The Panel's respons to the stakeholders' comments and questions to the Scientific Documentation Report

Organization Stakeholder	Ch/ sect	Comments	Question	Response to question and comments
Bæredygtigt Landbrug	General		Does the reviewing group agree that "N limitation" means that the ecosystem receives too much P (from wastewater, run off and sediment) - not that nitrogen must be controlled?	The panel discusses possibilities of controlling N and P jointly in Chapter 5. In particular, it recommends studying innovative ways of reducing agricultural P input
Bæredygtigt Landbrug	General	Overall Consideration of the N:P ratio, cf. Comments/questions from the organization	How is the comment taken into account?	N:P ratios are important to watch. The panel has commented on this in Chapter 5. Current N:P ratio of loads is not very different from historic values (it was much more deviant in the 1980s). The panel discusses possibilities to act on N and P simultaneously, and recommends further study on this
Bæredygtigt Landbrug	General	N:P interactions, cf. Comments/questions from the organization	How is the comment taken into account?	See above
Bæredygtigt Landbrug	General	N and P in marine environment	How is the comment taken into account?	See above
Bæredygtigt Landbrug	General	Phosphorus in waste water creates problems, cf. Comments/questions from the organization	How is the comment taken into account?	Efforts to reduce P have already had significant results during the implementation of the UWWT directive and phosphate free detergents (EEA, 2015 https://www.eea.europa.eu/data-and-maps/indicators/nutrients-in-freshwater/nutrients-in-freshwater-assessment-published-6). See also Conley, D.J., Paerl, H.W., Howarth, R.W., Boesch, D.F., Seitzinger, S.P., Havens, K.E., Lancelot, C. and Likens, G.E., 2009. Controlling eutrophication: nitrogen and phosphorus. Science, 323(5917), pp.1014-1015.
Bæredygtigt Landbrug	General	Conclusion on general comments, cf. Comments/questions from the organization	How is the comment taken into account?	Large reductions of P input from urban sources have already been implemented. In general the data do support the thesis that further reduction of eutrophication can be reached by reducing diffuse loads, in particular of Nitrogen. See also Ch. 5
Dansk Sportsfiskerforbund	General	The work with the models started late in the process. The WFD was signed in 2000. This first Danish plan covered the period from 2010-2015	How is the comment taken into account?	Efforts in Denmark with respect to WFD do not lag behind the efforts in other countries

Dansk Sportsfiskerforbund	General		Do you find that the Danish surveillance is sufficient and is this data good enough to support the models?	The panel comments on monitoring in several chapters
Dansk Sportsfiskerforbund	General		Do you find that there had been the necessary finance and time for the development of the models?	The panel has no full overview of time and resources, and is only given the final output as a basis for the evaluation. Consequently, the panel will not comment on this question
Dansk Sportsfiskerforbund	General		Is there the necessary continuity in the model work?	The panel has not seen reasons to question the continuity in the model work
Landbrug & Fødevarer	General	The EU Water Framework Directive (WFD) prescribes all water bodies to attain "good ecological status". In Denmark, River Basin Management Plans (RBMP) are developed to ensure that this goal is achieved., cf. comments/questions from the organization	How is the comment taken into account?	See Chapter 2.1
Landbrug & Fødevarer	General		Should eco-system models supporting RBMP build on scientific documentation, i.e. peer-reviewed articles?	The Scientific Documentation Report clearly builds on the scientific literature. Methods used are also based on published literature. The current review, both by stakeholders and by the review panel, is a more thorough peer review than the usual procedure used by journals.
Landbrug & Fødevarer	General		The panel is strongly encouraged to request additional information regarding peer-reviewed articles describing the modeling approach from both DHI and AU.	See above
Landbrug & Fødevarer	General	All calculations of uncertainty are based on the final results concerning required nitrogen load reductions. It is shown that the available data are insufficient for determination of the maximum confidence interval, cf. comments/questions from the organization	How is the comment taken into account?	The panel recommends on this in Chapters 6 and 8
Landbrug & Fødevarer	General		No attempt is made to quantify the uncertainties arising from model input and through modeling procedures, using both mechanistic and statistical	The panel recommends on this in Chapters 6 and 8. We note that a full formal uncertainty analysis is not possible for the very complicated calculations needed

			approaches. Does the panel agree that a solid assessment of uncertainties of the models is missing?	to estimate MAI. Researchers, stakeholders and authorities will have to accept the existence of uncertainty, and continue to properly monitor the systems' response to measures with the aim of adjusting the measures where and when needed.
Bæredygtigt Landbrug	2	Legal comments on the International Nitrogen Assesment, cf. Comments/questions from the organization	How is the comment taken into account?	The panel are not legal experts so cannot respond adequately to this question
Bæredygtigt Landbrug	2	Water Services contra the Danish translation "forsyningsforpligtelser", cf. Comments/questions from the organization	How is the comment taken into account?	The panel members do not speak or read Danish therefore are not qualified to comment on alleged mistranslation.
Bæredygtigt Landbrug	2	Proportionality, cf. Comments/questions from the organization	How is the comment taken into account?	This question has legal implications and the panel are not legal experts so cannot respond adequately to this question
Danmarks Naturfredningsforening	2	We notice, that the development of the marine model tools was largely founded on the recommendations of the 'Eelgrass Working Group II'.	How is the comment taken into account?	The panel has no full overview of the ways in which the work originated or was based on previous efforts, and prefers to comment on the end product instead
Danmarks Naturfredningsforening	2		Do you find that the marine model tools founded on the recommendations of 'Eelgrass Working Group II' are sufficient?	See Chapter 10, for the overall assessment of the sufficiency of the models and primarily Chapters 6-8 for details
Danmarks Naturfredningsforening	2		Can you recommend, that the marine model tools founded on the recommendation of the 'Eelgrass Working Group II' is further qualified?	see recommendations in Chapter 11, and further details about model tools Chapters 6-8
Dansk Sportsfiskerforbund	2	The development of the marine model tools was founded on recommendations of the 'Eelgrass Working Group II'.	How is the comment taken into account?	See Chapter 10, for the overall assessment of the sufficiency of the models and primarily Chapters 6-8 for details
Dansk Sportsfiskerforbund	2		Are these tools qualified? Are they sufficient?	See Chapter 10, for the overall assessment of the sufficiency of the models and primarily Chapters 6-8 for details
Landbrug & Fødevarer	2.1	The text in section 2.1 does not touch the central issue in the WFD – returning to good ecological status. Already in 2009, Duarte et al. (2009) described (...), cf. comments/questions from the organization	How is the comment taken into account?	The Duarte et al (2009) paper is an excellent and very interesting article, particularly since it includes a Danish example. Nevertheless, it cannot be invoked as a basis to abandon the Danish implementation of the WFD. Note that, in general, the literature on regime shifts and alternative stable states indicates that stronger nutrient

				reduction is needed than would be estimated from a linear model, in order to revert to the original state of the system.
Landbrug & Fødevarer	2.1	It is clearly demonstrated that returning to good ecological status is not merely a question of reducing nitrogen loads to previous levels.	How is the comment taken into account?	See above
Landbrug & Fødevarer	2.1		Does the panel agree that several stress factors must be taken into account?	Coastal systems are subject to a range of pressures. This is the reason that a number of directives (UWWT, Nitrates, WFD, MSFD) address water quality as part of environmental and ecological status. Nutrients are one of the most important pressures and this was why the EU chose eutrophication for the intercalibration excercise. It is also an important issue for Helcom and Ospar. The Panel stress that in Danish waters decreasing the nutrient pressure is a necessary, but possibly insufficient condition for restauration of GES. However, the Panel recommends that more effort can be put into investigating further whether combined nitrogen and phosphorus reduction could optimise the efficiency of action (Ch. 5)
Landbrug & Fødevarer	2.1		Does the panel agree that understanding feedback mechanisms is important in order to implement the right measures for achieving good ecological status?	The panel is fully aware of the importance of feedback mechanisms. There is a real possibility that the proposed measures will be insufficient if they are not able to push the system back to the original state. Monitoring and follow-up of the effects of the proposed measures will indicate if more effort is needed. The panel estimates that it is highly unlikely that less effort in nutrient reduction will be sufficient to obtain GES.
Bæredygtigt Landbrug	2.2	Uncertain nitrogen assessment methodology behind the River Basin Management Plans, cf. Comments/questions from the organization	How is the comment taken into account?	See Chapter 2
Bæredygtigt Landbrug	2.2	Neglect of the WFD requirements, cf. Comments/questions from the organization	How is the comment taken into account?	See Chapter 2
Danmarks Naturfredningsforening	2.2	With a reference to section 2.1 (…) The essence of The Water Framework Directive (WFD) is, that all surface waters	How is the comment taken into account?	See Chapter 2.1

