to use and management of coastal resources potentially vulnerable to effects from climate change, <u>so that avoidable social and economic loss and harm to communities does not occur</u>. In my view, that reads both ways. Too stringent provisions can cause avoidable social and economic loss and harm to communities as can too lenient provisions.

44. In short, Policy 3 does not direct that coastal hazard assessments should be precautionary.

45. Confirmation of that also comes from DOC's Guidance note on Policy 3 that says "The application of the precautionary approach is a risk management approach rather than a risk assessment approach." (page 6)

46. Other relevant statutes for different purposes:

    a. Section 44A(2)(a) Local Government Official Information and Meetings Act 1987 different - matters to be included in a land information memorandum (LIM) are:

        > "information identifying each (if any) special feature or characteristic of the land concerned, including but not limited to potential erosion, … [that] … is not apparent from … a district plan under the [RMA]" (emphasis added).

    Potential erosion is referred to on its own without qualifications. The provision ceases to apply when the district plan deals with the matter so limited effect. The reference to the district plan is relevant in that a Council would not normally expect to receive a report in the nature of CSL's reports, identifying only very unlikely results, for district plan purposes.

    This is the provision the *Weir v KCDC* High Court judicial review case was about [2013] NZHC 3522 and [2015] NZHC 43.

    b. Sections 71-74 Building Act 2004 - relevant to notices on title for building consents - s 71(1)(a) refers to land which:

        > "is subject or is likely to be subject" (emphases added) to natural hazards.

    If a person obtains a building consent for construction of a new building, or major alterations to a building, on land that is subject or is likely to be subject to a natural hazard, a notice goes on the property title about the hazard. A coastal hazard assessment that doesn't identify land that is subject or is likely to be subject to coastal erosion jeopardises Council's use of the Building Act, as has happened in Kapiti.

How some NZ coastal scientists interpret the law and approach their role

47. One wonders how the exact same results can morph from:

    a. "likely"; to

    b. "based on a worst case scenario" (but worse than what and by how much were not explained); to

    c. "very unlikely".

48. It seems extraordinary for that to be able to occur. How could such a thing happen, with $1 billion+ of property affected?

49. If I hadn't lived through it myself I would have found it difficult to believe that such a thing could happen.

50. My view is that it has occurred because some coastal scientists are:

    a. misinterpreting or ignoring the law;

    b. misunderstanding their proper role in the RMA process;

    c. providing only very unlikely results (or results of that ilk);

    d. failing to explain clearly the nature of such results (instead, referring to precautionary, conservative, potential) thereby camouflaging the very unlikely nature of the results;

    e. failing to get proper statistical input;

    f. failing to report the uncertainties;

    g. providing false certainty of overstated results; and

    h. unintentionally undermining, or indeed sabotaging, the RMA processes.

51. I have already noted that the district plan must give effect to the NZCPS 2010. I have set out some elements of Policies 3, 24, 25 and 27 and discussed the relevant wording. All of the provisions of the NZCPS 2010 are relevant, including the objectives and policies.

52. It is the Council's role (not coastal scientists) to give effect to the NZCPS 2010 in the district plan.

53. It is the role of the coastal scientist to provide appropriate objective, scientific information:

    a. to enable submitters to participate in the RMA process; and

    b. decision-makers to make appropriate decisions,

    in an informed manner.

54. Some NZ coastal scientists seem to be usurping the decision-maker's role in deciding that only "precautionary" or "conservative" or "potential" results should be provided without clarifying how precautionary or conservative the results are or what the coastal scientist means by potential - and compared to what. Some are providing only results that are very unlikely.

55. The Supreme Court in *Sustain our Sounds Inc v The New Zealand King Salmon Company Ltd* [2014] NZSC 40 said:

> "[157] We accept that public participation is a key tenet of decision making under the RMA with many public participatory processes… As noted by Keith J in *Discount Brands Ltd v Westfield (New Zealand) Ltd*, the purpose of these processes is to recognise and protect the particular rights of those who are affected and to enhance the quality of the decision making."

