



Instead
HERITAGE

Supplementary **impact assessment**
of the Helgeland Coastal Plan for the
World Heritage property of
‘Vegaøyen – The Vega Archipelago’

Commissioned by **Vega Municipality**
August 2022

Supplementary **impact assessment**
of the Helgeland Coastal Plan
for the World Heritage property of
‘Vegaøyane – The Vega Archipelago’

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World Heritage property: Vegaøyane – The Vega Archipelago, Norway (1143bis, inscribed 2004)

Contract: **Program for supplementary assessments to Helgeland Intermunicipal Master Plan for Vega**
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Cover image: View from Vega towards a proposed aquaculture facility location near to the island of Sjøla
Source: Ascanio D’Andrea | Instead Heritage

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APPENDIX 1: Program for supplementary assessments to Helgeland Intermunicipal Master Plan for Vega commissioned by Vega Municipal Council (client brief issued as part of August 2020 tender)

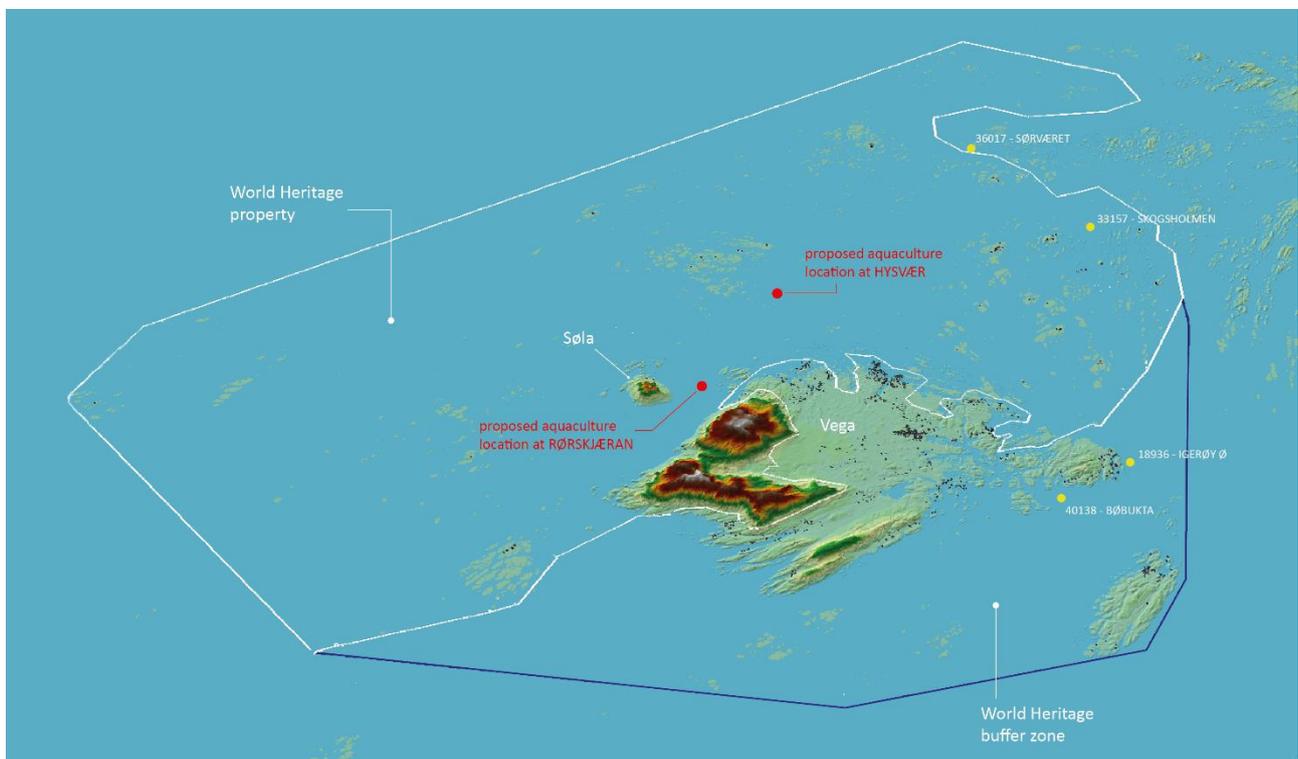
APPENDIX 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO.

APPENDIX 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega*. NIVA.

APPENDIX 4: Results of the Instead Heritage online public survey ‘Supplerende konsekvensutredning av Kystplan Helgeland for verdensarvom råde ‘Vegaøyen – The Vega Archipelago’

NON-TECHNICAL SUMMARY

This document is a *Supplementary impact assessment of the Helgeland Coastal Plan for the World Heritage property of ‘Vegaøyen – The Vega Archipelago’*. It assesses the Helgeland Coastal Plan, an intermunicipal plan for 11 neighbouring municipalities in northern Norway, and focuses on the municipality of Vega, with a particular emphasis on the UNESCO World Heritage property of ‘Vegaøyen – The Vega Archipelago’. It looks at the potential impacts on the Outstanding Universal Value of the property, the reason that the archipelago’s heritage is of global importance, should the coastal plan be adopted by Vega Municipality and the two proposed aquaculture facilities implemented.



The ‘Vegaøyen – The Vega Archipelago’ World Heritage property (white line) and buffer zone (blue line) with the location of existing (yellow dots) and proposed (red dots) aquaculture facilities.

World Heritage Property of ‘Vegaøyen – The Vega Archipelago’

‘Vegaøyen – The Vega Archipelago’ was inscribed on the World Heritage List in 2004 on the basis that it ‘reflects the way generations of fishermen/farmers have, over the past 1,500 years, maintained a sustainable living in an inhospitable seascape near the Arctic Circle, based on the now unique practice of eider down harvesting, and it also celebrates the contribution made by women to the eider down process’. At the same meeting, the World Heritage Committee expressed concern about ‘the interface between conservation and sustainable development in respect of aquaculture’ in this cultural landscape and requested that the Norwegian State Party address this issue in future planning. The archipelago and the ways of life of its rural community are in many ways representative of the historic natural environment along the coastline of the

Norwegian Sea. As this is increasingly being reduced in extent, it makes the high concentration and diversity of important habitats within the Vega Archipelago ever more significant.

The particular geology and climate of the Vega Archipelago, a vast seascape of low-lying islands and shallow waters contrasted by more mountainous island peaks, provided the preconditions for abundant marine resources, making the area particularly attractive to early humans despite the harsh conditions found this close to the Arctic Circle. As a result, the landscape has also been shaped by people for 10,000 years, with permanent resident communities arriving approximately 1,500 years ago. By exploiting the wide range of natural resources, they were able to survive even when there were natural fluctuations in the abundance of individual species. Ways of life continue to draw on multiple livelihoods (diversification and mobility within households) that also change with the seasons. This continuous occupation of the islands has meant many aspects of nature and culture evolved to become interdependent with an evolving tradition of sustainable management of the land and sea.

However, when 'Vegaøyane – The Vega Archipelago' was inscribed on the World Heritage List in 2004, it was in a very poor state of health in terms of its natural and cultural heritage, and faced challenges typical of rural communities, such as depopulation and reduced services. Management efforts since inscription have tackled many of these issues, with some of the negative natural and cultural trends being inverted. Nevertheless, taken holistically, the property's state of conservation is still not robust, making the baseline for this impact assessment fragile and less able to resist negative impacts. This means that, today, Vega's community still has connections to the sustainable ways of life which have characterized it over time, but in its currently weakened state, this requires careful management to continue their recovery.

The Helgeland Coastal Plan and proposed aquaculture facilities

The Helgeland Coastal Plan is a zoning plan for the sea areas of 11 neighbouring municipalities with the stated intention to 'set goals for the physical, environmental, economic, social and cultural development in municipalities and regions, clarify societal needs and tasks, and state how the tasks can be solved'. However, the focus is clearly placed on aquaculture. It should be noted that two locations for new aquaculture facilities are included within the Vega section of the Helgeland Coastal Plan:

- Marine Harvest Norway AS, now operating as Mowi ASA, applied in 2015 for a permit to establish an aquaculture facility to farm fish at Rørskjæran (this location is also known as Søla/Måsskjæret). Rørskjæran lies between the main island of Vega and the island of Søla to its west and is within the World Heritage property.
- Vega Sjøfarm AS, together with Nova Sea AS and Vegalaks AS, applied for a permit to establish an aquaculture facility to farm fish at Hysvær in 2015. This is an area of sea approximately 4 km north-west of the main island of Vega, close to the Hysværet group of islands within the World Heritage property.