		shall achieve at least good ecological and chemical status., cf. Comments/questions from the organization		
Danmarks Naturfredningsforening	2.2		Do you find that the ecological status in the Danish plan period 2015-21 can be classified according to the three indicators mentioned in section 2.2.1 (page 9 – 10)?	See Chapter 2.2 and chapter 4
Danmarks Naturfredningsforening	2.2		Do you find, that the ecological status in the Danish plan period 2015-21 could have been classified according to more or other indicators, than the three indicators mentioned I section 2.2.1 (page 9 – 10)? If so, do you think, that it would have had influence of the result for the maximum allowable nutrient input (MAI) due to the models for calculation?	See Chapter 2.2 and chapter 4
Dansk Akvakultur	2.2	Per 1: The eel grass tool "However, though the best availably tool at that time, it…" Ell grass tool was not the best tool at that time. There were models (DHI) which were much better developed."	How is the comment taken into account?	Not dealt with by the Panel
Dansk Sportsfiskerforbund	2.2	In Denmark the required reduction of nutrients inputs is political defined. And the reduction have been changed in the period – and prosponed. We find that The Water Framework Directive (WFD), demands that all surface waters shall achieve at least good ecological and chemical status.	How is the comment taken into account?	The panel agree that the Water Framework Directive (WFD) requires that all surface waters shall achieve at least good ecological and chemical status. We are not qualified to comment on the political process in Denmark.
Dansk Sportsfiskerforbund	2.2		It is possible to classiefi the ecological status in the Danish plan period 2015-21, according to the three indicators mentioned?	The indicators capture the essence of water quality. See chapter 4, chapter 11 and next response
Dansk Sportsfiskerforbund	2.2		Could the plan have been classified according to other indicators?	More indicators could, at least in principle, be included to make the assessment more robust, see recommendations in Chapter 11. Note however, that the inclusion of an additional indicator requires that (1) a credible reference state can be defined and (2) the response of the indicator on proposed measures can be quantified. Unless this can be achieved, additional indicators will add more expert judgment and discussion to the process. Therefore the panel

				recommends more study into additional indicators before they are operationally used.
Dansk Sportsfiskerforbund	2.2		Is the three indicators representative?	See Chapter 2.2 and chapter 4
Dansk Sportsfiskerforbund	2.2		Could that have had influence of the result for the maximum allowable nutrient input due to the models for calculation?	See Chapter 9 about Maximum Allowable Input
Landbrug & Fødevarer	2.2	Figure 2,3 p. 10 (status of clorophyll a), cf. comments/questions from the organization	Abrupt changes in ecological status between neighboring water bodies frequently occur, as demonstrated in the comments. Does the panel agree that biologically it does not make sense to see such changes?	This issue is recognised by the Panel and typology and reference conditions are discussed extensively in the evaluation. Note, however, that when gradients in a system are summarized into a few discrete classes, 'abrupt' transitions will always appear in maps even though underlying gradients are small. It is comparable to a student passing with 5.1/10, and failing with 4.9/10.
Landbrug & Fødevarer	2.2		Do the abrupt changes indicate problems for instance with the typologization being too coarse?	See chapter 3 Typology
Landbrug & Fødevarer	3.1	Transitional water, cf. comments/questions from the organization	How is the comment taken into account?	This was a decision by the Danish Competent Authority. Other countries (e.g. Germany) have also adopted this strategy.
Landbrug & Fødevarer	3.1		Has hydromorphology for Danish coastal waters been sufficiently described?	The typology is discussed by the Panel extensively in Ch. 3
Landbrug & Fødevarer	3.1		Why have no Danish water bodies been designated "transitional water", given the description in the WFD?	See chapter 3 Typology. This was a decision by the Danish Competent Authority. Other countries (e.g. Germany) have also adopted this strategy.
Landbrug & Fødevarer	3.1		Would it be relevant to re-consider the designation of certain water bodies – in particular the inner, coastal fjords, as suggested by the EU commission?	It is a possibility and we note a suggestion that such a project is planned in the answers of the researchers to our questions. However, we recommend that the Danish modelling could go to specific water bodies.
Landbrug & Fødevarer	3.2	The typology is central for the classification of reference conditions and ecological status., cf. comments/questions from the organization	How is the comment taken into account?	See chapter 3 Typology
Landbrug & Fødevarer	3.2		The European Commission has requested that Denmark further develops water typologies. Is it acceptable to simplify typologization to a degree where highly different water bodies must live up to similar environmental threshold values?	See chapter 3 Typology. As long as type specific reference conditions are established for the water bodies, this is not a problem in the context of WFD implementation. See also previous answers

Landbrug & Fødevarer	3.2		Physical modifications, such as dams and bridges, are not taken into account in the typologization. Does the panel agree that dams and, to some extent, bridges may impact the exchange of water?	There is the possibility to classify as **modified** water body.
Landbrug & Fødevarer	3.2		Only in two cases are fjords with a sluice designated the "sluice fjord" typology. Does the panel agree that as a basic premise, the presence of a sluice should require an individual assessment of the impact of the modification, and if necessary specific threshold values for the given fjord?	See chapter 3 Typology
Danmarks Naturfredningsforening	4	In the chapter it is mentioned, that originally The Danish National Aquatic Monitoring and Assessment Programme (DNAMAP) probably was the most comprehensive programmes in the world (page 19).	How is the comment taken into account?	See chapter 3 Typology
Danmarks Naturfredningsforening	4		Do you find, that The Danish National Aquatic Monitoring and Assessment Programme (DNAMAP) probably no longer is the most comprehensive programmes in the world?	See chapter 3 Typology
Danmarks Naturfredningsforening	4		Do you overall find, that the DNAMAP is sufficient according to numbers of stations and monitoring land-based loadings of N and of P in Denmark?	See chapter 3 Typology
Danmarks Naturfredningsforening	4		Do you overall find that the data from DNAMAP can be used to develop the marina modeling tools as done in the project?	See chapter 3 Typology
Danmarks Naturfredningsforening	4		Do you overall find that if the land-based loadings of N and P in Denmark had been monitored further in DNAMAP in the period used, it would have result in a greater strength of linear relationship between modeled and observed data, than shown in the project? If so, how much more should there have been monitored in order to get a greater strength of linear relationship between modelled and observed data, than shown in the project?	Annex V, 1.3 of WFD specifies the minimum requirements for monitoring of ecological status and chemical status for surface waters
Dansk Sportsfiskerforbund	4		In the chapter it is mentioned, that originally The Danish National Aquatic Monitoring and	See chapter 3 Typology

			Assessment Programme (DNAMAP) in the start was the best programme. Do you agree?	
Dansk Sportsfiskerforbund	4		The Danish National Aquatic Monitoring and Assessment Programme (DNAMAP) probably no longer is the best programme in the world? Do you agree?	See chapter 3 Typology
Dansk Sportsfiskerforbund	4		Is the numbers of stations and monitoring land-based loadings of N and of P in Denmark sufficient?	See chapter 3 Typology
Landbrug & Fødevarer	4	The monitoring program has been decreased at the same time as the government introduced different reduction targets for each water body, Water bodies with specific nitrogen reduction targets, cf. comments/questions from the organization	How is the comment taken into account?	See chapter 3 Typology
Landbrug & Fødevarer	4.1	The monitoring carried out in Danish marine waters does not cover all water bodies with specific nitrogen reduction targets. Only very few typologies are applied to the 119 Danish marine water bodies (see section 3.2)., cf. comments/questions from the organization	How is the comment taken into account?	See chapter 3 Typology
Landbrug & Fødevarer	4.1	See chapter 3 Typology	Considering the extensive use of models, does the panel find the ongoing monitoring program sufficient?	See chapter 3 Typology
Landbrug & Fødevarer	4.1		Meta models are used when modeling data is insufficient. As meta models are developed in different water bodies than where applied, they often produce result of high uncertainty. Should the monitoring program be extended in order to reduce the use of meta models?	Modelling and monitoring are complementary activities. Adequate monitoring and data is necessary to calibrate and test the models. Annex V, 1.3 of WFD specifies the minimum requirements for monitoring of ecological status and chemical status for surface waters. The application of Meta models is also discussed extensively in Chapter 8.
Dansk Akvakultur	4.2	An aquaculture plant in Smålandshavet is mentioned as increasing the load here. The discharge of nutrients is very low compared to other sources. Therefore it is incorrect and misleading and should be	How is the comment taken into account?	The panel cannot make a statement on the specific case. However in general, depending on the sort of aquaculture, there can be inputs, e.g. caged salmon. Some organisms can act as biofilters and others (e.g. algae) can remove nutrients. So the type of aquaculture is important.

