

Further Submission on KDCD Draft District Plan 2012

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Further Submissions on the specified coastal environment provisions

Submission from:

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This is a personal submission and I could not make any advantage in trade competition through it. We are building at Te Horo beach and while our property is unaffected by the proposed changes we are part of the Kapiti coastal community and hence have an interest in the proposed district plan greater than the general public.

I wish to speak at the hearing.

This further submission is in response to submissions 202 from the Department of Conservation (DOC), Wellington Hawke's Bay Conservancy, PO Box 5086, Wellington, and 441 Greater Wellington Regional Council (GW), PO Box 11 646, Wellington.

I oppose in part these submissions and seek to have them disallowed in part as detailed below.

Introduction

My original submission was that none of the Policies, Rules or Standards that have been based on the various *Kapiti Coast Erosion Hazard Assessment* (KCEHA) reports prepared for the Kapiti Coast District Council (KDCD) by Coastal Systems Ltd (CSL) be adopted.

To the extent to which the DOC and GW submissions rely on this report being fit-for-purpose their submissions (whether in support of the Policies, Rules and Standards, or in proposing amendments) are opposed.

I will address the specific issues DOC and GW raise but will first make some quick notes on my expertise in this matter, and elucidate some general issues that relate my original submission to DOC and GW's assumptions. The latter points set the framework for argumentation on DOC and GW's particular proposals.

Expertise

In my original submission I noted that I had a modicum of expertise in statistical analysis as it related to forecasting and projections under uncertainty. This is one of the key understandings required to undertake hazard risks assessments on the 100 year time frame required by the 2010 NZ Coastal Policy Statement (2010 NZCPS).

Further Submission on KCDC Draft District Plan 2012

I have subsequently discovered that despite the limitations of my own expertise it is in fact greater than that of any of the expertise KCDC has called upon in this matter¹.

The only statistical expert cited by KCEHA is Dr Ganesalingam but it is clear from "Summary of Peer Reviewer comments on the KCDC Open Coastal Erosion Hazard Report"² he simply gave advice on the use of linear regression as a technique to fit a linear model to the shoreline, and there is no evidence he reviewed the appropriateness of using this model or technique or the way it was subsequently used in the modelling of the coastal processes, hazard risk assessment, or projecting/forecasting future shorelines³.

Second, in my discussion below I rely on interpretations of the legislation governing the management of the coastal environment. Again I would not claim any particular current expertise, but I do have some basic understanding of the principles involved. In the early 1980s I chaired the working party that led to the current machinery of government and legislative framework dealing with environment management in NZ; led the officials' group tasked with the implementation; and subsequently assisted in MfE during the development of the RMA and related legislation, and later still in the mid-1990s was involved during its implementation through industry as CEO of the NZ Manufacturers Federation.

General comments relevant to the DOC submission

DOC and GW have accepted KCEHA as fit-for-purpose, and my original submission sets out the specific problems with KCEHA as a piece of work. What follows links those failings more directly to the requirements of the 2010 NZCPS and the DOC and GW submission.

Precaution and hazard risk assessment

The first issue is the application of the precautionary approach insofar as it relates to the process of hazard risk identification (2010 NZCPS Policy 24).

2010 NZCPS says:

Policy 3 Precautionary approach

(1) *Adopt a precautionary approach **towards proposed activities** whose effects on the coastal environment are uncertain, unknown, or little understood, but potentially significantly adverse.*

(2) *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;*

¹ Roger Shand authored the various KCEHA reports; Richard Reinen-Hamill, James Dahm, Michael Shepherd and Roger Shand were the experts KCDC relied on in M&V Weir v KCDC; and James Dahm, Robin Britton and Bronwen Gibberd reviewed the District Plan Coastal Hazards provisions. None claim expertise in statistical forecasting techniques.

² Ref Appendix 1 to SP 13-866 p30-32, KCDC Council meeting 18 April 2013

³ I forwarded my original submission to him for comment on the issues I raised, but he indicated that he had now retired.

Further Submission on KCDC Draft District Plan 2012

(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.

[emphasis added]

Thus the precaution is over **proposed activities** and **the use and management of coastal resources**, not the hazard identification or risk assessment. Rather we need the hazard identification and risk assessment to tell us where things **are uncertain, unknown, or little understood, but potentially significantly adverse**. If we don't quantify the uncertainty around hazards and instead we simply assume the worst case (which is what KCEHA consistently does), we simply can't be precautionary about managing any proposed activities⁴. Everything is to be avoided.