This impact assessment

The Helgeland Coastal Plan included an impact assessment following national regulatory requirements, however, this supplementary assessment addresses requirements at an international level and works on two levels: i) a strategic environmental assessment of the Vega section of the Helgeland Coastal Plan, and ii) an impact assessment of the two individual aquaculture proposals for Rørskjæran and Hysvær in more detail. Impacts are considered to be the result of interactions of different components of the coastal plan and the

proposed aquaculture facilities with attributes of the World Heritage property that convey its Outstanding Universal Value. These interactions are assessed when they might have a direct effect, but also where an attribute is affected through a chain effect. This is of particular relevance within social-ecological systems that also constitute a cultural landscape where, for example, humans are dependent on particular species for harvesting as natural resources, and these species are in turn dependent on others which form their habitat or are part of their food web.

Conclusions

The adoption of the Vega section of the Helgeland Coastal Plan, *without* new proposed aquaculture facilities, would potentially bring numerous benefits that would sustain the Outstanding Universal Value of the World Heritage property. In general, the Helgeland Coastal Plan brings together a range of existing uses of the coastal area that are based on long-term use patterns which contribute to the ongoing life of Vega's population and its natural and cultural environment. However, it is noted that perhaps not all uses of the coastal area are supported by regulations that incorporate a full understanding of World Heritage commitments; the coastal plan would need to be reinforced in order for the potential positive impacts to be gained. Areas of concern arise, for example, about the potential negative impacts of outdoor recreation when it takes the form of unmanaged tourism and the potential negative impact of large-scale natural resource harvesting. These activities need to be proactively managed in light of commitments to conserve the sense of place of 'Vegaøyen – The Vega Archipelago'.

With regard to the two proposed aquaculture facilities for Rørskjæran and Hysvær, some potential positive impacts are identified, specifically regarding employment opportunities and economic gains for the municipality, but they are of a relatively low level, representing benefits which might equally be gained through alternative economic activities. On the whole, the potential impacts that emerge are minor to moderately negative. Norway's salmon aquaculture industry is making progress in terms of technological developments to lessen environmental impacts and it is recognized that the sector is more resource efficient in comparison to the production of other animal proteins. However, there are externalities for the environment from farmed fish and, in particular, the impact of multiple facilities on fragile marine ecosystems are insufficiently understood. Both proposed facilities would have potential negative impacts on the sense of place that cannot be deemed negligible.

The assessment shows that, overall, there would be residual negative impacts on the Outstanding Universal Value of the World Heritage property even with mitigation in place. It is also recognized that the two proposed aquaculture facilities for Hysvær and Rørskjæran have different potential impacts according to location and vicinity to specific heritage attributes. Whilst different areas of the World Heritage property are affected, the accumulation of negative impacts from such industrial activities, together with those in the buffer zone, that contrast with the characteristics of the Outstanding Universal Value and further weaken a vulnerable ecosystem, cannot be considered acceptable.

Recommendations

It is recommended that, as a first step, Vega Municipality should adopt a revised Helgeland Coastal Plan in light of World Heritage considerations, *without* any new aquaculture in or near the World Heritage property and its buffer zone. There would be a number of positive impacts gained through proactively managing and planning for the seascape. By formalizing the existing uses of the coastal area, decision-makers would have a framework within which to take informed planning decisions for the World Heritage property and beyond.

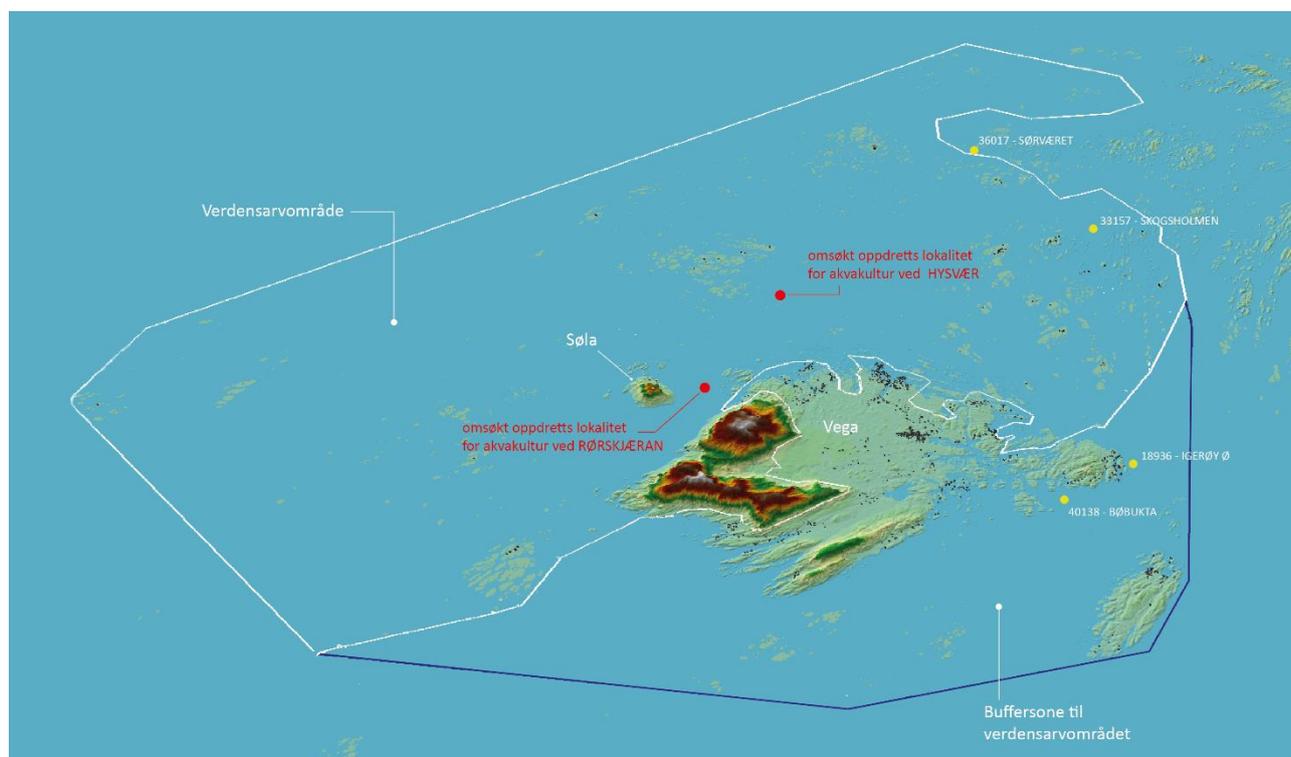
Proposals for new or modified uses of this area could then be judged to see if they are compatible within this overall framework, thereby avoiding ad hoc decisions made on individual cases. This framework, in time, would need to be reinforced or replaced by measures emerging from the integration of World Heritage commitments into Norwegian legislation and by more suitable planning and management tools, ideally addressing land and sea areas together.

Instead, as no damage or potential harm to Outstanding Universal Value can be considered acceptable, the two proposed aquaculture facilities should not be approved. Moreover, at least under current conditions, existing aquaculture facilities within or near the World Heritage property, including neighbouring municipalities should be reconsidered, ideally within a broader review of the buffer zone boundaries and management of the wider setting. Stronger and more systematic mapping and monitoring of heritage attributes of 'Vegaøyen – The Vega Archipelago', and their interdependencies, needs to be taken forward to inform future proposals for aquaculture, other uses of the seascape and, indeed, the archipelago as a whole. The Outstanding Universal Value of this World Heritage property relies on the presence of a vibrant local community as much as it does on healthy ecosystems. Solutions perhaps lie in the strength of Norway's international partnerships for World Heritage. Norway has long been an active member of the World Heritage community, encouraging other State Parties to meet their commitments and continually improve management practices. In this context, 'Vegaøyen – The Vega Archipelago' becomes an opportunity for Norway to demonstrate leadership through the implementation of new approaches to World Heritage to meet the challenges of the twenty-first century. The priorities would be research and monitoring to understand and manage the Vega Archipelago as a social-ecological system, identifying and actively supporting ways of life and uses of the landscape, seascape and marine resources that ensure livelihoods and wellbeing of the local population, together with the maintenance of healthy ecosystems.