		removed. There hasn't been any new aquaculture farm here in many years.		
Dansk Akvakultur	4.2	Sentence: " Despite the efforts to reduce the diffuse loads, Danish agriculture remains the major source of both N (80%) and P (50%) in Danish streams, lakes and coastal waters (Kronvang et al. 2005)."is not correct for coastal waters, as external sources are far more important here.	How is the comment taken into account?	The Panel is well aware that there are influences from offshore on coastal waters to a varying degree and although the Panel have suggestions for refined typology, the effects are accounted for adequately in the models described in the Scientific Documentation Report
Landbrug & Fødevarer	4.2	Nitrogen loading, on an annual basis, is the target of action in the Danish RBMP.	How is the comment taken into account?	The Panel address the issue of seasonality in Chapter 5
Landbrug & Fødevarer	4.2			See questions regarding this point in section 9.1
Danmarks Naturfredningsforening	5.1	We notice the recommendation given by the Eelgrass Working Group II about which models, there should be in focus (page 24).	Are those models and methods – or similar models and methods -used to support the establishment of Danish River Basin Management Plans – been develop and used in other countries/water bodies?	The Panel address the issue in Chapter 9
Danmarks Naturfredningsforening	5.1	We notice, that both the budget and the time schedule was taking into account when it was adopted an approach involving development of four mechanistic biogeochemical models and statistical models (page 24).	Are the models and methods used to support the establishment of Danish River Basin Management Plans generally scientifically accepted?	The Panel gives an overall assessment in chapter 10, details are found in remaining chapters.
Danmarks Naturfredningsforening	5.1		Should there have been developed more than four mechanistic biogeochemical models and statistical models (if the budget and the time had not to be taking into account) calculating nutrient reduction requirement and corresponding MAI to obtain GES?	Yes, the Panel recommends that mechanistic models are applied in more water bodies
Danmarks Naturfredningsforening	5.1		Considering the Danish water bodies do you assess, that the four mechanistic biogeochemical models and statistical models developed sufficient covers the Danish water bodies?	The question is extensively discussed in Chapter 8
Dansk Sportsfiskerforbund	5.1	Development of four mechanistic biogeochemical models and statistical models had a budget and time schedule, that set the frame.	How is the comment taken into account?	The Panel have noticed that the researchers behind the Scientific Documentation Report refer to limited resources and time as reason for not exploring certain lines of research. However, the Panel has not the overview over time-frame and budget to make an assessment on whether reasonable resources have been spent.

Dansk Sportsfiskerforbund	5.1		Do you find that the necessary money and time was given to the development of the models?	See response to the comment above, however, we give recommendations on how the work could be extended and refined.
Dansk Sportsfiskerforbund	5.1		Are the models and methods used to support the establishment of Danish River Basin Management Plans generally scientifically accepted?	See the overall assessment in Chapter 10
Dansk Sportsfiskerforbund	5.1		Do you find that the Danish water bodies is sufficient covered, with the used of the mechanistic biogeochemical models and statistical models?	The question is extensively discussed in Chapter 8
Dansk Sportsfiskerforbund	5.1		Should there have been developed more models calculating nutrient reduction requirement and corresponding MAI to obtain GES?	The question is extensively discussed in Chapter 8 and consider the recommendations in Chapter 10
Landbrug & Fødevarer	5.1	It is explained that meta models are used for "too small" water bodies and when data availability is limited, cf. comments/questions from the organization	How is the comment taken into account?	Meta modeling is discussed extensively in Chapter 8 and the typology in Chapter 3
Landbrug & Fødevarer	5.1		Have scientific criteria for identification of 'too small' water bodies been established / provided?	See chapter 3 and chapter 8
Danmarks Naturfredningsforening	5.2	We notice, that it is mentioned, that for the Danish plan period 2015-21, ecological status is classified to three indicators (chlorophyll-a, eelgrass depth limit and a fauna index (DKI). We furthermore notice, that not all of these indicators can be linked to the model toolbox (page 25).	How is the comment taken into account?	The Panel discuss indicators in general in Chapter 2 in terms of the WFD, but also specifically in several of the other Chapters the consequences of indicator choices are discussed.
Danmarks Naturfredningsforening	5.2		Do you agree that it was necessary to make the adjustments as described in section 5.2 (page 25 – 26)?	The Panel agrees with the researchers that the link between nutrient inputs and the benthic fauna biodiversity is not understood well enough to make use of that indicator in the present context
Danmarks Naturfredningsforening	5.2		What is your assessment of the adjustment described in section 5.2 (page 25 – 26)? Could the adjustment have influence on the result of linear	Here the Panel assume that the question relates to the estimation of Chl-a targets using the models. This is discussed in several of the chapters, concerning various aspects on that issue

			relationship between modeled and observed data?	
Dansk Akvakultur	5.2	p. 26 par 2: Is it a lack that biodiversity not is included.	How is the comment taken into account?	The Panel agrees with the researchers that the link between nutrient inputs and the benthic fauna biodiversity is not understood well enough to make use of that indicator in the present context.
Dansk Sportsfiskerforbund	5.2	In the Danish plan period 2015-21, ecological status is classified to three indicators.	How is the comment taken into account?	See Chapter 2 and Chapter 4 on indicators
Dansk Sportsfiskerforbund	5.2		Do you find it was necessary to make the adjustments as described? What is your assessment of the adjustment described?	The Panel agrees with the researchers that the link between nutrient inputs and the benthic fauna biodiversity is not understood well enough to make use of that indicator in the present context
Dansk Sportsfiskerforbund	5.2		Will you comment the influence on the result of linear relationship between model and observed data with these adjustments?	Here the Panel assume that the question relates to the estimation of Chl-a targets using the models. This is discussed in several of the chapters, concerning various aspects on that issue
Landbrug & Fødevarer	5.2	The WFD operates with three "biological quality elements", of which angiosperm distribution is one. cf. comments/questions from the organization	How is the comment taken into account?	See Chapter 2 on indicators
Landbrug & Fødevarer	5.2		Is it acceptable to disregard species of angiosperms other than eelgrass, e.g. spiral tasselweed, even though specific areas have abundant populations of these?	The distribution of *Ruppia* (Spiral tassle weed) will also be affected by Kd
Landbrug & Fødevarer	5.2		Is it reasonable to assign poor ecological status, concerning "other aquatic flora", to areas with a widespread eelgrass population, but where eelgrass is not found at the bottom of e.g. an artificial channel in the fjord?	If the channel is dredged to be kept open "artificially" this will also destroy the eelgrass
Landbrug & Fødevarer	5.2	Kd is a physico-chemical quality element; basically the transparency of the water, cf. comments/questions from the organization	Numerous factors influence the eelgrass depth limit. Is it reasonable to focus exclusively on Kd as a proxy?	Kd was the chosen indicator, but maybe insufficient. See discussion in Ch. 4
Landbrug & Fødevarer	5.2		Is it possible, maybe even likely, that eelgrass will not, even after a time lag, spread to the required depth limit if only one stress factor is addressed?	This is discussed in Ch.4. It is indeed possible that other measures would be necessary. However, the panel also discusses the possibility that Kd is affected by nutrient loading but lags behind in its response due to stocks of (coloured) organic matter or other factors

Landbrug & Fødevarer	6		The panel is kindly requested to reflect and comment on the evaluation report differing from the original, Danish reports, which form the basis for RBMP. What is the value of an international evaluation, if the background reports have been altered at critical points?	We are unable to ascertain this as we cannot read Danish. The panel only evaluates the English report. We urge the different parties to build a relationship on trust and respect to resolve the complex issue of ecological quality, which will ultimately benefit all Danish people.
Danmarks Naturfredningsforening	6.1		Do you agree, that the PLS regression models are an appropriate tool taking the argument for the chose mentioned in section 6.1 in to consideration (page 27)?	Yes
Danmarks Naturfredningsforening	6.1		Do you in overall find, that it would have been inadvisable, if PLS regression models had not been chosen as a tool?	We do not understand the question with its double negation very well. The panel does not see problems with PLS as a statistical tool. However, it recommends changes to the statistical approach based on other considerations in Ch. 6
Dansk Akvakultur	6.1	p.27 par 1: Statistical linear models with multiple predictors (MLR, mixed models, PLS etc.) have previously been applied in several studies of marine eutrophication published in international peerreviewed journals (Conley et al. 2007;….” These models are as far as we know not pre-reviewed but only used in reports. There should be a clear discussion of the advantages, as well as the disadvantages of using the statistical models.	How is the comment taken into account?	Basic computational methods have been published elsewhere and the methods are well established. It is possible that no publications describe application to Danish marine systems, but that does not render the models suspicious or bad. Note that the present review should be considered a 'heavy' peer review
Dansk Akvakultur	6.1	Is it right that these models are not prereviewed?	Is it right that these models are not prereviewed? The models should be pre-reviewed if they are used, and it should be clear that the models are not pre-rewired.	See previous response
Landbrug & Fødevarer	6.1	The cited ”earlier work on MLR” (Markager et al. 2006, 2008) are non-peer reviewed reports. Thus, both previous work and the present reports have not passed a scientific peerreview, cf. comments/questions from the organization	How is the comment taken into account?	The reports that form the basis of the typology and the modelling are not based on peer reviewed articles and this is pointed out as a weakness by the stakeholders. However, the nature and purpose of scientific reports is different to that of scientific, peer reviewed articles. Articles are usually too short for a full and detailed explanation. Nevertheless, this DRBMP report has now been subjected to a very thorough peer review lasing several weeks and involving 5 international experts on the panel. Additionally, it has been peer reviewed by

