

Review of Well-Being Assessment of North and Central Coastal British Columbia
DRAFT Report dated 27 January 2004.

Review prepared by:

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General Comments

In the past 5 years several organizations and individuals have attempted to develop indices of well-being, incorporating, with varying degrees of success, measures of economic, social and environmental components of sustainable development to provide an assessment of the well-being of communities, regions or nations. Most of these well-being index exercises suffer technical problems which can be partially attributable to the developmental nature of the work. They are often criticised for bias in indicator selection, arbitrariness of weighting, analyses that do not draw on statistical methods and are not founded in best scientific practises, unsatisfactory treatment of uncertainty and misuse of averaging. In general, the analysis under review here is subject to the same list of criticisms. The lack of high quality, timely data, as identified by the authors, is a recurring theme among most well-being index exercises, and most 'state of exercises. Considered in the context of this larger body of work the *Wellbeing Assessment of North and Central Coastal BC* provides a valuable contribution to this developing body of work but has not resolved the weaknesses of other well-being index exercises.

Some of the innovations in this analysis are particularly commendable. For example, the development of a measure of knowledge which accesses the availability of information on both human and natural systems is an excellent addition. The indicator on the diversity of indigenous languages, which is not complete in the draft I reviewed, has been selected as one of eleven global indicators of biological diversity by the Convention on Biological Diversity at its most recent meeting in Kuala Lumpur, February 2004. Its inclusion here will help place the North and Central Coast of BC in an international context for this measure.

This report is very cumbersome to read and I believe this is because it suffers from lack of a clear audience. It provides neither detailed enough information for the technically articulate reader wanting to assess the methodology nor a concise enough synthesis to be useful for the decision-maker. A short "Highlights" or "Executive Summary" section, which synthesizes the main results and identifies the major issues raised would facilitate entry into this

difficult to read report. On the other hand, detailed technical backgrounders which provide the metadata, detailed methodology, demonstration of the weighting and calculations, and an assessment of the quality of data would add significantly to the credibility and repeatability of the analysis. Presumably the analysis would be repeated in the future and detailed documentation is critical to ensure that a future assessment is even possible.

Qualifiers of this analysis:

I was not provided with any of the Appendices to conduct this review, where, according to the text, the rationale for much of the performance scoring and the way indicators are combined is provided. Lack of rationale for many of the choices made is a major criticism of the Ecosystem Well-Being component and some of the problems may be resolved if the rationale in the appendices is sound - something I was unable to assess.

Several components were not complete. For example, "data on the economic foundations are still being processes" as are data on components of the knowledge and culture index. It seems that data on aboriginal title and rates are also not reflected in the Community index. I was unclear how conclusions could be drawn without all of the data in.

QUESTIONS:

1. How would you evaluate the use of scientific information in the document? Is there a clear and consistent use of the relevant data and facts? Are management or other decisions clearly linked to objective evaluations of fact?

There is an attempt to use as much data as is available and an acute awareness that the data availability is indeed very poor, especially for the indicators in the Ecosystem Well-Being Index. A survey was conducted which provides a significant amount of recent information for the Human Well-Being Index, and hence data for that component are better. Even so, the draft obtained for review does not contain several components of the data and analysis for HWI. Tables are provided which rate the availability of data, a technique being used frequently in 'state of' reports and an indicator in the culture and knowledge section. Highlighting data availability is an important aspect of this type of analysis and the authors are commended for their treatment of this issue. It is impossible to assess sustainability without a foundation of high quality monitoring information on both the ecosystem and human sides.

In some areas where the data is particularly weak there are substitute data bases that could have been explored (and perhaps were but it is not indicated in the

report). For example, as there was no water quality data for most of the area and all of the measurements used are surrogates for effects of land activities on water, it would have been valid to at least measure changes in water quantity using the hydrometric data available. This is particularly important as baseline information considering the significant effects that climate change is expected to have in this region. For the Coast of BC precipitation has already increased by 2% per decade from 1929 to 1998 (Climate Change Indicators for BC 2002: http://wlapwww.gov.bc.ca/air/climate/indicat/precip_id1.html) and is expected to continue to increase.