56. The extract below is from the CSL website under the tab Kapiti Erosion Hazard Assessments (the website indicates that the page was updated on 15 March 2015). The extract is interesting (though troubling) in its failure to understand the difference between the High Court judicial review LIM statutory context and the NZCPS 2010/RMA context, and in what it says about how coastal practitioners interpret their role:

> "The 2008 assessment had been carried out conservatively enough to meet the "potential" hazard (risk) level specifically stipulated in the NZCPS 2010, along with additional requirements to allow for increased uncertainty associated with predicted climate change. It is noted that "potential erosion" is typically interpreted by practitioners as erosion occurring under an extreme set of circumstances and as such is "very unlikely" to occur. It is noted that the High Court has recently defined potential erosion as a "reasonably possible worst case scenario… i.e. a worst case scenario objectively determined and evidentially based" (CIV-2012-485-2577 [2015] NZHC 43). Such definitions are entirely appropriate as developers, prospective purchasers and insurers want to know that in the future their property of interest will be virtually free of erosion hazard." (emphasis added)

57. The newly-created key (as of March 2015) for the Kapiti projected shorelines maps on CSL's website identifies that CSL's Kapiti results are "Very unlikely".

58. So, the extract and the newly-created key are saying that, in the RMA context and according to the NZCPS 2010, coastal practitioners consider that their proper role is to provide only very unlikely results.

59. It becomes particularly problematic if coastal scientists consider it their role to provide only very unlikely results, but label them in ambiguous ways such as precautionary, conservative, or potential, thus camouflaging the fact that they are providing results that are, in fact, "very unlikely".

60. It is relevant to note that there is no reference in the CSL 2008 reports or the 2012 Update to the results being a worst case scenario, let alone a reasonably possible one. The language about a worst case scenario started with KCDC's letter to affected residents in January 2013.

61. Instead, the CSL 2008 and 2012 reports use the terms "precautionary" or "conservative", but just how precautionary or conservative, or precautionary or conservative compared to what, is not explained.

62. Kapiti has many areas of significant existing development. KCDC obviously considered that it was being given results that were likely, not very unlikely.

63. Using ambiguous language to describe "very unlikely" results is not helpful.

64. In addition, the idea that it is the role of coastal scientists to provide only "very unlikely" results in the RMA and NZCPS 2010 context:

    a. ignores the difference between s 44A of the Local Government Official Information and Meetings Act (where the word "potential" erosion is used on its own) and the RMA and Policies 24, 25 and 27 of the

NZCPS 2010 where it is not[20], as has already been discussed;

b. ignores the difference between judicial review of LIMs where there is a low threshold for assuming the validity of results and the RMA process where the "science and the reliability of his 50 and 100 year lines will be put to the test", as noted by the High Court in para [35] of the interim judgment;

c. fails to understand that it is the role of the coastal scientist to provide objective, scientific results to enable submitters to participate, and decision-maker to make decisions, based on results that are fit for purpose;

d. fails to understand that it is the role of the Council (or the Environment Court) to apply the Policy 3 precautionary approach, not the coastal scientist.

65. I refer to the point in b in the preceding paragraph about ignoring the difference between judicial review of LIMs where there is a low threshold for assuming the validity of results and the RMA process where the "science and the reliability of his 50 and 100 year lines will be put to the test". In the final judgment, the High Court said:

> "[7] The panel has since found, I am advised, that the Shand lines were not sufficiently robust to warrant their inclusion in the District Plan. With that finding in hand, the Council has now resolved to remove the lines from all LIMs because, according to Mr Stephens, they do not now meet the criteria for mandatory disclosure in s 44A(2). There remains on the LIMs some precautionary wording about coastal erosion, the terms of which have been agreed between the parties…
>
> [17] … In truth, the review panel undertook its work in the context of the Council's consideration of the proposed District Plan. That is evidence that the system works as it was designed to work. As I said at [53] of the interim judgment:
>
> > I am satisfied that Mr [sic] Shand's science is sufficiently robust to satisfy that relatively low threshold requirement [i.e. a reasonable possibility of erosion]. Of course I say nothing at all about whether the Shand Report and the Shand lines should survive a more rigorous merit-based review through the District Plan Review process under the Resource Management Act 1991. That is not my arena. [the square brackets in the quote are the Court's]
>
> [18] The merits of the Shand lines were tested and found wanting…".

[20] As already noted, Policy 25 of the NZCPS 2010 deals with "areas potentially affected by coastal hazards", so "potentially affected" is used on its own there. However, it is my view that it should be read in the context of Policy 24, which specifically deals with the "[identification of] areas … potentially affected by coastal hazards" and also refers to the likely effects of climate change (and hazard risks), so that Policy 25 addresses areas identified by Policy 24.