				highly qualified consultants acting for the stakeholders. This level of scrutiny should contribute to an improved report and more robust results.
Landbrug & Fødevarer	6.2	According to this section, PLS models were developed "with the main purpose of quantifying the relationship between nutrient loadings and the selected response variables", cf. comments/questions from the organization	Does the panel agree that selecting input variables in advance is a problematic approach, which is unnecessary given the many advantages of PLS regression?	yes. See comments in Chapter 6
Danmarks Naturfredningsforening	6.3	We notice, that the predictors was selected due to their known ability to act as forcing factors on the indicators (see table 6.2 at page 30).	How is the comment taken into account?	For this and the following comments and questions, the panel refers to Ch. 6
Danmarks Naturfredningsforening	6.3		Please comment figure 6.1 according to the numbers of official stations compared to the Danish water bodies and their individual characteristics (page 29).	Question is unclear to the panel
Danmarks Naturfredningsforening	6.3		Do you find it correct, that only monitoring stations within the zone of WRD and data series with at least 15 years of data during the period 1990 to 2012 with a minimum of one bimonthly observation, has been used (page 29)?	It is advisable to use all available data that has been quality controlled. Annex V section 1.3 of the WFD sets out the requirements for monitoring of ecological status and chemical status for surface waters. In practice decisions on what is 'sufficient' must be taken by all researchers. The panel thinks the applied criteria are reasonable and does not see reason to criticize them
Danmarks Naturfredningsforening	6.3		Do you assess, that the selected predictors are the right predictors in order to developed statistical models in the project?	Collinear predictors could have included given estimated covariances to add the most important predictors for the management.
Danmarks Naturfredningsforening	6.3		Could there have been chosen fewer predictors without influencing the project statistical models and the project result of linear relationship between modeled and observed data?	No
Danmarks Naturfredningsforening	6.3		To what extent can it have influenced on the statistical models, that all data series have not been analyzed for outliers individually (page 32)?	Data series should be quality checked. Outliers may be important but if erroneous they can distort results.
Danmarks Naturfredningsforening	6.3		Do you agree, that in order to balance the two aspect of the predictor variables described (page 33) it is correct to specify, that the predictors variables should not start earlier than the year	Time lags seem ok given short retention times

			before the responding variable? And do you find, that the rules for predictor variables are sufficient (se also figure 6.3 at page 34)?	
Danmarks Naturfredningsforening	6.3		Do you agree that the additional analyses used to identify the most likely variable in those cases, where different sets of predictor variables described the selected responding variable almost equally, is sufficient (see also page 38)?	Analysis gives additional information necessary. In this case, it is hard to get better information.
Dansk Sportsfiskerforbund	6.3	We notice, that the predictors was selected due to their known ability to act as forcing factors on the indicators.	How is the comment taken into account?	For this and the following comments and questions, the panel refers to Ch. 6
Dansk Sportsfiskerforbund	6.3		Please comment figure 6.1 according to the numbers of official stations compared to the Danish waterbodies and their individual characteristics.	Question is unclear to the panel
Dansk Sportsfiskerforbund	6.3		Do you find it correct, that only monitoring stations within the zone of WRD and data series with at least 15 years of data during the period 1990 to 2012 with a minimum of one bimonthly observation, has been used?	It is advisable to use all available data that has been quality controlled. Annex V section 1.3 of the WFD sets out the requirements for monitoring of ecological status and chemical status for surface waters. In practice decisions on what is 'sufficient' must be taken by all researchers. The panel thinks the applied criteria are reasonable and does not see reason to criticize them
Dansk Sportsfiskerforbund	6.3		Do you assess, that the selected predictors are the right predictors in order to developed statistical models in the project?	Collinear predictors could have included given estimated covariances to add the most important predictors for the management.
Dansk Sportsfiskerforbund	6.3		Could there have been chosen fewer predictors without influencing the project statistical models and the project result of linear relationship between modelled and observed data?	No
Dansk Sportsfiskerforbund	6.3		To what extent can it have influenced on the statistical models, that all data series have not been analyzed for outliers individually?	Data series should be quality checked. Outliers maybe important but if erroneous they can distort results.
Dansk Sportsfiskerforbund	6.3		Do you agree, that in order to balance the two aspect of the predictor variables described (p. 33) it is correct to specify, that the predictors variables should not start earlier than the year before the responding variable? And do you find, that the rules for predictor variables are sufficient (se also figure 6.3)?	Time lags seem ok given short retention times

Dansk Sportsfiskerforbund	6.3		Do you agree that the additional analyses used to identify the most likely variable in those cases, where different sets of predictor variables described the selected responding variable almost equally, is sufficient?	Analysis gives additional information necessary. In this case, it is hard to get better information.
Landbrug & Fødevarer	6.3	Four responding variables (…) were chosen as environmental indicators due to their welldocumented response to nutrient enrichment", cf. comments/questions from the organization	Is choosing responding variables based on which factors they respond to an acceptable method in accordance with scientific standards?	Variable selection is in accordance with scientific standards, but see comments in Ch. 6
Landbrug & Fødevarer	6.3		Should non-Danish contributions to the total nutrient load in Danish marine waters be taken into account when developing regression models describing the ecosystems in these waters?	They should, but the question is not easy to solve. When regressing a response variable on land-based N load only, as was done in the statistical modelling, one accounts for other influences as random influences. If however external loading has a decreasing trend, e.g. as a consequence of Baltic actions, this could deviate from the random assumption. In principle, the effect could be built into the statistical model. We suspect, however, that it will have little influence in practice since it applies to very open waters where required nutrient load reductions are small
Landbrug & Fødevarer	6.3		Should the trend in climate change be included in the model work?	The panel discusses this in Ch.9. Climate change could have effects but these are not very clear at the moment. Climate change should not be invoked as a reason not to act today. Elliot et al 2015, discuss this with respect to Good Environmental Status (MSFD) and biodiversity, however, most of the arguments are also valid for GES and the WFD. See Elliott, M et al. 2015. Force majeure: Will climate change affect our ability to attain Good Environmental Status for marine biodiversity?. Marine pollution bulletin, 95(1), pp.7-27.
Landbrug & Fødevarer	6.3		How is the comment taken into account?	The Panel asked the researchers about the importance of this detrending. It appears to have minimal effect on the overall analysis
Landbrug & Fødevarer	6.3	According to equation 6.2, detrending was used for preprocessing data. The exact settings for the detrending are not stated in the paper, why the strength of the detrending is unknown to the reader, cf.	Should the trend in climate change be included in the model work?	See Chapter 9 MAI and other answers on the topic

		comments/questions from the organization		
Landbrug & Fødevarer	6.3	As commented in Appendix 2, it is unusual to use MLR for variable selection, followed by PLS for the actual modeling.	How is the comment taken into account?	Variable selection in general is statistically well justified. However, the Panel also questions whether it is needed here, given the well-established theory on the influence of nutrients on phytoplankton. See chapter 6 for full discussion
Landbrug & Fødevarer	6.3		Has variable selection been carried out in a satisfactory way?	Variable selection in general is statistically well justified. However, the Panel also questions whether it is needed here, given the well-established theory on the influence of nutrients on phytoplankton. See chapter 6 for full discussion
Landbrug & Fødevarer	6.3		Could important information potentially be lost through the applied procedures, specifically the use of MLR for variable selection before PLS modeling?	See chapter 6 on statistical modelling
Landbrug & Fødevarer	6.3	Specific comment to page 36: “we experienced that the parameters (PLS coefficients) were still sensitive to small variations in the data set when highly intercorrelated predictors ($r > 0.9$) were used, making use of highly correlated data sets problematic even in PLS regressions”, cf. comments/questions from the organization	How is the comment taken into account?	It's likely and justified. The Panel proposes an alternative approach that reduces this problem
Landbrug & Fødevarer	6.3		Does the panel agree that omitting intercorrelated variables, which are very well handled by PLS regression, might mean that important information is lost?	This is likely and therefore, we recommend to model the correlation between the variables and to make resulting uncertainty MAI transparent
Bæredygtigt Landbrug	6.4		In more than 40% of the cases, no relation was found between N load and Kd. How is it then possible to assume that the relation is still valid by using the so called meta model?	This is based on the assumption that water bodies behave in the same way. If the evidence from water body specific model & data is not strong enough then this assumption is valid. The panel comments on specific problems with Kd in chapter 4, and proposes cross-systems statistical analysis in Ch. 6 to better treat this problem

