

Reviewer 1

Comment: Human impacts ...

General:

This is a fine overview about a very complex field, and the authors are to be applauded for a good overview. In principle it could be accepted as is, but I take the opportunity to list a few issues, which the authors may want to think about, plus as series of minor points.

Thank you, we appreciate the thorough review and suggested changes.

It would be helpful, if all aspects discussed would be introduced with a similar sketch-diagram showing the major and minor influences upon each other.

We see the reviewer's point, and we agree that this would be very good. In fact, we have been going through many iterations and attempts to visualize the different influences on each other. Actually, it became clear that with the many interdependencies, either a sketch would be too chaotic and unreadable, or we would have a proper sketch for each factor, which would mean that the page number would increase even more. We may opt to have these 19 single graphs as supplement files, which may be downloaded from the ESD website.

The societal dimension could be covered more seriously. For instance, for tourism, it may matter more the perception of climate change than climate change itself. Also societal preferences may change preferred tourist sites.

We will add these aspects but we see that there are few references on these effects. A paragraph is added in section 5.1.1

Figure 8 places ecosystems in the center- but there should also be "societal system", which is not really part of the ecosystem (or the rest of the manuscript had to be written differently. In the summary the relationship of society/ecosystem and the role of societal value systems is dealt with in a superfluous manner (characteristic of ecologists)

We will revise Fig 8, adding societal/human aspects, and add a paragraph in the summary section as well as in other sections where appropriate

In general, the historical dimension is a bit weak. What about "pristine"/"undisturbed" conditions, earlier "strange" events; so far it is almost entirely on conditions since 1950 or 1990. (e.g., 6.4, 6.12)

We will include historical/background values/conditions as far as possible. Note: section 6 key messages and knowledge gaps are now incorporated into section 5 to eliminate repetitions

In the section of shipping, the issue of using different fuels should be mentioned, also the effect of phasing out crude oil (also 6.14)

The use of crude oil and LNG are discussed in section 5.14; we will make it clearer and shortly add the aspect of phasing out crude oil.

In general: reduce the list of linkages wot significant ones, and mention: "the issues X, y, and z likely are insignificant."

Not sure we understand this comment. We have stated in the bullet lists in section 5 only the connections which were indicated as significant (+); and we have also discussed the

ones with a question mark (?) because we believe that these linkages may be interesting. The insignificant ones are already omitted from the bullet lists. They are there in Table 2 but we think they should remain there for the complete picture.

In Sec 6.1, the issues: effect of aerosol emissions and of land use need to be listed as major issues in the knowledge gaps.

These effects will be added to the knowledge gaps. Thank you!

In Sec 6.8 – the issue of cities should be addressed.

Of course, cities should be addressed in this section. Thank you!

Why have big constructions not been addressed – this was a big issue some years ago, and partly still so (Fehmarn belt tunnel).

The large infrastructure projects (oil and gas pipelines) Nordstream1 and 2 as well as the Baltic Pipe project are discussed but the Fehmarn Belt tunnel was not, as ecological impacts are probably very much eliminated as compared to a bridge, which was previously planned.

Minor

- Both tables are hard to read.
We will try to increase readability and explain better
- line 295: authors'
OK
- 328: I guess this is not so much an issue of the latitudinal position but of the fact that most of Earth is covered by the ocean, but that the sea is only a minor part of the Baltic Sea region.
We believe it is related to the northerly position of the region and the proximity to the polar region. The feedback processes related to snow/sea-ice in the winter half of the year are responsible for the large temperature increase. Looking not only at winter it is also clear that the region is to a strong degree continental and the small size of the Baltic Sea implies that it can't reduce the warming in the full region in the summer. So for the sake of brevity we prefer to keep this phrase.
- 355: warming of the ... why so?
Thermal expansion is the largest contributor to global sea level rise. Sea level rise in the Baltic Sea basically follows global mean sea level rise (with some modification due to the melting of the Antarctic ice sheet). We will change "most obvious" to "profound".
- 363 – the numerical estimate of sea level rise – still valid in view of the new IPCC report; also this number MUST be associated with a time horizon – when?
... until 2100.
- 545 – emissions of chemicals ...
OK
- 604 – “unfortunate” for whom?
The term will be deleted
- 623 – “dangerous” – for whom?
The sentence will be re-phrased with neutral term to eliminate subjective terminology
- 630 ff – needs better structuring. Why “as a consequence”?
The sentence will be re-phrased for better understanding