Thus precaution and the planning for the extremes come after hazard risk assessment, not as part of it. To the extent to which the science prejudices the risk assessment through its assumptions it undermines the subsequent processes required under the 2010 NZCPS to manage any proposed activities as required under the RMA.

I just note parenthetically that this problem doesn't only impact on the DOC and GW submissions; it means the KCDC LIMs are technically incorrect⁵.

Assessments based only on the extreme risk

Assuming the worst in the hazard risk assessment in the name of precaution isn't just contrary to Policy 3. The 2010 NZCPS Policy 24 makes it doubly clear that the likelihood of the hazard risk needs to be assessed, not just some extreme level assumed.

First some background that perhaps explains the mistaken currency of extreme assessments by NZ's coastal consultants.

The early KCEHA reports were undertaken against the background of the 1994 NZCPS. As KCDC worked towards the revised District Plan it became necessary to revise the assessments to take account of the changes that were made in the 2010 NZCPS.

Two of these changes were top of mind for KCDC and reflected in the "Kapiti Coast Erosion Hazard Assessment – 2012 Update" by CSL: the requirements for a 100 year assessment and to more explicitly account for climate change.

⁴ Paradoxically KCEHA is saying on the one hand we don't know what is happening with coastal processes, and on the other is saying we can be certain about the risks.

⁵ The LIM states: "Note 2: *The New Zealand Coastal Policy Statement requires the adoption of a precautionary approach in relation to the coast (Policy 3). Consequently, the risk assessment is based on a worst case scenario.*" While a non-sequitur it also evidences a failure to understand Policy 3.

Further Submission on KCDC Draft District Plan 2012

Missed was a change that undermined the use of absolute extreme risk limits that Dr Shand (and some of his colleagues in the community of NZ's coastal hazards consultants) had used in the past to mark out areas where hazard risks exist.

The 1994 NZCPS says of identification of hazards:

3.4 Recognition of Natural Hazards and Provision for Avoiding or Mitigating Their Effects

Policy 3.4.1

Local authority policy statements and plans should identify areas in the coastal environment where natural hazards exist.

Policy 3.4.2

Policy statements and plans should recognise the possibility of a rise in sea level, and should identify areas which would as a consequence be subject to erosion or inundation. Natural systems which are a natural defence to erosion and/or inundation should be identified and their integrity protected.

It then goes off further into issues by way of mitigation.

Policy 3.4 simply required areas where coastal hazards existed to be identified. There was no requirement to quantify the risk so an absolute line in the sand (as it were) could be seen as acceptable. This is the legal framework within which NZ's coastal consultants had operated up until 2010 and that led to the kinds of practices adopted in KCEHA.

However the 2010 NZCPS Policy 24 changed all that, introducing more sophisticated risk manage concepts to this process⁶:

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*

⁶ And no doubt reflected where international coastal science had gone – the idea of forecasting coastal hazard risks on a probabilistic basis had been mainstream in the US Geological Survey and recommended as best practice by the U.S. Climate Change Science Program well before the 2010 NZCPS was drafted.

Further Submission on KCDC Draft District Plan 2012

(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.

[emphasis added]

I have emphasised the probabilistic language introduced in the 2010 NZCPS. We aren't now just required to identify areas where hazards exist, we have to identify those areas **potentially** affected, calculate the **risks**, and put those at **high risk** up in lights. Risk is to be calculated taking account of (a) – (h) and taking account of available information on **likely** (not extreme) effects of climate changes⁷.

Hazard risks itself implies a probabilistic assessment, since risk is the “effect of uncertainty on objectives”⁸. The uncertainty here derives, inter alia, from the uncertainty in the matters set out in Policy 24 (1) (a) – (h). If there was no uncertainty there would be no risk. Thus for these purposes the assessment of **hazard risk** is no more or no less than the quantification of this uncertainty.

Quantification involves estimating some measures of the likely risk and its probability distribution and not just presenting a fixed assessment (as might have been acceptable pre-2010 NZCPS). Quantification or assessment of the uncertainty is something KCEHA completely fails to do. KCEHA simply reports an extreme value that is derived primarily from extreme assumptions.

A further point on hazard risks relevant to GW's submission is that the way the term **hazard risk** is used throughout 2010 NZCPS is independent of how the area is used. Hazard risk refers to the risk of a hazard occurring at an area, not the risk from it occurring. This comes later in the policy statement⁹.