66. KCDC had affidavits from 4 coastal scientists in the *Weir v KCDC* case. The interim judgment includes statements that, in my view, demonstrate that coastal scientists are misunderstanding their role:

> "[47] It is also reflected, Mr Stephens argued, in the Ministry for the Environment's Coastal Hazards and Climate Change Guidelines …:
>
> > Coastal erosion, on the other hand, at present tends not to be expressed probabilistically. As it is an ongoing process (a creeping hazard) it is usually defined as the expected position of the coast at a certain future point in time. [emphasis added]
>
> [48] The thrust of the evidence of scientists for KCDC was that the lines provide a sound worst case prediction over the assessment period using orthodox and up-to-date methods, together with an appropriately precautionary approach as required by the NZCPS." (emphases added)

67. The coastal scientists have apparently:

a. failed to consider that the MFE Guidelines refer to the "expected position" of the coast, not the worst case or very unlikely position;

b. failed to consider the reference in Policy 24 to the "likely effects" of climate change, the definition of risk which requires consideration of the likelihood of the event, and the reference in Policy 27 to areas of significant existing development "likely" to be affected;

c. failed to realise that it is not the role of coastal scientists to apply a "precautionary approach" to hazard identification. As already noted, Policy 3(2) refers to use and management of coastal resources. Application of the precautionary approach is the role of the Council (or the Environment Court), not the coastal scientists.

68. In addition, the evidence demonstrates the misleading nature of the CSL reports. Nowhere do the reports identify that the results are a worst case. Instead, they are precautionary or conservative, conveying a different meaning. Indeed, we know now that the results are in fact very unlikely.

69. In summary, my view is that a number of coastal experts have the wrong end of the stick in terms of their interpretation of the relevant legal provisions and their appropriate role in the process. That is causing a lot of trouble and undermines both the RMA and the NZCPS 2010.

70. The recommendations of the independent Coastal Panel engaged by KCDC are instructive.

71. The Coastal Panel said:

> "It is recommended that studies such as these involve an experienced statistician, preferably one familiar with time-series analysis. There seems to have been only limited involvement of a statistician in the CSL analyses" (page 45);

> "From a statistical perspective, it is recommended that "best estimates" rather than precautionary values be adopted, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate. Alternatively, one could give several scenarios based on best, worst and mid-way cases." (page 45); and
>
> "An economic assessment of the consequences of planning restrictions needs to be undertaken before imposing them, since the restrictions may have been made on the basis of calculations which may be excessively precautionary. One needs to balance the cost to property owners of any restrictions with the actual risk (and its time scale) and one can't do this if there are hidden "precautionary" adjustments" (page 45).

72. From a legal perspective, I generally endorse what the Coastal Panel has said about these matters, but many coastal experts do not provide either:

    a. "best estimates" rather than precautionary values, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate; or

    b. several scenarios based on best, worst and mid-way cases.

73. Doing what the Coastal Panel recommends from a statistical perspective would enable everyone in the RMA process to participate effectively.

74. Risk management and effective decision-making requires an understanding of the uncertainties. Providing only very unlikely results (and/or describing them in ambiguous terms) does not assist submitters to participate effectively in the RMA process or enable Councils and the Environment Court to make informed decisions.

75. Interestingly, the Coastal Panel also said:

> "Where no factor of safety is adopted, conventional practice has been to adopt conservative/precautionary values. While it is appropriate to include a safety margin, this needs to be done in a transparent way and after taking account of the uncertainties involved in the estimates." (page 40)

76. So conventional practice developed among coastal experts, presumably without considering:

    a. the appropriateness of the "best estimates" statistical perspective; and

    b. the need for transparent information to be provided in the RMA legal process both for submitters and decision-makers

    may be a large part of the problem.

77. It is my view that variability in results should be reported and the uncertainties explicitly identified.

78. Just by way of example, if there is variability along a coast in relation to different components relevant to modelling, my view is that such variability

should also be reported rather than adopting precautionary/conservative values to each component as the "conventional practice" apparently supports.

79. The regrettable result of the "conventional practice" is that one ends up with precautionary assumption, added to precautionary assumption, added to precautionary assumption for each component of the model. The effect of those precautionary assumptions remains hidden and the cumulative effect can be significant.

80. As the Coastal Panel noted, from a statistical perspective "best estimates" are appropriate with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate.

81. In my view, the same applies from a legal perspective. It enables properly-informed participation and decision-making in the RMA processes.

82. The approach of a number of New Zealand coastal scientists in providing only very unlikely results (and describing them in ambiguous terms) is, in my view, highly problematic.

83. It is particularly problematic as it is difficult to get to the bottom of what the coastal experts are actually doing. Over time, I have developed suspicions about what some might be doing. But it has taken me far too many hours, and several years, to uncover that the CSL results are not:

    a. "likely" as initially described by KCDC; or

    b. "precautionary" or "conservative", terms used in the 2008 and 2012 reports; or

    c. "based on a worst case scenario" as later described by KCDC; but

    d. "very unlikely" as described on CSL's own website in March 2015.