A clear long-term vision is needed for the Vega Archipelago based on cultural and natural heritage values and which takes people-centred approaches to safeguarding heritage through empowering local entrepreneurship and rural life. It would require adjustments to how institutions contribute expertise and funding and contribute to decision making, perhaps stimulating improvements to governance for this World Heritage property to overcome the mismatch between Norway's strong tradition of decentralization and co-responsibility and the obligations of international legislation.

This paradigm shift in management would be of particular resonance given that sustainable development is at the heart of 'Vegaøyen – The Vega Archipelago' 's Outstanding Universal Value. The archipelago's model of livelihoods based on the mobility of households - work sector, location and seasons - is at the heart of current research regarding sources of resilience in the face of the climate crisis. Building on existing cultural and natural values, 'Vegaøyen – The Vega Archipelago' has the potential to showcase to the global community the way in which sustainable practices and diversification of ways of life can bring benefits for both World Heritage and for society as a whole.

Dette dokumentet er en *Tilleggsutredning til Kystplan Helgeland for Vega kommune*. Den vurderer Kystplan Helgeland, en interkommunal kystsoneplan for 11 nabokommuner, og har fokus på Vega kommune med særlig vekt på Vegaøyen som er innskrevet på UNESCOs liste over verdens kultur- og naturarv. Utredningen vurderer mulige konsekvenser på verdensarvområdets enestående universelle verdier, grunnen til at området har global betydning, dersom kystplanen skulle vedtas av Vega kommune og de to foreslåtte akvakulturanleggene implementeres.



Verdensarvområde 'Vegaøyen – The Vega Archipelago' (hvit linje) og buffersone (blå linje) med presisering av eksisterende akvakulturanlegg (gule prikker) og de to foreslåtte akvakulturanleggene (røde prikker).

Verdensarvområde 'Vegaøyen – The Vega Archipelago'

'Vegaøyen – The Vega Archipelago' ble innskrevet på UNESCOs verdensarvliste i 2004 på bakgrunn av at området 'reflekterer måten generasjoner med fiskere/bønder i de siste 1500 årene har opprettholdt et bærekraftig liv i et ugjestmildt havlandskap ved polarsirkelen, basert på høsting av ærfugldun som nå anses som en unik praksis. Erkjennelsen berømmer også kvinners bidrag til arbeidet med ærfugldun.' På samme møte da Vegaøyen fikk verdensarvstatus uttrykte Verdensarvkomiteen bekymring for 'grensesnittet mellom vern og bærekraftig utvikling i forbindelse med akvakultur' i kulturlandskapet, og ba den norske statsparten vurdere saken i fremtidig planlegging. Levemåten i Vegaøyen er på mange måter representativt for det historiske naturmiljøet langs den norske kysten. Ettersom disse miljøene reduseres i økende grad, er den høye konsentrasjonen og mangfoldet av viktige naturtyper innenfor Vegaøyen stadig mer betydningsfull.

Den særegne geologien og klimaet som kjennetegner Vegaøyen omfatter et enormt havlandskap med lavtliggende øyer og grunt vann i kontrast til de mere fjellrike øytoppene, noe som ga forutsetninger for rike marine ressurser og som gjorde området spesielt attraktivt for de første bosettingene til tross for de tøffe forholdene nær polarsirkelen. Som et resultat har landskapet også blitt formet av mennesker i løpet av 10 000 år, som etter hvert ble fastboende for ca 1.500 år siden. Ved å utnytte det store spekteret av naturressurser, klarte menneskene å overleve selv når det var naturlige svingninger i mengden ulike enkeltarter. Levemåten fortsetter å trekke på "flersyslerier" samt flere inntektskilder som også endrer seg med årstidene. Det at øyene har vært kontinuerlig bebodd har ført til at mange natur- og kulturaspekter har utviklet seg til å bli gjensidig avhengige av en utviklende tradisjon for bærekraftig forvaltning av land og hav.

Men da Vegaøyen ble innskrevet på verdensarvlisten i 2004 var verdensarvområdet i en svært dårlig tilstand med tanke på natur- og kulturarven, og hadde flere utfordringer som var typiske for bygdesamfunn, som for eksempel fraflytting og reduserte offentlige tjenester. En betydelig forvaltningsinnsats siden innskrivingen har gjort at mange av disse problemene er blitt ivaretatt, og flere av de negative trendene knyttet til både natur og kultur går nå i motsatt retning. Ikke desto mindre, sett helhetlig, kan områdets bevaringstilstand fortsatt ikke beskrives som robust, noe som gjør grunnlaget for denne konsekvensutredningen skjør og mindre i stand til å motstå negative påvirkninger. Dette betyr at Vegasamfunnet i dag fremdeles har tilknytninger til de bærekraftige levemåtene som har preget stedet over lang tid, men tilstanden er svekket, og vil kreve kontinuerlig forvaltning for å opprettholde områdets enestående universelle verdier.

Kystplan Helgeland og de foreslåtte akvakulturanleggene

Kystplan Helgeland er en interkommunal plan for kystområdene til 11 nabokommuner med den hensikt å «sette mål for den fysiske, miljømessige, økonomiske, sosiale og kulturelle utviklingen i kommuner og regioner, avklare samfunnsbehov og oppgaver, samt angi hvordan oppgavene kan løses». Det er imidlertid et tydelig fokus på havbruk. Det skal bemerkes at etableringene av to nye akvakulturanlegg er inkludert i Kystplan Helgeland - Vega:

- Marine Harvest Norway AS, som nå opererer under Mowi ASA, søkte i 2015 om tillatelse til å etablere et akvakulturanlegg for oppdrett ved Rørskjæran (også kjent som Sjøla/Måsskjæret). Rørskjæran ligger mellom hovedøya Vega og øyen Sjøla i vest og befinner seg innenfor verdensarvområdet.
- Vega Sjøfarm AS søkte sammen med Nova Sea AS og Vegalaks AS om tillatelse til å etablere et akvakulturanlegg for oppdrett ved Hysvær i 2015. Havområdet ligger ca 4 km nordvest for hovedøya Vega, nær øygruppen Hysværet, også innenfor verdensarvområdet.

Konsekvensutredningen

Denne tilleggsutredningen som omfatter en konsekvensutredning tar for seg krav på internasjonalt nivå og arbeider på to plan: i) en strategisk miljøvurdering av Kystplan Helgeland - Vega, og ii) en mer detaljert konsekvensutredning av de to individuelle akvakulturforslagene for Rørskjæran og Hysvær. Konsekvenser anses som resultatet av et samspill mellom ulike elementer i kystplanen og de foreslåtte akvakulturanleggene *sett i sammenheng med* attributter relatert til verdensarvområdet som formidler områdets enestående universelle verdi. Disse interaksjonene vurderes i situasjoner hvor de kan ha en direkte effekt, men også når de påvirkes gjennom en kjede-effekt. Dette er av særlig relevans innenfor sosialøkosystemer. Slike systemer utgjør blant annet kulturlandskap hvor for eksempel mennesker kan være avhengige av bestemte arter som høstes som naturressurser, og disse artene er til gjengjeld avhengig av ressurser som forblir en del av deres habitat eller næringskjede.

Konklusjoner

Vedtas Kystplan Helgeland- Vega, *uten* foreslåtte akvakulturanlegg, vil dette potensielt føre til en rekke fordeler som kan opprettholde de enestående universelle verdiene knyttet til verdensarvområdet. Generelt sett sammenfatter Kystplan Helgeland – Vega en rekke eksisterende bruksområder i sjøarealene basert på langsiktig bruk som bidrar til å videreføre livsgrunnlaget til Vegas befolkning og områdets natur- og kulturmiljøer. Det bemerkes imidlertid at ikke alle foreslåtte tiltak innen sjøarealene støtter en helhetlig forståelse av verdensarvforpliktelser; kystplanen må derfor forsterkes for at de potensielle positive virkningene skal kunne oppnås. Det oppstår blant annet bekymring, for eksempel, omkring de potensielle negative konsekvensene knyttet til friluftsliv i form av utilstrekkelig besøks- og turismeforvaltning, og den potensielle negative effekten som innhøsting av naturressurser i storskala kan ha. Disse aktivitetene må forvaltes proaktivt i forbindelse med forpliktelsen til å bevare stedsfølelsen for Vegaøyen.