I was surprised that the authors were able to find population trends for focal species. The focal species chosen are well known and many are well studied.

Inland water conversion is an internationally accepted indicator of fragmentation in freshwater systems and it is hard to understand why it was not used here. The authors say that they could not develop an indicator from the data available, although it does seem that there was data for dams and diversions. I would suggest the indicator used by World Resources 2000-2001 – Degree of River Fragmentation – pg 280 – Major watersheds of the world – *People and Ecosystems: The Fraying Web of Life* would have been appropriate.

The analysis for Ecosystem Well-Being is generally given without context. Trends and comparisons help in an evaluation such as this. In the Human Well-Being section trends and comparisons both in BC, Canada and Internationally are provided, which helps significantly in drawing conclusions.

2 Was all available and relevant information used? If not, what available data are missing? Could these omissions have affected the decisions made? Were the data, facts or fundamental scientific information interpreted correctly within their limits of applicability?

Performance Scoring

The credibility of this analysis rests of the credibility of the scoring method. I agree with the authors that there are many possible choices for normalizing and that the method used here, providing a scoring mechanism based on performance bands, is as justifiable as any of the other normalization methods used in index calculations. In many cases the performance bands are rationalized credibly and the methodology is transparent. In some cases, however, the performance bands are set arbitrarily, often by the admission of the authors, and the resultant scores are not credible. It is a difficult exercise to establish performance bands (or desired future states as they are called elsewhere) and

their setting is often based on a combination of science and values. Transparency and credible rationalization are the best approaches to ensuring that the performance bands make sense.

There are many examples throughout the document of performance bands which are not credible. Some include:

- Economic Foundations: Resource sectors diversity index (RSDI); business viability
- Land conversion: performance scores are based on “global performance”. However, the global performance does not evaluate whether the levels of conversion in other countries are sustainable or not.
- Performance bands for road density are based on the considerable amount of literature on potential impact on wildlife. However, they are then multiplied by 3, which is not adequately explained and I presume would affect the final analysis.
- The performance bands for focal species habitat protection range from 16% good to 4% or less being considered ‘bad’ with no rationalization at all.
- The performance criteria for protected areas is arbitrary and not based on an analysis of how much of each sub-region is required to adequately protect ecosystem integrity. For example, the fair category is set as 10%, because this is the international target for ecosystem representation. It is true that 10% is an international target (Convention on Biological Diversity) but the international target is not based on any rationale assessment of what percentage is needed for any particular type of ecosystem. The 20% for the good category is equally arbitrary. In this case the scoring is particularly important as one of the main recommendations is based around improving protection.
- The same performance bands are used for freshwater protection. This is even more arbitrary as the international target is for terrestrial systems. I am not sure what the rationale would be to translate it to terrestrial systems.
- Resource species – a performance band is chosen for salmon which is different than that used by the American Fisheries Society in its landmark report “Salmon at Risk”, which I believe was published in 1996. No reference or rationale is given for the performance bands used in this study and why they are different from other studies. The performance bands used in this Well-Being exercise may be justified but as a reviewer it is impossible to know.
- Population change: neither references nor rationale are given for the scoring bands. The rates seem high and warranting the poor categories but without context and rationale it is impossible to assess.
- The performance scale for the Wellbeing/Stress Index is not explained and seems arbitrary.

- Weighting is done in the summing of performance scores for two reasons, either because of gaps in data or the importance of the indicator. These are two very different concepts. Weighting on importance makes sense and reflects what other indices use; data gaps should be dealt with as an uncertainty (see below).

Double-counting

The document has several examples of double-counting. Some are listed throughout my review. A few examples are:

- In the land conversion score there seems to be some double-counting as road density is presented as a separate indicator and is also embedded in the converted percentage indicator, including 200m around every road is considered converted land.
- Only one indicator, the lower of the two, was used in the scoring, for which there is little rationale. I did not do the analysis but wonder if it would have made a difference to the final outcome had just the converted percentage been used.