84. In the next section, I deal with some recent New Zealand cases that give an indication of what the Environment Court may be thinking in relation to these aspects as well.

Hints from the Environment Court

85. There may be some hints from the Environment Court about appropriate approaches, but I don't want to overstate what the Court may be inferring.

86. It is relevant to recall the Coastal Panel's comment about adopting "best estimates" rather than precautionary values, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate. Or several scenarios based on best, worst and mid-way cases.

87. *Gallagher v Tasman District Council* [2014] NZEnvC 245 was a plan change hearing mainly about inundation from sea level rise rather than coastal erosion.

88. At para [95], the Court said:

> "The coastal witnesses all agreed that a conservative approach should be adopted in assessing the hazard risk from coastal inundation induced flooding on the Gallagher property … we have decided that [a specified overtopping rate] should be adopted as the *best fit* from all of the evidence which we heard. We consider that it is a realistic possibility." (emphasis is the Court's)

89. In the end, it was not determinative, but:

a. it is interesting that all of the coastal witnesses agreed that a conservative - there's that word again - approach should be adopted; but

b. the Court seems to be saying it is adopting the rate because it is the "best fit", rather than because it is a conservative approach.

90. It is also relevant to note the Court's reference to a "realistic" possibility.

91. At para [73], the Court said:

> "During the hearing there was extensive questioning of the witnesses on a number of key parameters … for which there were significant differences of opinion… Despite this questioning, for the most part we were left little the wiser."

92. A problem if coastal experts are not careful, explicit and transparent about what they are doing is that it makes it unnecessarily difficult for the decision-maker.

93. *Mahanga E Tu Inc v Hawkes Bay Regional Council and Wairoa District Council* [2014] NZEnvC 83 is a case about a resource consent for a new subdivision in quite particular facts, not a case about provisions in a plan.

94. But it's interesting, and troubling, to see the differences in the predictions of the experts and interesting to see the comments of the Court.

95. The Environment Court identified that the property would be affected by erosion (at para [16]):

> "The Council submits, we think correctly, that the proposal cannot *avoid* the effects of coastal erosion over either 50 or 100 year periods. The best that can be done is to *mitigate* those effects through the process of managed retreat once the shoreline retracts to the chosen trigger point." (emphases are the Court's)

96. The Court said at para [35]:

> "It became evident from the different approaches by the coastal scientists dealing with essentially the same set of facts, that the preparation of accurate long term predictions for the behaviour of complex natural systems at a very small site is fraught with difficulty."

97. The erosion rates from the three experts, and the relevant paragraph references from the case, are:

- Mr Moynihan = - 0.14 m/yr (the long-term erosion rate will reduce or reach zero but some potential for no more than -0.14) (para [29]);
- Mr Reinen-Hamill = - 0.9 m/yr (para [30]); and
- Dr Roger Shand = - 1.2 m/yr (para [31]).

98. So after, say, 50 years, the differences in the predicted erosion at the site would be:

- Mr Moynihan = 7 m;
- Mr Reinen-Hamill = 45 m; and
- Dr Roger Shand = 60 m.

99. The Council in that case considered that 100 years was the appropriate planning period.

100. After 100 years, the differences would be even more dramatic:

- Mr Moynihan = 14 m;
- Mr Reinen-Hamill = 90 m; and
- Dr Roger Shand = 120 m.

101. So, what initially seem to be relatively small differences become enormous when multiplied by 50 or 100 years. In the special circumstances of that case, the Environment Court decided to use 20 years.

102. Both Dr Shand and Mr Reinen-Hamill had applied a 30% "factor of safety" to their predictions, a point that was criticised by Mr Moynihan (para [34]).

103. In relation to Dr Shand's prediction, the Court said:

> "[32] Dr Shand acknowledged that his analysis focused on the *potential* erosion hazard at the site over the 100 year planning period. He agreed that the *most likely* outcome was somewhat less than the potential hazard he identified, and would be around the predictions of Mr Reinen-Hamill." (emphases are the Court's)

104. The Environment Court did not accept the predictions of either Dr Shand or Mr Reinen-Hamill, referred to "a likely average rate of retreat of the shoreline at the site of around -0.4 m/yr", and decided to use 20 years as a relevant timeframe in the special circumstances of that case. The Court said:

> "[36] … we are more inclined to the rather more pragmatic approach of Mr Moynihan. In simple terms, there is an observed rate of long-term erosion … of less than -0.2 m/yr. If the influence of sea level rise in the future that is greater than that already observed in the long term rate is factored in, this could double the rate of long term erosion.
>
> [37] For the purpose of this decision, this would indicate a likely average rate of retreat of the shoreline at the site of around -0.4 m/yr …

> [38] We have not found it necessary to determine a precise time frame based on erosion rate predictions beyond the *most likely* scenario described above in order to answer the core question…" [emphasis is the Court's]…
>
> [84] When the coastal issues are explored, and the proposed mitigation accepted, there really is no reason, on the evidence, to decline the necessary consents. The appeal is declined and the grant of subdivision and resource consents by both Councils is confirmed."