Når det gjelder de to foreslåtte akvakulturanleggene for Rørskjæran og Hysvær, er det identifisert noen potensielle positive virkninger, spesielt knyttet til sysselsettingsmuligheter og økonomiske gevinster for kommunen. Disse positive virkningene er imidlertid relativt marginale og må kunne oppnås gjennom alternative økonomiske virksomheter og insentiver. Samlet er de tenkelige konsekvensene som er identifiserte negative, i liten til moderat grad. Norges akvakulturindustri gjør fremskritt når det gjelder teknologisk utvikling for å redusere miljøpåvirkninger, og det erkjennes at sektoren er mer ressurseffektiv sammenlignet med produksjon av andre animalske proteiner. Samtidig er det kjent at det oppstår eksterne virkninger på miljøet fra oppdrettsfisk, spesielt når det er snakk om flere anlegg. Per nå finnes det utilstrekkelig kunnskap som kan bekrefte de samlede virkningene som oppstår når det etableres flere anlegg i marine økosystemer som allerede anses som skjøre. Begge de foreslåtte anleggene innenfor verdensarvområdet vil ha potensielle negative effekter på stedsfølelsen som ikke kan anses som ubetydelige.

Vurderingen viser at det totalt sett vil være gjenværende negative innvirkninger på de enestående universelle verdiene av verdensarvområdet selv med avbøtende tiltak på plass. Det er også anerkjent at de to foreslåtte akvakulturanleggene for Hysvær og Rørskjæran har ulik potensiell påvirkning i henhold til beliggenhet og nærhet til spesifikke attributter knyttet til verdensarven. Selv om ulike deler av verdensarvområdet vil være berørt, er det viktig å påpeke at akkumuleringen av negative påvirkninger fra slike industrielle aktiviteter, sammen med aktiviteter i buffersonen, ytterligere vil svekke et allerede sårbart økosystem. Dette står i kontrast til de enestående universelle verdiene og kan ikke betraktes som akseptabelt.

Anbefalinger

Det anbefales at Vega kommune som et første skritt vedtar en revidert Kystplan Helgeland - Vega uten nye akvakulturlokalteter i eller i nærheten av verdensarvområdet og områdets buffersone. Flere positive effekter kan oppnås gjennom en proaktiv styring og planlegging av havlandskapet. En formalisering av eksisterende bruk av sjøarealene vil kunne gi beslutningstakere et rammeverk for å ta kunnskapsbaserte planbeslutninger for verdensarvområdet med buffersone. Forslag til ny eller modifisert bruk av området kan da vurderes utfra forenlighet med overordnede rammer og ad hoc-vedtak i enkeltsaker kan dermed unngås. Dette rammeverket vil på sikt måtte forsterkes eller erstattes av beslutninger som følger av integreringen av verdensarvforpliktelser i norsk lovgivning. Forbedring av planleggings- og forvaltningsverktøy, hvor land- og sjøområder ideelt sett blir adressert sammen, vil også kunne forsterke rammeverket i fremtiden.

Ettersom det ikke er akseptabelt med noen form for forringelse på de enestående universelle verdiene bør de to foreslåtte akvakulturanleggene ikke godkjennes. Med en oppfatning av de nåværende svekkede

forholdene bør også de allerede eksisterende akvakulturanleggene innenfor eller i nærheten av verdensarvområdet, inkludert i nabokommuner, revurderes. En slik revurdering vil ideelt sett foretas med en bredere gjennomgang av buffersonegrensene og forvaltningen av et større nærmiljø. Kartlegging og overvåkning av verdensarv-attributtene, og deres gjensidige avhengighet, med større omfang og mer systematisk tilnærming, må videreføres for å informere om fremtidige forslag til akvakultur, annen bruk av havlandskapet og området i sin helhet.

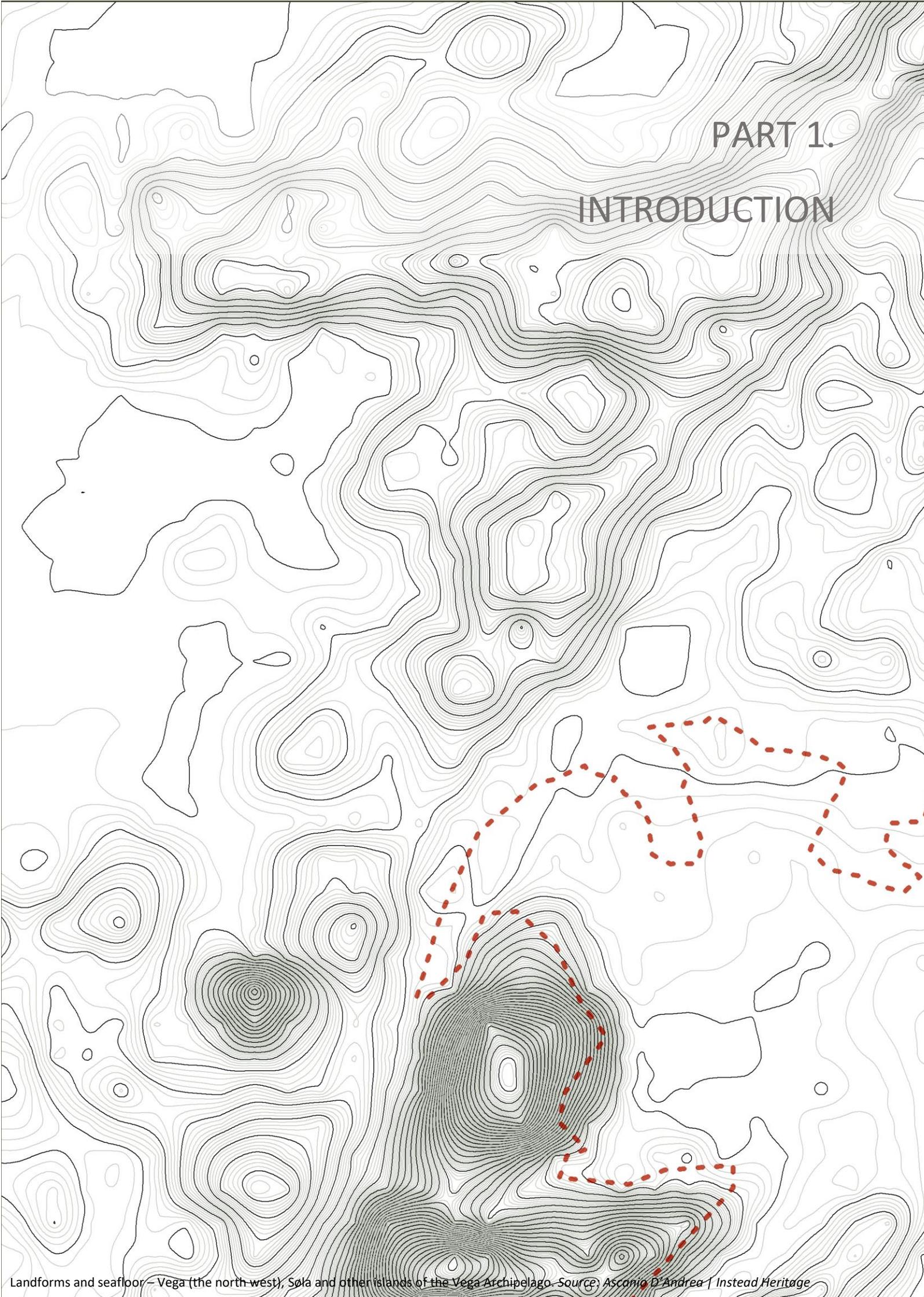
De enestående universelle verdiene som kjennetegner dette verdensarvområdet, er avhengig av tilstedeværelsen av et levende lokalsamfunn i like stor grad som den er avhengig av sunne økosystemer. Kanskje ligger løsningene i Norges styrke innen internasjonale partnerskapsamarbeid for verdensarv. Norge har lenge vært et aktivt medlem av verdensarvsamfunnet og har oppmuntret andre statsparter til å oppfylle sine forpliktelser og kontinuerlig forbedre forvaltningspraksiser. I denne sammenhengen kan Vegaøyen være en mulighet for Norge å vise lederskap gjennom implementering av nye tilnærminger til verdensarv for å møte utfordringene i det 21. århundre. Prioriteringene vil være forskning og overvåking som kan bidra til å forstå hvordan Vegaøyen kan forvaltes som et sosialøkologisk system, identifisere og aktivt støtte levemåter og bruk av landskapet, havlandskapet og marine ressurser som sikrer lokalbefolkningens næringsgrunnlag og livsstil, samtidig som det opprettholdes sunne økosystemer.