Danmarks Naturfredningsforening	6.4	We notice, that it is referred, that a closer autocorrelation analysis revealed, that the historical signal for TN have different effect to different water bodies, but due to the relative short time series available.	How is the comment taken into account?	Time series may be too short but reveal the differences in effects.
Danmarks Naturfredningsforening	6.4		Do you access, that there could have been done quantification of autocorrelation in order to improve the models based on time series available?	That would have been informative addition.
Danmarks Naturfredningsforening	6.4		Please comment the two last sections at page 43. Do you agree in the arguments and the assessments in these two sections?	The panel has commented on this in Ch. 6
Dansk Sportsfiskerforbund	6.4	We notice, that it is referred, that a closer autocorrelation analysis revealed, that the historical signal for TN have different effect to different water bodies, but due to the relative short time series available.	How is the comment taken into account?	Time series may be too short but reveal the differences in effects.
Dansk Sportsfiskerforbund	6.4		Do you access, that there could have been done quantification of autocorrelation in order to improve the models based on time series available?	That would have been informative addition.
Landbrug & Fødevarer	6.4	It is noted that the Kd models do not describe data very well. This is explained by influence of light absorption by dissolved organic matter and detritus as well as scattering of light by particles, cf. comments/questions from the organization	How is the comment taken into account?	See Chapter 4. Kd may not be sufficient as an indicator for eelgrass. Kd was the chosen indicator, but maybe insufficient,
Landbrug & Fødevarer	6.4		When the ecological status of Kd is determined by several factors in addition to N loading, is it then scientifically correct to investigate and address only N loading?	Closer analysis of the correlation between Kd and Chl-a, both at the present and in 1900, suggests that both are influenced by nutrient loading but with different response times. Seagrass is known to be very sensitive to nutrient loading, although low nutrient loading alone may not be sufficient to restore seagrass meadows.
Landbrug & Fødevarer	6.4		Is good ecological status obtainable when other variables of significance are not addressed?	The panel recommends pursuing closer studies into this problem (Ch. 4 and general recommendations)

Landbrug & Fødevarer	6.4		Is it problematic to extrapolate a correlation far out of its defined range, as is done in the statistical model approach?	Uncertainty has been acknowledged correctly in the report.
Danmarks Naturfredningsforening	6.5	We notice, that the aim of the project is to provide a model-based management tools for estimation Maximum allowable loadings (MAI) for each of the 119 marine water bodies covered by the WFD in Denmark (page 46).	Do you agree that there is overwhelming evidence in the scientific literature, that nutrient loadings do have an impact on selected response variables (page 46)?	Yes
Dansk Sportsfiskerforbund	6.5	The aim is to provide a model-based management tools for estimation Maximum allowable loadings (MAI) for each of the 119 marine water bodies covered by the WFD in Denmark.	How is the comment taken into account?	See Chapter 9 MAI.
Dansk Sportsfiskerforbund	6.5		Is there evidence, that nutrient loadings do have an impact on selected response variables?	yes
Landbrug & Fødevarer	6.5	It is unfortunately necessary to inform the panel that the described approach of modeling seems to have changed from the original reports, in Danish, to the English report forming the basis for the present evaluation. A phrasing such as (…), cf. comments/questions from the organization	How is the comment taken into account?	We are unable to ascertain this as we cannot read Danish. There will always be differences in interpretation in a translation. We urge the different parties to build a relationship on trust and respect to resolve the complex issue of ecological quality, which will ultimately benefit all Danish people.
Landbrug & Fødevarer	7	Different aspects of the various water bodies' ecosystems could have been investigated by using the models, cf. comments/questions from the organization	Why are only scenarios of nitrogen and phosphorus load reductions included in the modeling work?	N and P loads are 2 of the most important pressures (Andersen et al 2017). Other pressures such as non-indigenous species and noise are covered in the MSFD descriptors. Local measures such as sluice operations etc. could become part of a local management plan. See also Ch. 2.5
Landbrug & Fødevarer	7		Alternative scenarios, focusing on different stress factors, would support the work towards finding the most promising solutions.	N and P loads are 2 of the most important pressures (Andersen et al 2017). Other pressures such as non-indigenous species and noise are covered in the MSFD descriptors. Local measures such as sluice operations etc. could become part of a local management plan. See also Ch. 2.5
Danmarks Naturfredningsforening	7.3	We notice, that the modelling work, where the focus was on the inner Danish waters did not experience any systematic errors and therefore it could be concluded	Referring to, that the project found, that the specific acceptance criteria were lower for the coastal areas and enclosed water bodies as specific bathymetric details and local conditions	We are afraid we do not understand the comment and the question. The physical modelling described on p.62 is assessed as excellent by the panel

		that the official data on loadings were valid for the purpose of the modeling page 59).	become increasingly important, do you find, that there are scientific evidence for this (page 62)?	
Dansk Akvakultur	7.3	Following sentence is very important: "As can be seen, there is a strong correlation between especially the Danish and the German N loads, but also a rather strong correlation between the Danish and the Swedish loads." It verifies that models only calculating Danish loads are misleading.	How is the comment taken into account?	The suggestion that the models used in the report are invalid because of this reason, is not endorsed by the Panel. The researchers have very carefully taken into account nutrient fluxes from outside Denmark.
Landbrug & Fødevarer	7.4	The calibration and validation of mechanistic models, like that of statistical, is crucial, cf. comments/questions from the organization	It does not seem that the mechanistic models are used for studying all relevant aspects of the ecosystem. Would it have been relevant to use mechanistic models for analyzing other scenarios than reducing nitrogen and phosphorus?	The mechanistic models are very comprehensive and could run diverse scenarios. However, the panel does not see obvious other pressures that could be of similar importance for the ecological status as nutrient loading, especially at national level
Bæredygtigt Landbrug	8	Exploitation of the Water Frame Directive, cf. Comments/questions from the organization	How is the comment taken into account?	See Chapter 2.1 Annex II of the WFD (section 1.3) specifies the procedure for the "Establishment of type-specific reference conditions for surface water body types". Type-specific reference conditions (RC) may be either spatially based or based on modelling, or may be derived using a combination of these methods. Where it is not possible to use these methods, Member States may use expert judgement to establish such conditions. The Danish approach relies on modelling and a 1900 baseline, since there are no pristine systems that can be used as a reference, which is appropriate and WFD compliant. See further Ch. 3 on typology
Bæredygtigt Landbrug	8	Non-compliance with the Water Framework Directive, cf. Comments/questions from the organization	How is the comment taken into account?	See Chapter 2.4 Based on the 'one out all out' principle, the indicators should be considered individually. If one is classified as below the G/M boundary, then management measures must be applied. This was not applied in the DRBMP as confirmed by the researchers in their answers to the panel questions. The outcome of using the 'one out all out' principle would make the measures more stringent. The panel comments on this point in chapter 4
Danmarks Naturfredningsforening	8	General comment	Can the decisions of how to use the historical observation together with the handling of the	See Chapter 9 about Maximum Allowable Input. If the historical data exists it could be used as the reference

			model uncertainty and sensitivity result in an underestimated nutrient reductions requirement in one or more of the 119 Danish WFD water bodies to fulfill GES according to the WFD?	condition. However, see Chpt 2.1 Annex II of the WFD (section 1.3) specifies the procedure for the "Establishment of type-specific reference conditions for surface water body types". Type-specific reference conditions (RC) may be either spatially based or based on modelling, or may be derived using a combination of these methods. Where it is not possible to use these methods, Member States may use expert judgement to establish such conditions. The Danish approach relies on modelling and a 1900 baseline, since there are no pristine systems that can be used as a reference, which is appropriate and WFD compliant.
Dansk Sportsfiskerforbund	8		The year 1900 is chosen as the historical reference conditions in Denmark founded on historical observations documenting eelgrass depth distribution and light penetration at that time. The historical observation is not used directly, even though Denmark have the data. It was decided to use the 90 pct percentil of the historical observations. The reference for GES was defined as 25-30 pct. deviation from the reference. Thus you have the data it was decided to assumed that GES for Danish waterbodies can be estimated at a lower level.	See Chapter 9 about Maximum Allowable Input
Dansk Sportsfiskerforbund	8	Do you agree, that the use of the historical data together with the handling of the model uncertainty, result in underestimating the requirement of nutrient reductions in more of the 119 Danish WFD water bodies, just to fulfill GES according to the WFD?		See Chapter 9 about Maximum Allowable Input. If the historical data exists it could be used as the reference condition. However, see Chpt 2.1 Annex II of the WFD (section 1.3) specifies the procedure for the "Establishment of type-specific reference conditions for surface water body types". Type-specific reference conditions (RC) may be either spatially based or based on modelling, or may be derived using a combination of these methods. Where it is not possible to use these methods, Member States may use expert judgement to establish such conditions. The Danish approach relies on modelling and a 1900 baseline, since there are no pristine systems that can be used as a reference, which is appropriate and WFD compliant.