- 643 – What is the “running out of sand”-concept?
Sand extractions and potential consequences will be better explained
- 695ff – unclear; what does the sentence “nt a total load ...” tells the reader?
The concentrations of heavy metals in the eroding soft cliffs are low, but due to the total volume of eroding material, the introduction of heavy metals into the coastal sea in this way is considerable.
- 801 – a repetition
We cannot spot the repetition
- 823 – are these significant effects or just something tny? How much “may speed up corrosion”?
Corrosion rates in Baltic Sea conditions were studied in field experiments in different anoxic/oxic transition areas, i.e. the Bornholm Deep and the Gdansk Deep western fringe. Metal coupons placed in near bottom water in fully oxic, oxic/anoxic and fully anoxic sites showed almost a doubling of corrosion rates between anoxic and transitional conditions, and ca. 20% increase in transitional conditions as compared to oxic. Therefore, the following sentence was added: “Therefore, hypoxic events and the resulting changes in oxic conditions may have a considerable impact on corrosion rates, e.g. a doubling in transitional as compared to fully anoxic conditions (Fabisiak et al. 2018)”
- Figure 2 – needed?
Will consider to delete
- 892 – “importance of short-term variability” – consisting of what?
For flux calculations of surface CO₂ in coastal areas, short term variability on hourly scales needs to be considered
- 1067 – BSAP?
Will be explained
- 1095 – refer to climate change section
This paragraph will be shortened considerably
- 1105ff – us fold face key words.
Key words will be printed in bold
- 1181 – “driving a regime shift through” sound a bit Germanic.
The language will be adjusted
- 1255 – “projected decrease in the South” was earlier declared uncartein.
The wording will be adjusted
- 1285 – “migration” – of whom?
Will be adjusted; “migration of species”
- 1323ff something missing
We do not understand the comment
- 1335 – “loss of social welfare” - hm, this may be a value-based assertion by a friend of pristine ecosystems
This will be either discussed or deleted
- 1355 – I remember that kay Emeis had an early key paper on this.
Will be investigated and cited if applicable
- 1448 – what does blue and blue-green stand for?
blue: sea-based, blue-green: sea-land based; will be explained
- 1475 – More probable – why?
Will be edited
- 1480 – add number for usage of wind energy
We will see if this can be calculated and provided

- 1601 – delete – trivial and vague; same with 1608
Will be deleted
- 1658 – “An engineering” – much too general an assessment.
The sentence can be deleted
- 1664 – “periodicity of climate” – what shall that be: annual cycle?
replace with “climate variability”
- 1728 – deepening
should be “depending”
- 1774 – “gentle” is not an adequate word
replace with “suggesting a small increase in the Northern part...”
- 1822 – There are --- which?
Yes, the associated risks and obstacles need to be briefly discussed
- 1836 – Anholt is in the Baltic Sea?
In a sense, yes... but will be changed to “...in the Kattegat”
- 1856 – discussed before
Yes, but not as a bullet in this section; whole text will still be revised to eliminate too much repetition
- 1870 – what are black waters, what grey waters?
This will be defined in the text
- 1877 – Kadet
will be corrected
- 2935 – one scenario or an ensemble of scenarios?
Wrong line number, unable to find the correct one
- 2308 – something I was wondering while reading: what about military ships and military exercises?
Information on this aspect may not be available; military ships and exercises may be too scarce to make an impact compared to other shipping; however, we will try to take this up in section 5.14...
- Figure 6 carries no informational value
Correct, purely decorative, may be deleted
- 2378 – very general statement
We think that this is an important definition of coastal management and how people understand the term
- 2394- detrimental – for whom? This is related to values
The term will be deleted
- Figure 7 – significant for the paper?
We are considering deletion
- 2447 – so what?
Should remain as a question mark bullet
- 2813 – farms
?
- 2982 “eradication of hunger” – hu? This is a key point in the UN millenniums goals.
Sorry!!! Of course, hunger is not eradicated. It is the first author’s view that this is not because of principal shortcomings in food production procedures or technologies, but due to dramatic political and social inequalities in different parts of the world. This discussion is beyond the scope of this paper, so we will re-phrase the sentence, thank you for pointing this out.

- 3145 – what is “blue growth”?
will be briefly explained
<https://www.sciencedirect.com/science/article/pii/S0308597X17306905>