105. An additional interesting factor about overstating results is that the Court explained that Mr Moynihan based his erosion rate predictions for the earlier Commissioners' hearing on the 2005 and 2007 analyses by Dr Jeremy Gibb (since retired and not available to give evidence at the Environment Court hearing). Various factors involved Mr Moynihan revisiting the erosion predictions. The Court said (at para [28]):

> "… Mr Moynihan noted that the observed rate of erosion at the site was far less than predicted by Dr Gibb in his coastal hazard assessment. This led to the conclusion that other processes (not accounted for in the model used by Dr Gibb …) were influencing the actual rate of erosion."

106. Again, without wishing to push things too far, interesting aspects of the *Mahanga E Tu Inc* case are:

a. the vast difference in the experts' predictions for coastal erosion for 50 years (7 m vs 45 m and 60 m) and 100 years (14 m vs 90 m and 120 m);

b. the Court not accepting the two more extreme predictions;

c. Dr Shand apparently referring to his results as "potential";

d. the difficulties the Court faced;

e. the Court referring to the most likely scenario and basing its decision on that; and

f. the Court indicating the difficulties of predictions at a small site.

107. From the opposite, and more general perspective, the vast difference in the predictions in this case (and the fact that observations had shown that earlier erosion predictions were in fact overstated) helps to demonstrate the potential perils of drawing lines on maps out 50 or 100 years, purporting to convey some measure of certainty, in what is an uncertain science, even when one is looking at specific facts at a specific site.

Problems with providing only very unlikely results or overstating results

108. A number of coastal experts apparently consider it their role to provide unlikely or very unlikely results, but label them in ambiguous ways such as precautionary, conservative, or potential.

109. A fundamental problem with providing only very unlikely results, or overstating results, is that it completely undermines the legal process that has been designed to enable informed participation and decision-making.

110. Proper expert information, including the uncertainties, is needed for informed participation and informed decision-making.

111. Decision-makers need to be able to consider all of the relevant factors that go into the mix and make their decisions based on informed judgement. Society ends up with sub-optimal decision-making when experts fail to provide the requisite information, including the uncertainties and any variability in any elements.

112. For as long as coastal scientists produce results that are not transparent and for as long as reports overstate the situation, conflicts between parties will continue and time and money will be wasted.

113. As already noted, to carry out its functions under Policy 24, the Council needs to:

    a. identify areas potentially affected by coastal hazards, with the hazard risks being assessed taking into account the likely effects of climate change;

    b. give priority to the identification of areas at high risk of being affected;

    c. in assessing risk (likelihood x consequences), consider the likelihood of coastal erosion occurring and the consequences.

114. In addition, Policy 24(1)(b) says that hazard risks are to be assessed having regard to "short-term and long-term natural dynamic fluctuations of erosion and accretion".

115. If coastal scientists in New Zealand had developed a practice of ignoring accretion, it should have stopped in New Zealand in December 2010 to enable Councils to fulfil their obligations under the NZCPS 2010.

116. Policy 27 sets out the range of options that KCDC (or any Council) should assess for reducing coastal hazard risk in areas of significant existing development likely to be affected by coastal hazards.

117. Providing only very unlikely results fails to recognise that for KCDC (or any Council) to consider a range of options for reducing coastal hazards in the areas of significant existing development that are very unlikely to be affected is:

    a. contrary to what Policy 27 says;

    b. a highly inefficient use of time and money; and

    c. perhaps most seriously, a distraction from the areas likely to be affected where the real focus, time and money should occur to identify options for reducing coastal erosion hazard risk.