Bæredygtigt Landbrug	8.1	No data – only uncertain model calculations, cf. Comments/questions from the organization	How is the comment taken into account?	1900 nutrient load estimates were not part of this project. Proper reference to the data sources has been given. There is more knowledge on nutrient budgets in that period than suggested here
Dansk Akvakultur	8.1	p.73. 8.1.4: Important to discuss the reasonableness of using 1900 as historical reference year in relation to data and natural changeability and fluctuation.	Is it optimal to choose 1900 as historical reference your, or was it better to use an other periode?	See Chapter 9 about Maximum Allowable Input. If the historical data exists it could be used as the reference condition. However, see Chpt 2.1. Annex II of the WFD (section 1.3) specifies the procedure for the "Establishment of type-specific reference conditions for surface water body types". Type-specific reference conditions (RC) may be either spatially based or based on modelling, or may be derived using a combination of these methods. Where it is not possible to use these methods, Member States may use expert judgement to establish such conditions. The Danish approach relies on modelling and a 1900 baseline, since there are no pristine systems that can be used as a reference, which is appropriate and WFD compliant.
Landbrug & Fødevarer	8.1	The chlorophyll a reference value is central in the modeling work. Finding a value for that can be approached in several ways, cf. comments/questions from the organization	How is the comment taken into account?	see Chpt 2.1. Annex II of the WFD (section 1.3) specifies the procedure for the "Establishment of type-specific reference conditions for surface water body types". Type-specific reference conditions (RC) may be either spatially based or based on modelling, or may be derived using a combination of these methods. Where it is not possible to use these methods, Member States may use expert judgement to establish such conditions. The Danish approach relies on modelling and a 1900 baseline, since there are no pristine systems that can be used as a reference, which is appropriate and WFD compliant.
Landbrug & Fødevarer	8.1		Does the panel agree that the almost flat response curves describing the correlation between nitrogen load and chlorophyll a result in large uncertainties on the estimated nitrogen load reductions?	This is not necessarily the case. A response can have a small slope but still be estimated with reasonably low error. Also note that low slopes imply that current status and reference value will be close together
Landbrug & Fødevarer	8.1		Does the panel find that the certainty of the reference load in 1900 has been satisfactorily accounted for?	See Chapter 9 about Maximum Allowable Input. see Chpt 2.1. Annex II of the WFD (section 1.3) specifies the procedure for the "Establishment of type-specific reference conditions for surface water body types". Type-specific reference conditions (RC) may be either

				spatially based or based on modelling, or may be derived using a combination of these methods. Where it is not possible to use these methods, Member States may use expert judgement to establish such conditions. The Danish approach relies on modelling and a 1900 baseline, since there are no pristine systems that can be used as a reference, which is appropriate and WFD compliant.
Landbrug & Fødevarer	8.1		And does the panel find that it falls within an acceptable range?	See Chapter 9 where comparisons with neighbouring countries are given
Bæredygtigt Landbrug	8.3		Is it the opinion of the reviewing group that lack of funds and time is an acceptable reason for ignoring the phosphorous effect in the model?	The panel was not asked to evaluate funds and time. It comments on N and P measures in Ch. 5
Danmarks Naturfredningsforening	8.3	We notice, that there is referred to the principle 'one-out-all-out' in the WFD and the project considers one pressure factor (nutrient loadings) (page 91).	How is the comment taken into account?	See Chapter 2.4 Based on the 'one out all out' principle, the indicators should be considered individually. If one is classified as below the G/M boundary, then management measures must be applied. This was not applied in the DRBMP as confirmed by the researchers in their answers to the panel questions. The outcome of using the 'one out all out' principle would make the measures more stringent. The panel comments on this point in chapter 4
Danmarks Naturfredningsforening	8.3		While nutrient loadings are a major pressure factor do you agree that the set up of the project using several indicators to describe the effect of this pressure factor is reasonable and correct? And do you agree that though not taken the principle 'one out all out' into consideration MAI estimated in project is sturdy?	According to the WFD each BQE should have at least one indicator. See Chapt 2. Also see discussion in chapter 4
Danmarks Naturfredningsforening	8.3		Do you agree in the assumption, that a weighted average approach provides a more correct estimate of the maximum allowable load and making it less susceptible to random variation in the data parameters (page 91)?	It is not guaranteed, but often likely. The panel comments on averaging in Ch. 8
Danmarks Naturfredningsforening	8.3		Do you agree in the use of each of six indicators and arguments for the modifications and values of the constant involved (an overview is given in table 8.7 at page 100 – 101))?	The panel has extensively commented on this in chapter 4

Danmarks Naturfredningsforening	8.3		Do you agree in the approach to handle the described off-sets and thus the assumption, that it is a valid approach as the overall calibration seems strong (page 103)?	This decision seems well justified. The panel has checked the overall validation and found it in general very good
Danmarks Naturfredningsforening	8.3		Do you find that the percentage chosen for 'Categorized in case of time Lag' are correct in order to the estimated GES (see table 8.7 at page 100 – 101)?	See comments in chapter 4
Dansk Sportsfiskerforbund	8.3	It is well documented that hypoxia or anoxia in the bottom water will accelerate the negative effects of eutrophication, such as loss of macro vegetation, release of both nitrogen and phosphorus from the sediment, fish kills and, ultimately, direct release of hydrogen sulphide to the atmosphere.	How is the comment taken into account?	Oxygenation condition could be included in the modelling as an indicator, provided good reference conditions can be estimated and clear dose-effect relations with causal factors can be established. The panel recommends research in this direction in Ch. 4
Dansk Sportsfiskerforbund	8.3		Do you agree, that if the low oxygen concentrations are restricted to a deep hole in an estuary, it may not have a significant impact on the estuary as a whole, whereas comprehensive hypoxia covering a large-sized area will most likely result in notable derived negative effects.	Even Hypoxia in a deep hole can have redox effects such as the release of P from the sediment. Wide-spread hypoxia is even more detrimental.
Landbrug & Fødevarer	8.3	Quoting the report page 90: "…this implies a restriction to indicators for which a reference condition and an EQR value for good-moderate status have been established.", cf. comments/questions from the organization	Can the two model approaches be compared directly, given that the statistical modeling approach requires the inclusion of four supporting indicators, whereas the mechanistic approach does not?	see chapter 6 Statistical modelling and chapter 4 on indicators
Landbrug & Fødevarer	8.3	The one-out all-out principle means that the ecological status of a water body is governed by the biological quality element of lowest status, cf. comments/questions from the organization	How is the comment taken into account?	See Chapter 2.4 Based on the 'one out all out' principle, the indicators should be considered individually. If one is classified as below the G/M boundary, then management measures must be applied. This was not applied in the DRBMP as confirmed by the researchers in their answers to the panel questions. The outcome of using the 'one out all out' principle would make the measures more stringent. The panel comments on this point in chapter 4

Landbrug & Fødevarer	8.3		Does the panel find that using a weighted average is in acceptable compliance with the WFD?	See discussion in chapter 4 on Kd and Chl-a. The panel has reasons to find this weighted averaging approach acceptable
Landbrug & Fødevarer	8.3	The indicator "chlorophyll a-concentration" It is reported that 17 out of 28 chlorophyll a models have a significant nitrogen coefficient, cf. comments/questions from the organization	When only 67 % of the developed models have nitrogen as a predictor variable, is it reasonable to focus exclusively on nitrogen regulation? Or should other factors be taken into account?	The panel discusses this issue in chapter 5. Also in Chapter 6 comments are given on the variable selection procedures and its consequences
Landbrug & Fødevarer	8.3		Percent load reductions above 100 % frequently occur for models on the chlorophyll a indicator. Not only in open waters, also indeed in closed fjords. Numbers as high as 135 % (Haderslev Fjord) are included in the weighted average to give the final PLR. Is including unrealistic model results in further calculations acceptable, scientific practice? Or should it be considered that maybe the model is not optimal if yielding unrealistic results?	See Chapter 3 on typology, Chapter 8 on calculation schemes, and chapters 9 and 10 on recommendations to avoid this type of situations.
Landbrug & Fødevarer	8.3	The indicator "light attenuation" The problem with eelgrass being the only angiosperm included in the Danish RBMP has been elaborated in section 5.2, but it is likewise relevant when discussing the indicator "light attenuation", cf. comments/questions from the organization	How is the comment taken into account?	See Chapter 2.2 Kd maybe insufficient as an indicator for eelgrass and is not independent from Chlorophyll a. Kd was the chosen indicator, but maybe insufficient because other factors also affect seagrasses. See chapter 4 for discussion on Kd
Landbrug & Fødevarer	8.3		Is it reasonable to link nitrogen load and angiosperm distribution directly, without considering other stress factors?	See chapter 4 for discussion of Kd and problems of seagrass.
Landbrug & Fødevarer	8.3		Is it acceptable scientific practice to replace clearly erroneous results with values that are chosen, based on no scientific evidence or calculations?	The answer to the general question is obviously 'No'. However, the question seems to imply that in the section referred to there are clear errors, and that is not endorsed by the Panel. The panel has discussed the problem of 'look-up' tables in Chapter 4
Landbrug & Fødevarer	8.3	Occurrence of Hypoxia / Ecological Signs of Hypoxia Occurrence of low oxygen conditions, or ecological signs of the same, is directly translated into a demand of 25 % reduction of total nitrogen (TN),	How is the comment taken into account?	Hypoxia is a serious and well documented consequence of nutrient pressures, especially nitrogen. Howarth, R., Chan, F., Conley, D.J., Garnier, J., Doney, S.C., Marino, R. and Billen, G., 2011. Coupled biogeochemical cycles: eutrophication and hypoxia in temperate estuaries and