En tydelig langsiktig visjon er nødvendig for Vegaøyen verdensarvområde basert på kultur- og naturarvverdiene som sikrer en tilnærming med lokalbefolkningen i sentrum og som styrker både lokalt entreprenørskap og lokal levemåte. Det vil kreve en justering i forhold til hvordan institusjoner bidrar med kompetanse, finansiering og beslutningsprosesser. Slike justeringer vil stimulere til forbedringer av styringen for verdensarvområdet for å overvinne misforholdet mellom Norges sterke tradisjon for desentralisering av forvaltningsmyndighet og medansvar og forpliktelsene i internasjonal lovgivning.

Dette paradigmeskiftet i forvaltningen og styringen vil være av spesiell resonans gitt at bærekraftig utvikling er kjernen i Vegaøyen sine enestående universelle verdier. Områdets næringsgrunnlag basert på husholdningenes «flersysleri», beliggenhet og årstider – er kjernen i dagens forskning om kilder til resiliens eller motstandskraft i møte med klimakrisen. Vegaøyen har her en mulighet for å vise det globale samfunnet hvordan bærekraftig praksis og diversifisering av levemåter kan gi fordeler for både verdensarv og samfunnet i sin helhet.



The islands of Liss Emårsøy, Magnetholmen, Stakkøya and Emårsøy. Source: Inge Ove Tysnes | Vega Archipelago World Heritage Foundation

A detailed topographic map of the Vega Archipelago, showing intricate contour lines that represent the landforms and seafloor. The map is rendered in grayscale, with varying line densities indicating elevation and depth. A prominent feature is a large, circular island in the lower center, surrounded by a dense pattern of contour lines. To its right, a series of smaller, elongated islands are visible. A red dashed line traces a path across the map, starting from the lower right, moving north, then west, then south, and finally east, passing through several of the islands. The overall appearance is that of a technical, scientific map.

PART 1.

INTRODUCTION

1.1 THIS IMPACT ASSESSMENT

This impact assessment is a supplementary assessment of the Helgeland Coastal Plan, an intermunicipal coastal plan for the neighbouring municipalities of Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy and Rødøy in the Nordland County of northern Norway. This assessment primarily looks at the municipality of Vega, with a particular emphasis on the World Heritage property of 'Vegaøyane – The Vega Archipelago' (Figure 2.1). It assesses the potential impacts of the coastal plan, specifically on the Outstanding Universal Value of the property, should the plan be adopted by Vega Municipality. It also examines in more detail the two proposed aquaculture facilities included within the coastal plan for the Vega area.



FIGURE 1.1. The location of the Vega Archipelago. Source: *Instead Heritage*

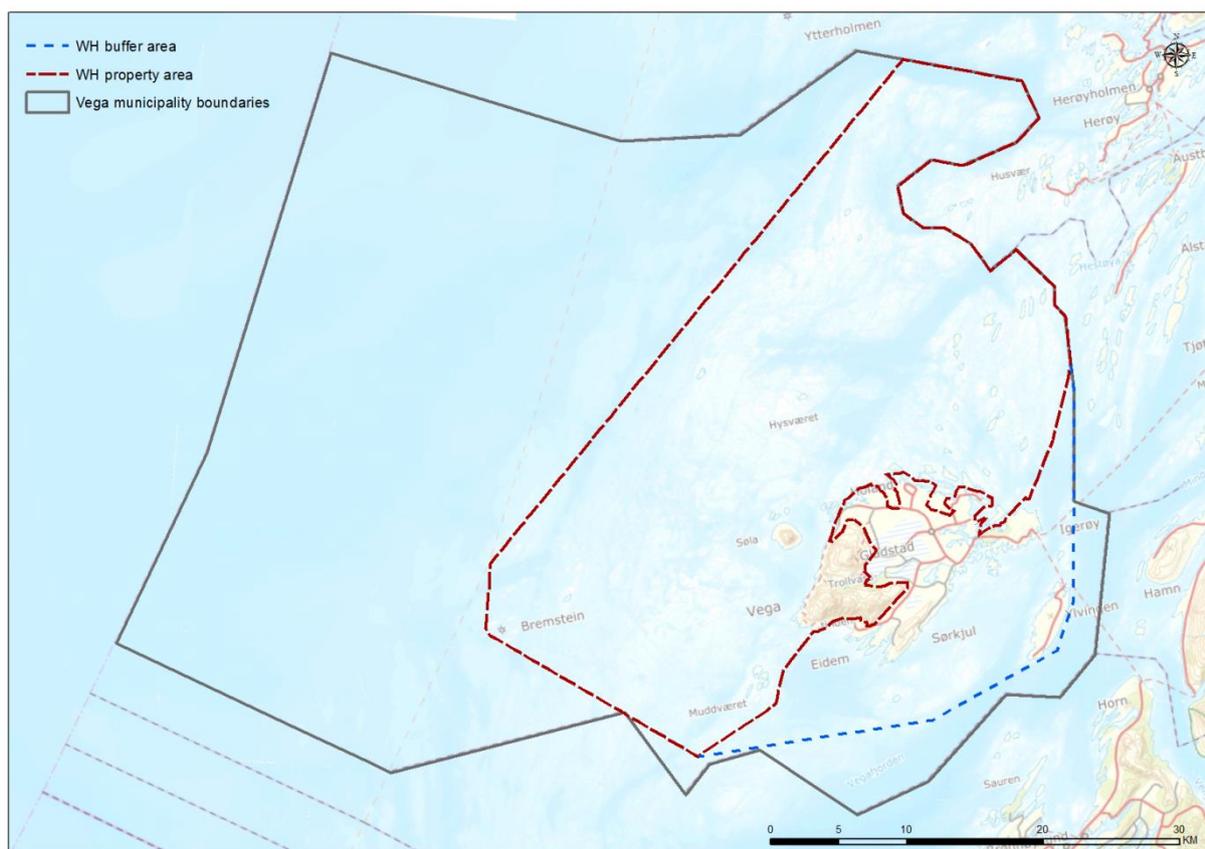


FIGURE 1.2. The World Heritage property of ‘Vegaøyen – The Vega Archipelago’ is outlined in red and its buffer zone in blue. It lies within the boundaries of Vega Municipality which are outlined in dark grey. *Source: Instead Heritage*¹

‘Vegaøyen – The Vega Archipelago’ was inscribed on the World Heritage List in 2004 on the basis that it ‘reflects the way generations of fishermen/farmers have, over the past 1500 years, maintained a sustainable living in an inhospitable seascape near the Arctic Circle, based on the now unique practice of eider down harvesting, and it also celebrates the contribution made by women to the eider down process.’ At the same meeting, the World Heritage Committee expressed concern, among others, about ‘the interface between conservation and sustainable development in respect of aquaculture’ and requested that the Norwegian State Party addressed this issue in its planning for the archipelago.²

Norwegian intermunicipal coastal plans aim to provide a framework for development and sustainable resource use.³ They are considered the best way to implement the national strategy for expanding aquaculture as one of Norway’s most important industries. The Helgeland Coastal Plan was drawn up to ensure that a coherent approach is taken throughout the coastal waters of 11 municipalities along the Helgeland coast. The Helgeland Coastal Plan is made up of the following documents:

- Helgeland Coastal Plan, volume 1: planning document (version 10 June 2019)

¹ Based on https://whc.unesco.org/en/list/1143/multiple=1&unique_number=2254

² UNESCO World Heritage Centre (2022) *Decision 28 COM 14B.45: nominations of cultural properties to the World Heritage List (Vegaøyen - The Vega Archipelago)* [online]. Available from: <https://whc.unesco.org/en/decisions/128>

³ Fiskeridirektoratet (2011) *Retningslinjer for arbeid med kystsoner- planlegging i Fiskeridirektoratet* [online]. Available from: https://www.regjeringen.no/contentassets/aa29aba920824b2c89ef1a57af532e76/retningslinjer-for-arbeid-med-kystsonerplanlegging-i-fiskeridirektoratet_-februar_2021-pdf.pdf

- Helgeland Coastal Plan, volume 2: strategic impact assessment and impact assessment of individual actions (1 May 2016)
- Helgeland Coastal Plan, volume 3: provisions and guidelines (version 10 June 2019).⁴

The Helgeland Coastal Plan covers the period 2018-2022; it was first drafted in 2016 and subsequently revised after an impact assessment and public review (most recently in 2019). While the plan has been adopted in other municipalities, specific objections were raised during review because the World Heritage property of 'Vegaøyen – The Vega Archipelago' had not been fully taken into consideration. As a result, this impact assessment was commissioned, which serves as a supplementary study within the Norwegian planning system and as a heritage impact assessment for World Heritage purposes. Vega Municipality awaits this impact assessment to inform decision-making regarding adoption of the coastal plan and regarding its World Heritage obligations.