118. Some of the troubling aspects about providing only very unlikely or overstated results, or not reporting the uncertainties, include:

a. coastal practitioners, rather than lawyers, purporting to interpret the law;

b. failing to realise the relevance and importance of the wording of the actual NZCPS 2010 provisions;

c. failing to appreciate that "developers, prospective purchasers and insurers [wanting] to know that in the future their property of interest will be virtually free of erosion hazard" is not an appropriate approach in the context of the RMA and the NZCPS 2010. Someone might well ask for such an assessment if that is what they want to achieve in a particular set of circumstances. But that is not what the wording (or the intent) of the NZCPS 2010 or the RMA contemplates and that is not what submitters and decision-makers in the RMA process need to participate effectively and to make informed decisions;

d. scientists providing policy results based on their own one-sided understanding of what they think people want rather than objective, scientific results based on the applicable law;

e. failing to realise that there are costs if restrictions are too precautionary, just as there are costs if restrictions are not sufficiently precautionary. It is for others ie the Council or the Environment Court to make the appropriate judgement, not coastal scientists;

f. failing to appreciate that the courts have said that the RMA is not a no-risk statute;

g. failing to appreciate that the role of a scientist is to provide the appropriate type of objective, scientific information, including the uncertainties, to enable KCDC (or any Council and, ultimately, the Environment Court) to make a decision on the basis of reliable and relevant scientific information and for submitters to participate effectively in the RMA process;

h. failing to understand that a coastal scientist should be providing objective, scientific results that are able to be used for the intended purpose. As the Coastal Panel said:

> "From a statistical perspective, it is recommended that "best estimates" rather than precautionary values be adopted, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate. Alternatively, one could give several scenarios based on best, worst and mid-way cases." (page 45)
>
> "The assessment of coastal hazard zones should consider a range of plausible scenarios (e.g. low, mid, high, or best estimate and extremes)." (ES.7 and page 47);

i. failing to appreciate that KCDC or any Council needs to assess the costs and benefits of any regulatory approaches (although it is required to give effect to the NZCPS 2010[21]). It is not for the coastal expert to decide to provide only results that show that properties will "in the future … be virtually free of erosion hazard" based on very unlikely results or for the coastal scientist to apply their own idea of acceptable policy. As the Coastal Panel said;

> "An economic assessment of the consequences of planning restrictions needs to be undertaken before imposing them, since the restrictions may have been made on the basis of calculations which may be excessively precautionary. One needs to balance the cost to property owners of any restrictions with the actual risk (and its time scale) and one can't do this if there are hidden "precautionary" adjustments" (page 45);

j. failing to describe the results in the CSL reports (or other experts' reports) as "very unlikely", instead using words like "precautionary" or "conservative" (others also use such terms, as well as "potential"), not identifying what is meant by those terms, and masking the true nature of the results being provided;

k. failing to appreciate that providing only very unlikely results, and doing that without explicitly stating that the results are very unlikely (instead of using ambiguous terms like "precautionary", "conservative" or "potential"), sabotages the legal process. There is not proper, objective, scientific information, including the uncertainties, to enable submitters to participate in an informed manner and to enable KCDC or any Council to carry out its functions.

119. Many people assume:

a. that residents will react negatively if provided with good information about risks to their property;

b. that in Kapiti it is the residents who are unreasonably rejecting steps that the Council is trying to take; and

c. if only people would listen to the coastal scientists everything would work out well.

120. Some residents may react negatively, but many want to know if their properties are exposed to risk and over what timeframe.

121. What Kapiti residents objected to was:

a. no consultation;

b. misrepresentation of the results;

c. lack of compliance with the law; and

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[21] *Environmental Defence Society Inc v The NZ King Salmon Co Ltd* [2014] NZSC 38.

d. precautionary assumption added to precautionary assumption added to precautionary assumption resulting in unreasonable, and now “very unlikely”, results.

122. CSL’s own subsequent reports for specific areas demonstrated that its own 2008 and 2012 reports considerably overstate the situation. In:

a. the northern part of the Waimeha inlet report, the lines were moved substantially seaward, if not completely off, the property of the landowner;

b. the Waikanae estuary in the vicinity of Kotuku Parks subdivision report, the lines were moved off the property. “Both the managed and unmanaged lines are now seaward of the Kotuku Parks boundary by about 40 m with the managed line adjustment increasing up to about 65 m in the northern sector” (page 7); and

c. the draft (but not released) managed scenario report for the Mangaone Inlet resulted in 2 or 3 properties being affected, not about 30.

123. Ultimately, it has been proven that the Kapiti residents were right. The results are not sufficiently robust to be used for the Proposed District Plan (Coastal Panel), should not be relied upon (KCDC’s website), and are very unlikely (CSL’s website).

124. But what a terrible waste of time, money, energy and emotion. And little or no progress in assessing the range of options for the areas that are truly at risk of erosion.