		cf. comments/questions from the organization		coastal marine ecosystems. Frontiers in Ecology and the Environment, 9(1), pp.18-26. See however comments of the panel on the lack of clear dose-effect relationships and why that makes the indicator less suitable.
Landbrug & Fødevarer	8.3		Is it common, scientific practice to simply choose a nitrogen reduction demand?	Expert judgment is an allowable and generally respected way of solving problems for which there is not enough other information available. However, when it can be replaced by hard information the latter is preferable. The Panel does not endorse the look-up tables (Ch. 4) but would also not call the expert judgment 'simply choose'
Landbrug & Fødevarer	8.3		Is it acceptable to base regulation on numbers chosen without any scientific basis, calculations or references?	See previous response
Landbrug & Fødevarer	8.3		Could the TN reduction demand just as well have been 20 %? 30 %? Or 15 %?	See previous response
Landbrug & Fødevarer	8.3	Nitrogen limitation of phytoplankton growth Again, please be advised that this indicator is not used in the calculations using mechanistic models. As for Kd models, the calculated values are changed according Table 8.7, though the change is less dramatic than for Kd.	How is the comment taken into account?	The panel had fully understood this, thank you
Landbrug & Fødevarer	8.3	Weights – as noted in Table 8.7 According to the table, chlorophyll and Kd model results are each given the weight 2, "occurrence of hypoxia" and "N limitation" are each given the weight 1, and the two "ecological signs of hypoxia"-indicators each have the weight 0.5, cf. comments/questions from the organization	How is the comment taken into account?	The panel makes recommendations on these ancillary indicators in chapter 4
Landbrug & Fødevarer	8.3		Is it acceptable to include supporting indicators which, in almost all cases, lead to lower required reductions – in the statistical and not in the mechanistic models?	See previous response
Landbrug & Fødevarer	8.3		Is it acceptable to include four supporting indicators which, in almost all cases, lead to lower required reductions in the designated statistical	See previous response

			models - and including only one supporting indicator in the meta models?	
Danmarks Naturfredningsforening	8.4		Do you find that the methodology described is sturdy, and combined with the reference values from section 8.1 can be used to estimate the part of the individual indicator that can be regulated from Danish land-based N loadings alone (page 102)?	See Ch. 8 for comments on the calculation methodology. The answer to the specific question is yes
Danmarks Naturfredningsforening	8.5		Do you agree, that even though the nature of the model types differs pronouncedly, the slopes are very similar, and thus support both the use of models for defining MAI and the application of water body types (page 119)?	see comments in Ch. 3 on typology, and in Ch.8 on calculation methodology
Dansk Akvakultur	8.5	It is important to underline that the statistical models (vs. mechanistic models) overestimate the Danish contribution to the eutrophication in the marine waters.	How is the comment taken into account?	This cannot be stated in general. It is, in fact, very difficult to exactly assess how much the statistical model results depend on Danish land-based N loads, but one should take into account that it are only these loads that have been considered when calculating the reference values
Landbrug & Fødevarer	8.5	It is noted in this section that "…statistical models are "black-box" models with a direct link to observations but without any descriptions of causal links", cf. comments/questions from the organization	Is it acceptable to describe a modeling approach as a "black-box" approach, when in fact input variables to some extent are selected in advance?	This is partly a semantic question. 'Black box' in this case means that if Y is described as a*X+b, it cannot directly be known (or measured in experiments) what a and b are. This does not mean however, that there cannot be very solid evidence and experience that across many systems and many periods, Y always tends to be a more or less linear function of X. In other words, 'black box' has no relation with the degree of confidence one can have in the relation, nor in the expectation that X will be related to Y. In chapter 6 the panel has commented extensively on variable selection
Landbrug & Fødevarer	8.6	Meta models are used for water bodies where no mechanistic or statistical model has been developed, for various reasons. However, for the statistical models, meta models are also used, if nitrogen load was not selected as an input variable, cf. comments/questions from the organization	How is the comment taken into account?	The interpretation of the stakeholder is only partly true. The slopes of the N-load versus Chl-a or Kd, in cases where Nload was not selected as variable, were indeed replaced by the average slope of the type. The panel has commented on this in chapter 6. The metamodelling procedure, however, contains additional elements
Landbrug & Fødevarer	8.6		Is it acceptable scientific procedure to omit results that differ from the expected? In this case	See chapter 6 (statistical modelling) for comments on this points

			meaning when nitrogen load is not selected as an input variable.	
Landbrug & Fødevarer	8.6	The idea in meta models is to apply models from different water bodies to a water body of the same type. A great part of the problem with meta models is, thus (…), cf. comments/questions from the organization	Would a more differentiated typologization possibly improve the applicability of meta models?	See Chapters 2.1, 3, 6 and 8. The panel is very concerned about this point and makes recommendations for change
Landbrug & Fødevarer	8.6	One specific example of the implications of problematic use of meta models is Stege Nor, a small water body with very limited opening towards open water. A satellite image of Stege Nor is presented in Appendix 4, cf. comments/questions from the organization	Is it reasonable to include a measured value so clearly deviating from the general level?	The Panel does not know all details about this system and refrains from making very specific comments about single localities. Statistical variation and occasional outliers due to errors in the monitoring procedure are known to occur and always present a problem. If one removes too many points, there is a danger of data manipulation. If one does not remove a clear outlier, there is a danger of reaching incorrect conclusions. The panel hopes that close interaction with stakeholders is a mechanism to take into account local knowledge that can avoid occasional errors of this kind.
Landbrug & Fødevarer	8.6		Should it be expected that input data for models of this type are comprehensively screened for outliers?	Data series should be quality checked. Outliers maybe important but if erroneous they can distort results and the calibration of models.
Landbrug & Fødevarer	8.8	As a comment to the calculations of model uncertainty, it is important to know that the calculations presented here, to the international panel, are completely different from the original calculations which were presented to Danish politicians and the public, cf. comments/questions from the organization	How is the comment taken into account?	The panel has no way of verifying this and only takes the English report as input. If the stakeholder is right that constructive comments have been taken into account, this reflects a commendable scientific attitude
Landbrug & Fødevarer	8.8	The analysis of variance results in a minimum confidence interval of ± 13.3 %-points. Thus, for three out of the 11 water bodies in question, no required load reduction has been demonstrated, as the mean reduction is	Given that neighboring water bodies are definitely correlated, does the panel find that a confidence interval of ± 13.3 %-points based on an assumption of independence provides useful information on the actual uncertainty? See further questions in section 8, General	The panel has commented on uncertainty analysis, the use of cross-system analysis, statistical models and independence between the statistical and mechanistic models in chapters 6 and 8

		less than 13.3 %, cf. comments/questions from the organization		
Landbrug & Fødevarer	8.8	Quantification of model uncertainty The presented analysis of variance shows, by a very narrow margin (P = 0.06), no significant difference between required nitrogen load reductions calculated by mechanistic and statistical models, cf. comments/questions from the organization	The panel is kindly requested to comment on the statistically significant differences between model results using the mechanistic and the statistical approaches, respectively.	The panel has commented on uncertainty analysis, the use of cross-system analysis, statistical models and independence between the statistical and mechanistic models in chapters 6 and 8
Landbrug & Fødevarer	9	It is mentioned that model development should be based on "state-of-the-art knowledge". The panel is, once again, advised to pay attention to the lack of peer-reviewed publishing of the statistical models. A report alone cannot be accepted as scientific documentation!	How is the comment taken into account?	The scientific basis of management should be based on peer reviewed papers. The reports that form the basis of the typology and the modelling are not based on peer reviewed articles and this is pointed out as a weekness by the stakeholders. However, the nature and purpose of scientific reports is different to that of scientific, peer reviewed articles. Articles are usually too short for a full and detailed explanation. Nevertheless, this DRBMP report has now been subjected to a very thorough peer review lasing several weeks and involving 5 international experts on the panel. Additionally, it has been peer reviewed by highly qualified consultants acting for the stakeholders. This level of scrutiny should contribute to an improved report and more robust results.
Landbrug & Fødevarer	9.1	The WFD requests that each member state ensures "a review of the impact of human activity on the status of surface waters" (article 5 (1)). In the Danish RBMP, no thorough review of all relevant stress factors was performed, and N is the only stress factor addressed, cf. comments/questions from the organization	How is the comment taken into account?	From the response of the researchers to the panel questions, it appeared that this was not part of the mission they were tasked with. However, N and P loads are 2 of the most important pressures (Andersen et al 2017). Other pressures such as non-indigenous species and noise are covered in the MSFD descriptors.
Landbrug & Fødevarer	9.1		The goal of the RBMP is to obtain good ecological status, as stated in the WFD, not to reduce nutrient loads. Should other stress factors than nitrogen load therefore be taken into account in the RBMP?	N and P loads are 2 of the most important pressures (Andersen et al 2017). Other pressures such as non-indigenous species and noise are covered in the MSFD descriptors. See Ch. 2.5 for more discussion