Moving beyond Policy 24 into the management we see Policies 25 and 27 requiring different management regimes depending on the level of risk. Policy 25 requires action in areas **potentially** affected, Policy 27 in areas **likely** to be affected. This discrimination is impossible unless the hazard risk assessment under Policy 24 includes a probabilistic assessment.

Thus by simply providing an extreme inland limit of coastal erosion KCEHA fails to provide the analysis necessary for KCDC to fulfil its obligations under Policies 24, 25

⁷ On a particular point “Kapiti Coast Erosion Hazard Assessment – 2012 Update” by CSL fails to comply with this requirement because it doesn't use the likely MfE estimates of sea level rise in its forecast. I also note that para 2.1.2 in this update that deals with this issue has a number of simple errors in it that suggest not much effort was put into either checking or reviewing it.

⁸ AS/NZS ISO 31000:2009.

⁹ This is reinforced by “risk” in Policy 25(a) being explicitly referenced to the Glossary (that in turn draws attention to the usage of “risk” that incorporates consequences) but this is not done elsewhere in the document.

Further Submission on KCDC Draft District Plan 2012

or 27 in developing the PDP. The assessment is thus misleading and not fit for purpose.

So the 2010 NZCPS changed the game when it came to hazard risk analysis¹⁰.

This view is implicitly acknowledged by a recent local work: Ramsay, D.L., Gibberd, B., Dahm, J., Bell, R.G. (2012) *“Defining coastal hazard zones and setback lines. A guide to good practice.”* NWA. It was developed under NZ government science funding and ironically the authors include some who have advised KCDC.

In section 4.3 it says the approach used in KCEHA to defining uncertainty is no longer regarded as representing best practice. They describe KCEHA’s approach as “typically a key source of variance between coastal erosion hazard predictions developed by different coastal hazard practitioners for the same environment”, “a primary cause of the many conflicts that occur around defining coastal erosion hazard zones and associated development setbacks”, lacking “transparency in the treatment of uncertainty” and producing precise predictions “without caveats related to the underlying uncertainties”.

Probabilistic assessments are “too hard”

Dr Shand has stated in defence of his approach (which Ramsay et al describe as “deterministic assessments”) that it is not possible at this stage to assess the hazard risks on a probabilistic basis¹¹. It is difficult not to see this as anything other than a post hoc justification for the failure of KCEHA to even try to address these issues to meet the requirements under the 2010 NZCPS.

Putting aside all the failings in the model KCEHA uses to calculate extreme inshore limits (discussed in my original submission), if one accepts this model it is trivial to also calculate extreme **seaward** limits for coast hazard lines. I should reinforce the point that the following example should not be taken in anyway as suggesting the model used by KCEHA is the appropriate method for assessing either inshore or seaward hazard limits. It is simply making the point if you believe it’s suitable for one, it is trivial to do the other.

The linear combination of the five components KCEHA use to calculate the inshore limits can be also use to give an estimate of the seaward limit as follows:

1. The measure of short-term variation would be retained, since this is assumed to be unaffected by longer-term dynamics (in fact since this measure double counts other factors it could be appropriate to reduce this¹²)

¹⁰ For this reason some of the guidance material on coastal hazard assessment produced before 2010 needs to be treated with caution to ensure it remains fit-for-purpose (and that produced subsequently checked to ensure it takes into account the new requirements). It should be noted that GW’s Regional Policy Statement while approved in 2012 is based on the 1994 NZCPS and therefore is potentially dated in this regard.

¹¹ See for example Shand’s supplementary affidavit in M&V Weir v KCDC, and KCDC’s reliance on this advice as evidenced in Dr. Ferguson’s affidavit.

¹² The short-term variation measure used in KCEHA is the variation around the trend line (even when the trend isn’t used). This variation comes about in the historic record for a whole range of reasons including natural variation in the assumed trend, measurement errors, changing dune heights etc that

Further Submission on KCDC Draft District Plan 2012

2. Where KCEHA use historic longer-term change (but sets this to zero where accretion has been occurring) we would use the extreme seaward value instead (and no longer set accretion to zero)
3. The projected sea level rise due to climate change adjusted for shore slope would be incorporated but the base recommendations from MfE would be used and KCEHA's double counting of the historic sea level rise removed¹³
4. The measure of dune stability would only be included where the combined effect of the other measures was to move the coast line inland
5. The sign on the assessment of measurement error would simply be reversed

Thus simply using the information already assembled in KCEHA we can project the two extremes for future coastal extent to give a **range** of possible values.