125. It is counterproductive to overstate the problem for many other reasons including:

a. it causes people to react negatively to the overstatements;

b. focusses attention on the overstatements rather than the main messages or solutions;

c. does not focus attention on areas truly at risk and assist in dealing with the issues faced by those in the areas at risk;

d. unfairly affects those not at risk;

e. wastes resources on areas not at risk;

f. does not enable the RMA process to proceed efficiently and effectively, with appropriate information for the submitters and the decision-maker.

Risk management and uncertainty - AS/NZS ISO 31000:2009 *Risk management - Principles and guidelines*

126. The definition of risk in the NZCPS 2010 refers to AS/NZS ISO 31000:2009 *Risk management - Principles and guidelines*. That Standard supersedes AS/NZS 4360:2004.

127. While the Standard may not legally be directly applicable, it is perhaps worth noting some of the principles from the Standard:

> "d) **Risk management explicitly addresses uncertainty.**
>
> Risk management explicitly takes account of uncertainty, the nature of that uncertainty, and how it can be addressed.
>
> …
>
> f) **Risk management is based on the best available information.**
>
> The inputs to the process of managing risk are based on information sources such as historical data, experience, stakeholder feedback, observation, forecasts and expert judgement. However, decision makers should inform themselves of, and should take into account, any limitations of the data or modelling used or the possibility of divergence among experts.
> …
>
> h) **Risk management takes human and cultural factors into account.**
>
> Risk management recognizes the capabilities, perceptions and intentions of external and internal people that can facilitate or hinder achievement of the organization's [organization is a wide-ranging term] objectives.
>
> i) **Risk management is transparent and inclusive.**
>
> Appropriate and timely involvement of stakeholders and, in particular, decision makers at all levels of the organization, ensures that risk management remains relevant and up-to-date. Involvement also allows stakeholders to be properly represented and to have their views taken into account in determining risk criteria."

128. Providing only very unlikely results, overstated results, or results with hidden (or difficult to untangle) precautionary adjustments:

a. does not explicitly take account of uncertainty;

b. does not provide the best available information;

c. perhaps demonstrates that a human factor currently being ignored is the human factor of the coastal scientists. Everyone assumes that

property owners are being unreasonable and that the scientists are being objective and scientific. That was my view of the Kapiti situation for a long time, before I eventually read the scientific reports; and

d. is not transparent and does not enable appropriate involvement of stakeholders. There is not the appropriate range and type of transparent, objective information to enable informed participation by submitters, or decision-makers, in the RMA process.

NZCPS 2010 provisions, the recommendations of the Coastal Panel vs conventional practice of NZ coastal experts, and what submitters and decision-makers are entitled to expect from scientific reports and coastal experts

129. In conclusion, I:

a. repeat what I said earlier about the wording of Policies 24, 25 and 27;

b. repeat some of the recommendations of the Coastal Panel;

c. consider the apparent conventional practice of NZ coastal experts; and

d. set out what, in my opinion, submitters and decision-makers are entitled to expect from scientific reports and coastal experts.

130. Policy 24 effectively says that the Council's function is to:

> "(1) Identify areas in the coastal environment that are potentially affected by coastal hazards (including tsunami), giving priority to the identification of areas at high risk of being affected. Hazard risks, over at least 100 years, are to be assessed having regard to [(a) to (h)] taking into account national guidance and the best available information on the likely effects of climate change on the region or district." (emphases added)

131. Risk is defined in the NZCPS 2010 as:

> "Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence …". (emphasis added)

132. So, to carry out its functions under Policy 24, a Council needs to:

a. identify areas potentially affected by coastal hazards, with the hazard risks being assessed taking into account the likely effects of climate change;

b. give priority to the identification of areas at high risk of being affected;

c. in assessing risk (likelihood x consequences), consider the likelihood of coastal erosion occurring and the consequences.

133. Policy 25 of the NZCPS 2010 deals with "areas potentially affected by coastal hazards", so "potentially affected" is used on its own there. However, it is my view that it should be read in the context of Policy 24, which specifically deals with the "[identification of] areas … potentially affected by coastal hazards" and also refers to the likely effects of climate change (and hazard risks), so that Policy 25 addresses areas identified by Policy 24.

134. Policy 27 of the NZCPS 2010 identifies the range of options the Council should assess for reducing coastal hazard risk in areas of significant existing development likely to be affected by coastal hazards. These areas should also have been identified by the Council during the Policy 24 process, as a subset of the other areas.

135. So producing only very unlikely or overstated results is not helpful. Nor are results where there are hidden precautionary adjustments or precautionary assumptions that cannot be readily untangled.