Following the *Guidance and Toolkit for Impact Assessment in a World Heritage Context*,⁵ this impact assessment report is structured as follows:

Part 2: the Vega Archipelago

- This section focuses on the natural and cultural heritage values of the Vega Archipelago and specifically the Outstanding Universal Value that was recognized when it was inscribed on the World Heritage List.
- Analysis of the Outstanding Universal Value highlights the reasons why 'Vegaøyen – The Vega Archipelago' is of global importance.
- This then allows the attributes of Outstanding Universal Value and other heritage/conservation values to be identified. This is important because these are the elements of 'Vegaøyen – The Vega Archipelago' that are used to establish a baseline for an impact assessment and could be potentially impacted by any proposed action.
- The current state of conservation of the heritage attributes is summarised as part of understanding the robustness or vulnerability of the baseline in maintaining good conditions while adapting to or withstanding changes.
- An overview of the management system is offered in light of protection and management as a pillar of Outstanding Universal Value. As a living cultural landscape, management processes, not just results, are an integral part of the significance of this heritage place and the basis for looking for ways forward for 'Vegaøyen – The Vega Archipelago'.

Part 3: the proposals being assessed

- This part analyses the zoning plan for Vega Municipality which forms the Vega section of the Helgeland Coastal Plan.
- It also describes the two new aquaculture facilities that are being proposed for 'Vegaøyen – The Vega Archipelago', examining them separately in terms of the specific location under consideration, the facilities, fish stocks, operations, etc.

⁴ Kystplan Helgeland: Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019); Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak (01.05.2016); Del 3: Bestemmelser og retningslinjer (revisjon 10.06.2019).

⁵ UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

Part 4: the impact assessment

- This section brings together the understanding of all of the above in order to identify exactly which attributes of the World Heritage property might interact with specific elements of the proposals, i.e., potential positive or negative impacts.
- These impacts are evaluated to show what are the potential consequences of implementing the proposals.

Part 5: conclusions and recommendations

- The final section brings together the assessment of all the individual impacts in order to conclude what would be the overall impact on the Outstanding Universal Value and other heritage/conservation values of the World Heritage property of 'Vegaøyen – The Vega Archipelago'.
- Recommendations are provided in order to ensure the protection and ongoing vibrancy of the Vega Archipelago.

1.2 METHODOLOGY

1.2.1 Assessment methods

This assessment is primarily based on the new *Guidance and Toolkit for Impact Assessment in a World Heritage Context* that has been recently published by the Advisory Bodies to the World Heritage Convention (ICCROM, ICOMOS and IUCN), together with the UNESCO World Heritage Centre.⁶ This *Guidance* is based on and updates the 2011 ICOMOS *Guidance on Impact Assessment for Cultural World Heritage Properties* and the 2013 IUCN *World Heritage Advice Note on Environmental Assessment*. The recommended methodology places emphasis on identifying potential impacts on the Outstanding Universal Value of a World Heritage property and the need for States Parties to take decisions in light of their commitment to protect World Heritage.

While this supplementary assessment was commissioned in order to address World Heritage concerns, Norway's legal framework for impact assessment is also respected.⁷ Norwegian environmental impact assessments regulations⁸ together with national guidelines were consulted and adapted to this case, in particular, the Norwegian Public Roads Administration's *Handbook for Impact Assessment*;⁹ the Directorate for Cultural Heritage's *Cultural Monuments, Cultural Environments and Landscapes: planning according to the Planning and Building Act*;¹⁰ the Norwegian Environmental Agency's *Environmental Impact Assessments: acknowledged methods and databases for data storage*¹¹ and the Norwegian Institute for Cultural Heritage Research's *Visual Impact on Cultural Monuments and the Cultural Environment*.¹² In addition, reference was made to specific impact assessment guidance for marine aquaculture: *Environmental Impact Assessment: Practical Guidelines Toolkit for Marine Fish Farming*.¹³

This impact assessment takes a similar approach to the original impact assessment of the Helgeland Coastal Plan,¹⁴ working on two levels:

- assessing the Vega section of the Helgeland Coastal Plan, constituting a Strategic Environmental Assessment;
- assessing individual aquaculture facilities proposed for Vega Municipality, thereby also constituting a specific Environmental and Social Impact Assessment/Heritage Impact Assessment.

At both levels, a World Heritage focus has been applied to the assessment in order to address the concerns raised by the World Heritage Committee and during the public review of the Helgeland Coastal Plan.

⁶ UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

⁷ In particular, the *Planning and Building Act* (2008 with revisions up to 2021; <https://lovdata.no/dokument/NL/lov/2008-06-27-71>) and *Regulations on Impact Assessments* (2017 with revisions up to 2021; <https://lovdata.no/dokument/SF/forskrift/2017-06-21-854>).

⁸ Forskrift om konsekvensutredninger. Available from: <https://lovdata.no/dokument/SF/forskrift/2017-06-21-854>

⁹ Statens vegvesens (2021) *Konsekvensanalyser. V712 i Statens vegvesens håndbokserie*. Statens vegvesens.

¹⁰ Riksantikvaren (2020) *Kulturminner, kulturmiljøer og landskap. Planlegging etter plan- og bygningsloven*. Riksantikvaren.

¹¹ Miljødirektoratet (2019) *Konsekvensutredninger: anerkjent metodikk og databaser for innlegging av data*. Miljødirektoratet.

¹² Norsk institutt for kulturminneforskning (2009) *Visuell innvirkning på kulturminner og kulturmiljø*. Norgesvassdrags- og energidirektorat.

¹³ RPS Group (2007) *Environmental Impact Assessment: Practical Guidelines Toolkit for Marine Fish Farming*. Scottish Aquaculture Research Forum/The Highland Council/The Scottish Executive.

¹⁴ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*.

1.2.2 Participation

Prior to this impact assessment, the Vega community, institutional stakeholders and other interest groups had been given opportunities to participate in various planning processes for Vega Municipality and 'Vegaøyane – The Vega Archipelago'. The planning process for the Helgeland Coastal Plan respected planning regulations by including public consultation opportunities both at the intermunicipal level, as well as specifically within Vega Municipality. This included documents being made available for comment, both the main coastal plan together with the original impact assessment, with statutory consultees, other interest groups, and private individuals providing feedback, including new proposals.¹⁵ This informed the revised coastal plan and included specific meetings regarding the Vega section of the plan and the need for this supplementary impact assessment. A scoping seminar was hosted by Vega Municipality in August 2018 on this subject with stakeholders representing institutions and other interest groups.¹⁶

It should be noted that other public engagement opportunities have taken place regarding a range of World Heritage issues since the inscription of 'Vegaøyane – The Vega Archipelago' in 2004. There is also permanent stakeholder representation through the advisory committee to the Vega Archipelago World Heritage Foundation, which is made up of representatives of local interest groups.¹⁷

Early on in this assessment, it became evident that consultation with local stakeholders had taken place multiple times on related issues. Therefore, in order to utilize previous progress and avoid 'stakeholder fatigue', existing results were relied upon whenever possible and targeted engagement was used to fill gaps and/or verify trends from earlier civil society involvement. This engagement was affected by the Covid-19 pandemic with its restrictions on in-person meetings. However, digital activities were organized to overcome these constraints and the following took place:

- *Public presentation:* early in the impact assessment process a public presentation took place online to guarantee transparency and provide information about the impact assessment process within the World Heritage context; a recording was provided to those who were unable to attend.
- *Interviews:* following stakeholder identification, a representative range of individuals from institutions and civic society were invited for an online interview. Those who did not feel comfortable speaking in English were offered the alternative of providing written input in Norwegian.
- *Requests for information:* various institutional representatives were contacted with requests for additional information pertinent to the assessment, as were the proponents of the aquaculture facilities proposed for Vega, when it was necessary to expand on existing documentation.
- *Public survey:* having used existing public feedback to inform early stages of research, towards the end of the assessment the Vega community was invited to complete an online survey so that specific concerns and aspirations could be expressed, thereby informing the final analysis and recommendations of the impact assessment.

¹⁵ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 11.*

¹⁶ Thomassen, J. & Føllestad, A. (2018) *Konsekvensutredning (KU) verdensarvverdier og akvakultur – rapport fra scopingseminar 20. august 2018, Vega havhotell.* NINA.