Averaging

Averaging is used throughout the document inappropriately. It results in neither a rosier picture, nor a more negative picture, but rather erroneous results which can go either way. There are too many examples of this approach to list them all. A few examples are:

- A mean for 'at risk' species is presented. For Haida Gwaii/QCI this results in a mean of 8.3% at risk. If the more usual approach of adding all of the 'at risk species' and dividing by all of the native species was used the percentage at risk would have been 4.4% for Haida Gwaii/QCI.
- The scores for population and First Nations on reserves are averaged. These scores are based on very different criteria and cannot be legitimately averaged.

Weighting

Although weighting is sometimes used to mask poor data, which I disagree with (see below under uncertainty), it is sometimes used in a rationale way. For example, when there are two measures and both are required for good performance, only the lower score is counted. This is done, for example, with population and health. The lower score of the two is used as the performance scores on the grounds that "good performance is essential in both".

Protected Areas

- 'Protected areas' is a key measure as it is used in several different sub-indices (which possibly results again in some double counting). The authors note on page 3.2 "the protected area system ... does a poor job of representing the region's land and marine diversity and is entirely inadequate in Inner North Coast and upper Mid Coast". These results are compatible with findings on the protected area system throughout Canada and comparisons could be noted for purpose of context.
- It is not clear what the authors mean by 'Protection'. In particular, in freshwater ecosystems does protection mean no take zones for harvesting? If not then what kind of protection are we talking about? This is important because of the key role this indicator has in the analysis.

3 Does the document make explicit discussion of uncertainty? If not, please indicate any areas where such uncertainties might influence management decisions.

Three types of uncertainty are identified by the authors:

1. uncertainty created by variability in the data or scores
2. uncertainty created by poor data or data gaps
3. uncertainty created by conflicting analysis in referenced reports

In the last chapter, section 5.5, *Main Uncertainties* some of the sources of uncertainty are explained well. In some cases, uncertainty is also dealt with well in the analysis. For example, the calculation of employment income and income deprivation is credible and uncertainties are transparent.

However, in many cases the analysis itself does not adequately reflect that uncertainty. Treating uncertainty in a more transparent fashion in the analysis would provide a better context for influencing decision-making and provide more credibility to the analysis.

Given the uncertainties it is difficult to reconcile some of the detailed messaging in Chapter 5, especially around the descriptions of the barometer. Because the performance scoring for many of the indicators is suspect (see comments on scoring below) and uncertainty bands are not provided (although they could be) the most that can be said is broad statements that all sub-regions are approximately in the middle of the Barometer. The more detailed descriptions of where in the middle band (upper, lower, mid) each-sub-region sits cannot be justified given the uncertainty in the data and the errors generated through scoring.

The comparison to the Barometer for Canada indicates that this region scores poorly when compared to Canada. Although a comparison such as this would be helpful if it were justified, because the Canada analysis is based on an entirely different set of indicators, with their own performance scales, the comparison is erroneous.

1. Uncertainty created by variability in the data or scores.

In these cases uncertainty would be more accurately reflected as a range of scores. For example, page 5.8-5.9 contains a section on “Main uncertainties” in which it is claimed that the index scores may vary +/- 15 for water and +/- 20 for species and genes and water. (Note that I could not identify any rationale for these particular ranges, but that’s another issue). If the scores were presented as a range, as in Table 3.1 reworked, below, you can see that the EWI scores range across two qualitative categories in most cases.

Reworking Table 3.1 with uncertainty.

subregion	EEI/EWI	high	low	Qualitative ranking
HG	57	65	36	Poor to fair
INC	43	49	20	Bad to med
ONC	61	67	38	Poor to fair
LNC	58	65	36	Poor to fair
OCC	60	67	38	Poor to fair
ICC	58	65	36	Poor to fair
UMC	40	44	15	Bad to poor
LMC	39	44	15	Bad to poor

Displaying uncertainty in this, more honest fashion, results in several subregions being rated as either very close to sustainability (HG,ONC, LNC, OCC, ICC) or very far from sustainability (same ones) on the final barometer. The management implications for this are important. Using a risk based approach a manager would proceed with caution and a diversity of approaches because of the high degree of uncertainty. Likely an important management approach would be to reduce the uncertainty - possibly by collecting better information.