The range is one of simplest ways to quantify the distribution of a set of numbers. In its most rudimentary form it might tell us nothing about how the likely values are distributed across this range, but it provides useful information nonetheless.

To show this I have roughly calculated the seaward extent for the transept close to our property (C26-58). The range for the coast line relative to 2008 would be (to the nearest 5m) -30m to +5m in 50 years' time, and -60m to +25m in a 100.

If KCEHA had provided this kind of analysis it is quite possible the subsequent decision making by KCDC on the proposed District Plan would have been different. At the very least it would have been much better placed to assess where the potential risk is high. This is a question they are required to address under Policy 24 in formulating the proposed District Plan, but failed to do because KCEHA failed to provide the necessary information. KCEHA was not fit for this purpose.

In fact by ignoring measures of the distribution (including the range) and what these can tell us about the extent of the risk, KCEHA's methodology will lead to hazard lines inland from the current coast line **for every sandy beach in NZ**¹⁴.

In addition we have further information about the distribution of shoreline extent from the KCEHA work that can be taken into account. KCEHA argues that the mechanism producing the shore line accretion is unknown and while it has been evidenced for much of the coast for the last century we should assume this ceases, **forthwith**.

This is in contradistinction to the treatment by KCEHA of Tsunami and seismic activity, both of which could have a similar impact on the shoreline extent but also, like coastal accretion ceasing, have a low probability of occurring in any one year. KCEHA ignores the potential impact of Tsunami and seismic activity and is content

are all matters that KCEHA count again. The short-term signal can be estimated separately from the long-term but this requires some consideration being given to partialling out seasonal variations, something KCEHA doesn't address.

¹³ Ref: MfE 2008 *Coastal Hazards and Climate Change: A Guidance Manual for Local Government in New Zealand* Table 2.3. KCEHA double counted the 2.1mm p.a. sea level increase already in the historic record i.e. the forecasts need to be reduced by this amount.

¹⁴ If this is truly a high hazard risk throughout NZ one would assume DOC and/or MfE would have issued national guidance on this matter.

Further Submission on KCDC Draft District Plan 2012

to assume the continuation of recent history, rather than assuming both a Tsunami and an earthquake also occurred in 2008. This would have been the consistent assumption to adopt¹⁵.

Thus KCEHA is predicated on coastal accretion ceasing in 2007. But in 2013 we have had no evidence that it hasn't continued for another 5 years. So as it comes time to adopt the proposed District Plan the assessments that rely on KCEHA are wrong by possibly an average of 2 metres along the northern coast line. The extreme ranges for 50 and 100 years' time will have moved seaward by a similar amount. This knowledge at least should have been incorporated in to the PDP.

Finally, reporting of the range along with even a basic assessment of the distribution of the future coast line within it would definitely have drawn KCDC's attention to the extent to which the hazard risks were simply the product of arbitrary assumptions by KCEHA rather than scientific investigation.

Returning to my example at transept C26-58 to illustrate these two points, over half the coastal retreat reported by KCEHA is simply due to its assumption that coastal accretion would stop in 2007. If instead coastal accretion ceasing was treated the same as Tsunami or seismic activity the two ranges would reduce down to -10m to +5m and -5m to +25m in 50 and 100 years' time respectively.

These are just further illustrations of why KCEHA is not fit for purpose and DOC and GW should not be relying upon it, or judgements based on it, in their submissions.

Implications for DOC's specific submissions

Chapter 4

DOC's submission expresses support for Section 4.2 Coastal Hazard Management Areas with some specific amendments. In light of my original submission and the further comments above I oppose DOC's submission on the basis that the Section is based on KCEHA assessment that fails to give effect to the 2010 NZCPS.

In particular the following amendments sought by DOC to specific sections are opposed for the stated reasons:

Introduction

Climate Change Impacts

Seeks addition of claim that "other relevant information/analysis has been relied on ..."

Opposed, not allowed: It is clear from my submissions that this claim cannot be made in the Plan.

¹⁵ Had KCEHA assumed a Tsunami or earthquake in 2008 as part of the hazard risk assessment, others including hopefully the peers, would have correctly observed that these were low probability events that should instead be dealt with as a cumulating hazard risk over the forecast period.