¹⁷ Vega Verdensarvsenter (no date) *Samarbeidspartnere* [online]. Available from: <https://www.verdensarvvega.no/no/samarbeid>

- *Fact checking*: various institutional representatives and the proponents of the aquaculture facilities were provided with the first three draft chapters of the assessment in order to be able to comment on factual content. Their feedback was checked and integrated wherever possible. However, it should be noted that the conclusions reached at the end of the assessment remain those of the authors.

1.2.3 Information

Information sources are provided throughout this report. Inevitably, some gaps exist in the data available that would ideally inform an impact assessment, particularly when assessing a strategic plan. These gaps are acknowledged throughout the assessment and recommendations to fill these gaps through future research and monitoring are provided. It has been recognized that there is a broad problem when assessing such a dynamic and evolving industry like aquaculture: new problems and opportunities continue to be identified and new solutions emerge, meaning that data is often missing or obsolete.¹⁸ However, the findings and conclusions of this assessment are based on the most relevant and updated information available at the time of writing.

In addition to desk-based research and consultation (section 1.2.2), the information gathered regarding ‘Vegaøyen – The Vega Archipelago’ was enriched through site visits throughout the Vega Archipelago that the authors were able to carry out in June 2021. Moreover, the thematic studies carried out by NIVA and NIBIO were also enhanced by in-person visits by those respective teams to the Vega Archipelago.

The demographic and financial data used in section 4.4 has been drawn from the *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger* report commissioned from Menon Economics in parallel to this supplementary impact assessment.¹⁹

¹⁸ Osmundsen, T.C., Almklov, P. & Tveterås, R. (2017) Fish farmers and regulators coping with the wickedness of aquaculture. *Aquaculture Economics & Management* 21: 163-183.

¹⁹ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics.





An interior of a building on the island of Bremstein. Source: Ascanio D'Andrea | Instead Heritage

2.1 THE SOCIO-ECOLOGICAL SYSTEM

The specific geology of the Vega Archipelago has been a key factor in determining its natural environment, as it underlies the distribution of land and sea, habitats and species. The strandflat provided protected and shallow waters in which marine life could flourish. In addition, location of the archipelago on the Gulf Stream created a relatively warmer climate and, therefore, more favourable conditions than other places at a similar latitude, again encouraging more abundant biodiversity. Human settlement and management of natural resources has contributed to the Vega Archipelago's varied environment where semi-natural, mountainous and oceanic ecosystems are all found together. The Vega Archipelago is in many ways representative of the historic natural environment along the coastline of the Norwegian Sea, a broad expanse of seascapes combined with natural and cultural landscapes. As this is increasingly being reduced in extent and put under pressure through development, the high concentration and diversity of important habitats within the archipelago become ever more significant.

While this report cannot address every detail of the Vega Archipelago, it attempts to summarize those key features – and the interconnections between them – that are relevant to this impact assessment. Particular importance is dedicated to habitats as building blocks of this complex environment and a basis for this assessment; they are intended to be considered as the sum of all the components they contain. Subsequent sections then offer more details on some of the vegetation and wildlife of the Vega Archipelago, while recognizing that individual species cannot be assessed in isolation. To give one example, the common eider, which is in many ways a symbolic species for the Vega Archipelago, is part of a network of connections within more than one habitat and is dependent on other species for food, which in turn are connected to other components of their environment (Figure 2.1). These ecological interdependencies also include people and together define the importance of the Vega Archipelago.

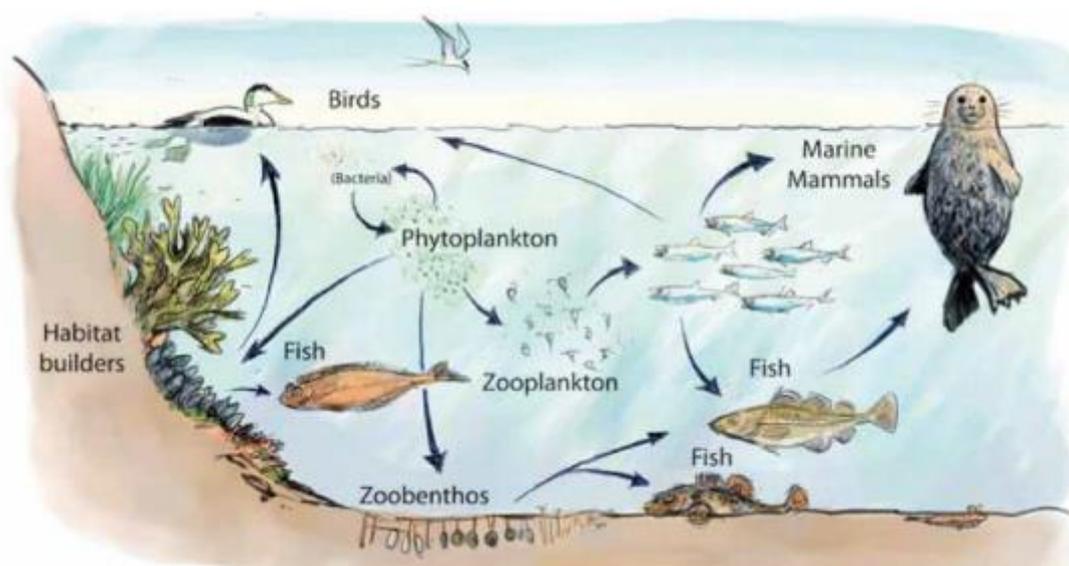


FIGURE 2.1: This illustration shows the connections between species and their habitats in the coastal areas of Norway. These interdependencies need to be considered when a proposed action might impact on an individual species.

Source: HELCOM²⁰

²⁰ HELCOM (2010) Ecosystem Health of the Baltic Sea 2003–2007: HELCOM Initial Holistic Assessment. *Baltic Sea Environmental Proceedings* 122.

2.2 GEOLOGY AND LANDSCAPE

2.2.1 Geological and geomorphological processes

Norway's intricate coastline is one of the longest in the world and its population has always faced out towards the sea. Numerous communities have lived on the countless small islands that run along the coast, attracted by the subsistence livelihoods and trade networks that the abundant nature sustained. The geological and geomorphological processes which shaped the Vega Archipelago provided a relatively protected and fertile setting, both on land and under the sea, and over the millennia this geodiversity has maintained the dynamic habitats and ecosystems on which the archipelago's biodiversity depends. The rocks, sediments and soils of its landforms, water sources, coasts and seafloors are an integral part of the heritage place. Seafloor and landform heterogeneity allows diverse assemblages across different habitats, increasing diversity and influencing ecosystem processes.

The consequent natural resources, within what would have otherwise been an inhospitable environment, attracted people to Vega throughout history and sustainable their ways of life. The geology of the archipelago has provided a foundation for all the features that make the place special today.

2.2.2 The landscape, seascape and seafloor of the Vega Archipelago

The Vega Archipelago's landscape began to rise at the end of the last Ice Age, once the weight of the ice sheets had been removed. Ancient shorelines can be seen at different heights above sea level on the island of Vega, marking the ongoing emergence of the land from the sea. Archaeological evidence associates these with very early human occupation as people came to the area almost immediately after the land was freed (section 2.4.1).

A typical geological feature along much of Norway's coast is the strandflat, a broad belt of land that forms a flat shore area and a shallow seabed along the coastline (Figure 2.2-2.3). The surface of the strandflat undulates, which can be seen as large numbers of low-lying islands and skerries (rocky islands too small to support human habitation) that emerge just above the surface of the coastal waters. These form archipelagos which, situated together in great numbers, form a barrier against the deeper sea and create an area of more protected water along the shoreline. Together with good currents, this encouraged the development of diverse marine life and, for most of history, provided rich fishing waters.