2. Uncertainty Created by Poor or Missing Data

This is the main type of uncertainty identified in the document and is treated by weighting the scores in favour of the elements with more or better data. (e.g. weighting air less than land, water, species and genes; weighting fresh water

more than sea; weighting water quality less than other water elements; weighting fishery species more than timber species). In general this approach is justified because there are so many data gaps that it would not have been possible to do any analysis based solely on the data that is needed.

However, because this treatment was necessary it is particularly important to remember where data was not available when drawing conclusions. However, in the conclusions the treatment of missing data seems to have been forgotten, resulting in conclusions that are not supported by data. A more appropriate approach would have been to highlight the uncertainties in the conclusions and be resigned to the fact that only broad generalizations can be made when the data is so poor.

For example, the Lower North Coast and Inner Central Coasts were given fair grades for land, water and air but poor for species and genes (page 5.1). However, there is no air quality monitoring in the Inner Central Coast (see page 3.1) and no water quality monitoring in any area except one station in Lower Mid Coast and the rest of the water indicators measure activities on land which affect the riparian area – but water parameters are not directly measured. As well, the species and genes data was too poor to measure the key elements, population trends and invasive species, in these sub-regions. For the Lower N. Coast there were only 4 ‘at risk’ species, which are not protected, giving it its low species and genes ranking.

3. Uncertainty Created by Conflicting Analysis in Referenced Reports

Averaging is the favoured method to address this type of uncertainty. Again, a range would better identify the uncertainties and provide a more transparent approach for managers. There are many examples, a few are:

- For Land ecosystem diversity two methods of calculating the proportion of ecosystem types in old seral stages are referenced. The authors averaged the results – a range would have indicated the degree of difference of opinion among the two authors cited. I am also confused as to why the seral percentages in Fig. 3.10 are modelled (referenced under water, page 3.9) when there are actual percentages available (Fig. 3.20).
- This problem is multiplied by the fact that the same methodology is used for determining the seral percentage in the water index – freshwater ecosystem diversity – old seral percentage of riparian forest. I have a sense of some double-counting here as would the same data not be incorporated into the land ecosystem diversity measure?
- The mean of habitat protection for six species is averaged, with no justification for doing this. Again a range would be more useful.

4. If management direction is suggested, is it clear, concise and practical (if relevant to the particular document).

Recommendations:

1. Adopt ecosystem-based planning and management to ensure development and resource use restore and maintain the diversity of native ecosystems, species and populations
2. Expand protected areas system, paying great attention to representation of land and marine diversity
3. Reduce harvest levels of resource species
4. Give local businesses and communities first cut and a bigger share of timber and fishery licenses
5. Secure important places for sustenance, heritage, spiritual values and recreation
6. Give local governments and local bodies a greater say in the allocation and management of local resources, along with programmes to improve local management skills.
7. Expand knowledge of ecosystem, resource and communities and monitor their status.

The recommendations are clear, concise and practical. However, I am not sure that this analysis was necessary to come to these recommendations and several of the recommendations do not flow from the analysis.

The results present some main messages which are very difficult to tease out of the document but are important to note.

Messages on Ecosystem Well-Being Are:

1. Air quality and water quality monitoring is so poor in most of the study area that it is not possible to make a meaningful assessment of the these two parameters. Since both air and water quality are closely linked to human health the lack of monitoring in these areas has a significant impact on the ability to make a meaningful assessment of the relationship between ecosystem services and human well-being.
2. Monitoring of species is also so poor that there was not enough data to assess the population status of at risk or focal species, again limiting the credibility of the findings and the ability of anyone to do any meaningful assessment.
3. Biodiversity, as it is measured here, is particularly at risk in the study area. The threats are not identified so management responses to this problem do not easily flow from this information.

Messages on Human Well-Being Are:

1. Monitoring is also weak for components of human well-being that are particularly relevant in rural areas of BC, such as sustenance activities and wild food supply (which is related to species monitoring on the ecosystem side), making it very difficult to conduct a meaningful assessment.
2. Most people rated their own wellbeing as high or very high, despite the indicators which show that their wellbeing is not as good as they rank it.
3. Human Well-Being is compromised by population fluctuations, low income, average education and knowledge and a lack of decision-making power.