Further Submission on KCDC Draft District Plan 2012

Coastal Hazards Identified

Make it clear climate change effects are in addition to other effects, seeking to use KCEHA by way of justification.

Opposed, not allowed: It is clear from my submissions that in practice KCEHA double counted the effects of climate change with that in the historic record.

Impacts on People and Property

Seeks to emphasise the impacts of climate change based on the assesment undertaken.

Opposed, not allowed: The underlying analysis doesn't justify the conclusions being claimed, and DOC offers no evidence in support of their claim.

Policies

4.10 Coastal Hazard Management Areas (CHMA)

Seeks to more explicitly introduce the 2010 NZCPS language into the Policy and thereby make greater claims for the extent to which KCEHA and CHMAs give effect to the 2010 NZCPS.

Opposed, not allowed: My submissions spell out why KCEHA and the consequent CHMAs do not give effect to the 2010 NZCPS, and DOC offers no evidence in support of their claim.

4.11 Land use subdivision in all CHMA through to 4.15 Adaption

Variously supports and in some cases seek amendments to suggest the assessments and CHMA reflects the requirements of 2010 NZCPS.

Opposed, not allowed: My submissions spell out why KCEHA and the consequent CHMAs do not give effect to the 2010 NZCPS, and DOC offers no evidence in support of their claim.

Chapter 9

Introduction

Seeks to retain the introduction and supports the risk and precautionary based approach.

Opposed, not allowed: The Introduction claims the Plan adopts a precautionary approach to risk management. My submissions set out how it fails to do this in respect of coastal hazards. DOC offers no evidence in support of their claim to contrary.

Further Submission on KCDC Draft District Plan 2012

Policies

9.1 Identification of Hazards

Supports this policy on the basis that it is in accord with 2010 NZCPS.

Opposed, not allowed: My submissions spell out why coastal hazard identification isn't in accord with the 2010 NZCPS, and DOC offers no evidence in support of their claim.

9.2 Risk based approach

Supported but seeks to broaden to minimising any harm from hazards, with the implication that use will be prohibited outside low risk areas.

Opposed, not allowed: The suggestion that risks should be simply minimised in high risk areas and use prevented without also considering the benefits is contrary to the RMA.

9.4 Precautionary approach

Supported, but with the inclusion of reference to the significance of the adverse effects.

Opposed, not allowed in part: The reference to the significance of the effects needs to be included but the suggestion in the explanation that "the precautionary approach has been considered when undertaking the hazard modelling and creating development restrictions to mitigate hazard risk" is clearly not correct for the reasons set out in my submissions. DOC offers no evidence in support of their claim in this regard.

Implications for GW's specific submissions

Section 4.2 Coastal Hazard Management Areas

The initial comments on this section do not lead to any specific submissions on the PDP but there are comments that in light of my original submission and the comments above call for a response:

"GWRC notes that the 0.9m sea level rise .. is in line with .. potential sea level rise .."
[emphasis added]

Policy 24 calls for account to be taken of the "*likely* effects of climate change"
[emphasis added] not the *potential* effects.

"GWRC ... notes ... it is best practice ... to consider worst case scenarios for future planning"

If this intended to refer to hazard assessment then it is incorrect for the reasons set out above. It is also incorrect when it comes to management under Policy 27, where the test is "areas ... *likely* to be affected by coastal hazards" [emphasis added] not the worst case.

Further Submission on KCDC Draft District Plan 2012

“Risk incorporates the hazard potential, the vulnerability of a development ... and the consequences ...to a development ..”

GW are confusing this issue. As noted above “hazard risk” in 2010 NZCPS is used in a way that is independent of the developments that might or might not have occurred. If this wasn’t done then the differing management regimes under Policy 25 and 27 would be impossible to implement (as is the case with the PDP).

These comments call into question GW’s submission on various policies relating to “hazard” and “risk”.

Policies 4.8 to 4.15

GW supports these policies with some caveats without any supporting argumentation.

Opposed, not allowed. These policies depend upon KCEHA for their definition of hazard areas, and for the reasons set out in my original and this supplementary submission KCEHA is not fit-for-purpose, so the definition of coastal hazard areas and any policies that depend on it are equally incorrect.

Section 9

Again GW supports various policies that have been derived from KCEHA.

Opposed, not allowed. For the reasons above.

Policy 9.4 either in its current form or as proposed to be amended by GW implies the precautionary approach has been correctly applied.

Opposed, not allowed. For the reasons above.



Simon Arnold