136. I repeat some of the recommendations of the Coastal Panel:

> "It is recommended that studies such as these involve an experienced statistician, preferably one familiar with time-series analysis. There seems to have been only limited involvement of a statistician in the CSL analyses" (page 45);
>
> "From a statistical perspective, it is recommended that "best estimates" rather than precautionary values be adopted, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate. Alternatively, one could give several scenarios based on best, worst and mid-way cases." (page 45);
>
> "An economic assessment of the consequences of planning restrictions needs to be undertaken before imposing them, since the restrictions may have been made on the basis of calculations which may be excessively precautionary. One needs to balance the cost to property owners of any restrictions with the actual risk (and its time scale) and one can't do this if there are hidden "precautionary" adjustments." (page 45)
>
> "Adaptive management provides a realistic alternative to excess speculation regarding definitive future coastal hazards." (page 47)
>
> "The assessment of coastal hazard zones should consider a range of plausible scenarios (e.g. low, mid, high, or best estimate and extremes)." (page 47)

137. From a legal perspective, I particularly agree with the statement that:

> "From a statistical perspective, it is recommended that "best estimates" rather than precautionary values be adopted, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate."

138. That is generally what I would have expected coastal experts to be doing. Doing that enables submitters and decision-makers to have access to transparent information about the assessment. I certainly did not expect to

uncover results based on precautionary assumption added to precautionary assumption added to precautionary assumption.

139. However, it is apparent that at least some coastal experts consider it their role to provide only very unlikely or overstated results.

140. The Coastal Panel said:

> "Where no factor of safety is adopted, conventional practice has been to adopt conservative/precautionary values. While it is appropriate to include a safety margin, this needs to be done in a transparent way and after taking account of the uncertainties involved in the estimates." (page 40)

141. So part of the problem may be this "conventional practice" that has apparently developed, presumably without considering:

a. the appropriateness of the "best estimates" statistical approach; and

b. the need for transparent information to be provided in the RMA legal process to enable submitters to participate, and decision-makers to make well-informed decisions, based on appropriate scientific information.

142. As already noted, the Supreme Court in *Sustain our Sounds Inc v The New Zealand King Salmon Company Ltd* [2014] NZSC 40 said:

> "[157] We accept that public participation is a key tenet of decision making under the RMA with many public participatory processes… As noted by Keith J in *Discount Brands Ltd v Westfield (New Zealand) Ltd*, the purpose of these processes is to recognise and protect the particular rights of those who are affected and to enhance the quality of the decision making."

143. The Coastal Panel said "One needs to balance the cost to property owners of any restrictions with the actual risk (and its time scale) and one can't do this if there are hidden "precautionary" adjustments".

144. I would comment that one cannot make informed decisions of any type, or properly give effect to the NZCPS 2010, if there are hidden precautionary adjustments and/or if coastal experts are providing only very unlikely or overstated results.

145. It is made worse if the results are described ambiguously as precautionary, conservative or potential.

146. In my opinion, submitters and decision-makers are entitled to expect that scientific reports:

a. convey objective, scientific, transparent information;

b. are fit for purpose;

c. have regard to the "short-term and long-term natural dynamic fluctuations of erosion and accretion" as set out in Policy 24(1)(b) and

to other scientific matters referred to in Policy 24 to enable the Council to perform its functions;

d. are based on sound statistics, involving statisticians with appropriate statistical expertise;

e. state all assumptions, and state the implications of the assumptions (as far as possible), clearly;

f. not contain hidden precautionary adjustments (or precautionary adjustments that cannot readily be untangled from the results);

g. not add precautionary assumption, to precautionary assumption to precautionary assumption;

h. use, as the Coastal Panel recommends from a statistical perspective (and also recalling the *Gallagher* case, where the Environment Court selected the specified overtopping rate because it was the "best fit"), "best estimates" rather than precautionary values, with margins of error or factors of safety kept separate from the estimates and added at the end if appropriate;

i. not provide very unlikely results (unless for some reason they have been specifically told to do so and then the results will be described as very unlikely);

j. not describe results using ambiguous terms such as precautionary, conservative, or potential (or, if that is done, identify precautionary or conservative or potential compared to what, and by how much, so that submitters and decision-makers can understand what the coastal scientist actually means when they use those terms); and

k. identify the uncertainties eg by, as the Coastal Panel recommends, considering a range of plausible scenarios (e.g. low, mid, high, or best estimate and extremes).

147. From my perspective, if that is done (and especially in areas where there is significant existing development), some of the difficulties with the current RMA processes may at least diminish.

148. If the CSL results had been reasonable in the first place, I certainly would not have troubled myself with what has become the Kapiti coastal erosion fiasco. There are other things I would rather be doing with my life.

Joan Allin
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