Landbrug & Fødevarer	9.1		Is it realistic that acting solely on a single stress factor will be the best way to attain good ecological status for all required elements?	N and P loads are 2 of the most important pressures (Andersen et al 2017). Other pressures such as non-indigenous species and noise are covered in the MSFD descriptors. See Ch. 2.5 for more discussion
Landbrug & Fødevarer	9.1		Is it possible that if acting only on a single stress factor, the need to reduce impact from this will be higher than by using a combined effort on several stress factors?	The panel comments on this in Chapter 5 and chapter 4
Landbrug & Fødevarer	9.1		The WFD has a requirement of applying a cost effective approach. When leaving out clearly relevant stress factors from the modeling, can it be claimed that the RBMP live up to this requirement?	The panel are not economic modellers. However, Preamble 38 of the WFD states "The use of economic instruments by Member States may be appropriate as part of a programme of measures. The principle of recovery of the costs of water services, including environmental and resource costs associated with damage or negative impact on the aquatic environment should be taken into account in accordance with, in particular, the polluter-pays principle". Preamble 28 of the WFD states that "Member States may phase implementation of the programme of measures in order to spread the costs of implementation". Article 9 of the WFD addresses the Recovery of costs for water services. Details of the economic analysis are given in Annex III and this takes in account 'the polluter pays principle'. Member States can "make judgements about the most cost-effective combination of measures in respect of water uses to be included in the programme of measures under Article 11 based on estimates of the potential costs of such measures". Article 11 is the Programme of measures.
Landbrug & Fødevarer	9.1	The impact of future climate changes is briefly discussed, and climate changes in the form of increased temperature and precipitation since 1875 are mentioned. It is noted that these changes have not been taken into account in the modeling work, cf. comments/questions from the organization	How is the comment taken into account?	See Chapter 9 MAI.

Landbrug & Fødevarer	9.1		Does the panel find that climate change can be omitted when estimating which ecological status can be obtained in Danish coastal waters?	See Chapter 9 MAI.
Landbrug & Fødevarer	9.1	The hydraulic residence time in a water body is of great significance to the biological effect of nutrients released into the water. This is not taken into account in the Danish RBMP, cf. comments/questions from the organization	How is the comment taken into account?	Residence time and flushing are important attributes of the sensitivity of the water bodies and should be taken into account. However, hysteriesis should also be taken into account as there may be a legacy effect, particularly in soils and sediments. The panel recommends a cross-system approach in statistical analysis (Ch. 6), which effectively incorporates these aspects. See also O'Higgins, T., Tett, P., Farmer, A., Cooper, P., Dolch, T., Friedrich, J., Goulding, I., Hunt, A., Icely, J., Murciano, C., Newton, A., Psuty, I., Raux, P., Roth, E., 2014. Temporal constraints on ecosystem management: Definitions and examples from Europe's regional seas. Ecology and Society, v. 19, n. 4, Art. 46. DOI: dx.doi.org/10.5751/ES-06507-190446
Landbrug & Fødevarer	9.1		It is known that the nitrogen lost during winter months in many water bodies with short residence time will be gone (washed to sea) before the onset of the algal growing season. Based on this, should timing of nitrogen reductions be included in the modeling work?	The panel recommends on this in Chapter 5. In principle, this may open innovative solutions, but important potential side effects should be taken into account: regional effects of total loading, and storage of organic matter in the systems. In addition, agronomic research should demonstrate what is possible in this respect. Therefore, the panel has recommended studying these possibilities in depth before incorporating them into the plans
Landbrug & Fødevarer	9.1		Various time periods are selected for input variables in the statistical models, but the periods are not included in the public reports. Should this information be included in order to evaluate the models better from a biological perspective?	The panel does not fully understand the question, but assumes it is about seasonal timing of the N loads. The panel recomends on this in Chapter 5
Landbrug & Fødevarer	9.2	Chlorophyll a targets It is described how reference values are determined according to type of water bodies, instead of based on the individual water bodies, cf. comments/questions from the organization	How is the comment taken into account?	See chapter 3 Typology
Landbrug & Fødevarer	9.2	See chapter 3 Typology	Do more data lead to more accurately determined reference values for a specific water body, if the	See chapter 3 Typology

			data derive from widely different water bodies assigned to the same type?	
Landbrug & Fødevarer	9.2	Chlorophyll a as indicator The discussion mentions high grazing pressure and high density of benthic filter feeders as cases where chlorophyll a levels do not increase in spite of high nutrient loads, cf. comments/questions from the organization	How is the comment taken into account?	Filter feeders can act as biofilters for phytoplankton thus resulting in 'high N, low Chorophyll waters', however other factors also play a part. In general, filter feeders show a trend of declining in Danish waters upon reduction of nutrient inputs (Riemann et al., 2016). This may imply that larger nutrient reductions may be needed than currently estimated, but this will have to be deduced from monitoring effects of measures.
Landbrug & Fødevarer	9.3	The statistical model approach is again described as built solely on monitoring data "without including any process descriptions or mechanisms". The panel is kindly reminded that in all cases where nitrogen load was not selected as an input variable, the model has been discarded and replaced by a meta model.	How is the comment taken into account?	The panel is aware of this and has commented on this at various places in the report
Landbrug & Fødevarer	9.3	For the statistical models it is repeated that "a suite of ecological[ly] relevant indicators […] was introduced in order to obtain a more holistic approach", cf. comments/questions from the organization	How is the comment taken into account?	The panel comments on this in Chapter 4 and Chapter 8
Landbrug & Fødevarer	9.3	The comparison of results from the two modeling approaches "revealed an overall satisfactory agreement between the two model approaches" according to the presente, cf. comments/questions from the organization	How is the comment taken into account?	Reference values actually used to calculate MAI were averaged across models before the calculations proceeded. The mentioned differences are therefore not reflected in the MAIs. In fact, the panel recommends against this averaging, in order to keep differences and variability of model results transparent and decide on merging both approaches only in a final stage, based on observed differences and variability
Landbrug & Fødevarer	9.4	Regime shifts are mentioned and briefly discussed. Such shifts are central to the critique of extrapolating correlations between chlorophyll a and nitrogen load far beyond the defined range, cf.	How is the comment taken into account?	Regime Shifts (Barange et al 2008) are complex issues, especially for mangement. The Duarte et al (2009) paper is an excellent and very interesting article, particularly since it includes a Danish example. Nevertheless, it cannot be invoked as a basis to abandon the Danish implementation of the WFD.

		comments/questions from the organization		Sustained monitoring should reveal to what extent regime shifts prevent return to desired conditions and what additional measures should be needed to reach the goals. **Barange**, M., Beaugrand, G., Harris, R., Perry, R.I., Scheffer, M. and Werner, F., 2008. Regime shifts in marine ecosystems: detection, prediction and management. Trends in Ecology & Evolution, 23(7), pp.402-409. **Duarte**, C.M., Conley, D.J., Carstensen, J. and Sánchez-Camacho, M., 2009. Return to Neverland: shifting baselines affect eutrophication restoration targets. Estuaries and Coasts, 32(1), pp.29-36.
Dansk Sportsfiskerforbund	Conclusion	To obtain more certain MAI estimates, it is important to continuously monitor the ecosystems as they approach GES and to evaluate, update and improve the models and methods accordingly based on new knowledge. Thus, themodel tools and methods developed in this project should be regarded as part of an ongoing process towards better understanding and improved predictability of the behaviour of marine ecosystems in a changing world.	Do you find that the Danish surveillance is sufficient and is this data good enough to support the models? Do you find that there had been the necessary finance and time for the development of the models? Is there the necessary continuity in the model work?	The panel makes recommendations on monitoring in several chapters and in the final recommendations
Danmarks Naturfredningsforening	References		Do you find the references used in the project are sufficient (page 144 – 163)?	yes
Danmarks Naturfredningsforening	References		Do you find the references support the tool development and application, the specific use for setting chlorophyll-a targets and calculating the load reduction requirements from Danish catchments in the project?	yes