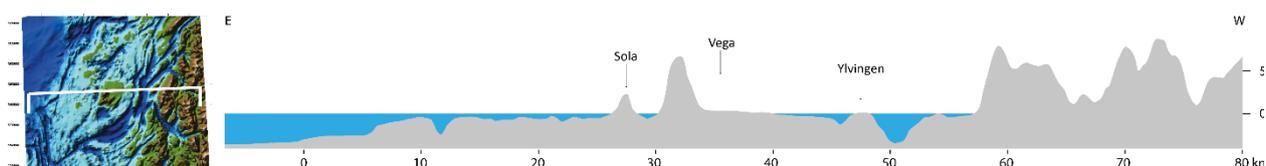


FIGURE 2.2. The profile of the strandflat across the Vega Archipelago from the open sea (left), across shallow waters surrounding the archipelago (centre) to the mainland (right). *Source: Instead Heritage*¹



FIGURE 2.3. The strandflat is characterised by shallow sea dotted with small, low-lying islands. This stretch of the strandflat at Lånan has a view towards the significantly higher – and geologically different – islands of Vega and Sjøla.
Source: Inge Ove Tysnes/Vega Archipelago World Heritage Foundation

The extraordinary intricacy of the shoreline in this stretch can be understood from the fact that Nordland County, in which Vega lies, has no less than a quarter of Norway's entire coastline.²¹ The strandflat is at its widest and most developed along the Helgeland coast of Nordland County, and at Vega it is up to 50 km wide before it reaches the open sea.²² Vega's archipelago is made up of 4,899 islands and 909 skerries. Despite this large number, 92% of the municipal area is sea (1,780 km²), surrounding a total land mass of only 165 km².²³

The geology is made more complex by the fact that a large southern area of the main island of Vega, together with the neighbouring islands and skerries, has a different geological origin and is made of harder granitoid rocks (Figure 2.4). In fact, this small area of Norway was originally part of the Laurentian (North America and Greenland) continent 400 million years ago. The few higher islands, including the main island of Vega and the neighbouring Sjøla, rise steeply out of the sea because the Laurentian granite resists erosion. Correspondingly, the generally shallow seabed includes the occasional, much deeper trench.

These differences in the underlying geology are reflected in the character and use of the landscape. The more fertile calcareous rocks to the north produce fertile soils, with more abundant plant and animal life, while

²¹ Riksantikvaren (no date) *Nordland er ferdig med fredningsgjennomgangen* [online]. Available from: <https://www.riksantikvaren.no/fredninger/nordland-er-ferdig-med-fredningsgjennomgangen/>

²² Trollfjell Geopark & friluftsråd (2022) *Strandflatelandskapet* [online]. Available from: <http://www.trollfjellgeopark.no/index.php/en/about-trollfjell-geopark/unique-geology/the-strandflat>

²³ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 14-15.*

the taller granite peaks to the south provided greater shelter from storms. The arrival of prehistoric humans to this area and their use of diverse locations across the archipelago is a direct response to these specific characteristics.

The natural and cultural landscape of the Vega Archipelago was evaluated within its Nordic context, with analysis showing that Vega is representative of many important broader contexts within the region. However, it simultaneously has its own distinct set of characteristics that stem from a unique arrangement of features that meet in this specific place. This combination of representativeness and distinctiveness was outlined in the file prepared for the World Heritage nomination.

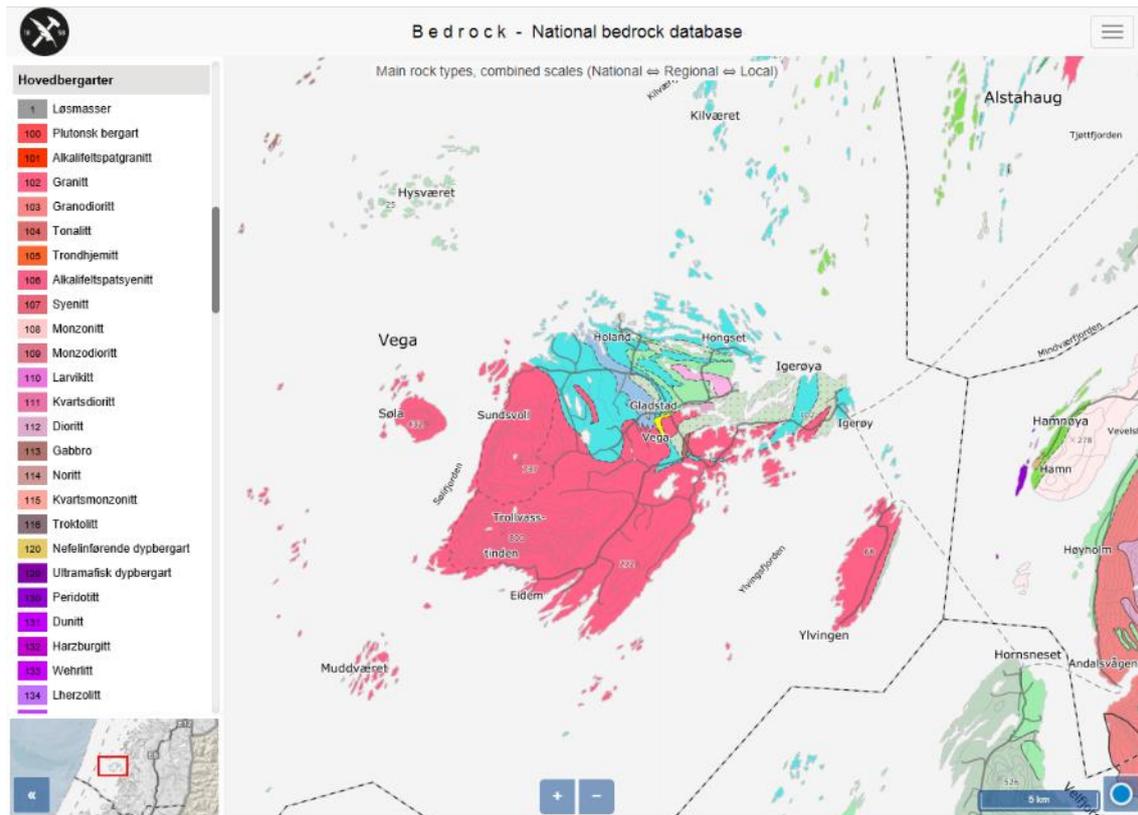


FIGURE 2.4. This geological map of the Vega Archipelago clearly shows the differences in the underlying geology between the harder granite rocks to the south (pink) and the more fertile calcareous rocks to the north (blue-greens).

Source: Geological Survey of Norway²⁴

2.2.3 Coastal waters

The water conditions at the Vega Archipelago have been optimal for encouraging thriving marine ecosystems. The coastal waters are relatively sheltered by the strandflat in comparison to the open ocean, while still maintaining good currents along the coast. The area is known for very low turbidity, meaning that the light conditions are good to a significant depth, encouraging marine plant and macroalgae growth.

The condition of the seawater with Vega Municipality is tested as part of national monitoring under the EU Water Framework Directive. The water quality monitoring measures both the ecological conditions and the

²⁴ Norges geologiske undersøkelse (no date) *Nasjonal berggrunnsdatabase* [online]. Available from: https://geo.ngu.no/kart/berggrunn_mobil

chemical conditions of the water in an area, which together show if environmental targets are being met or if action is needed to improve the water quality (Figure 2.5).

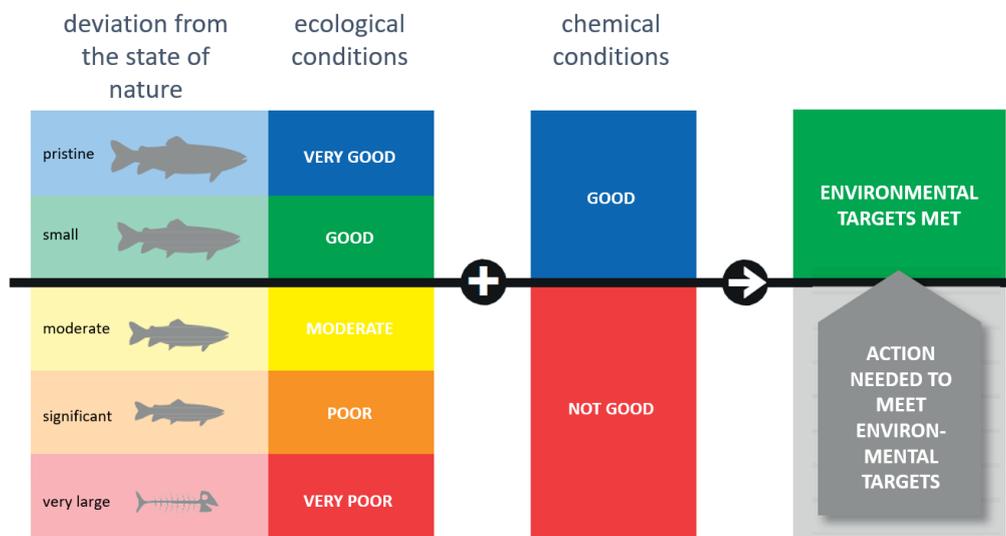


FIGURE 2.5. Environmental targets for water quality require sea areas to meet thresholds for both ecological and chemical conditions. *Source: adapted from Vannportalen*²⁵

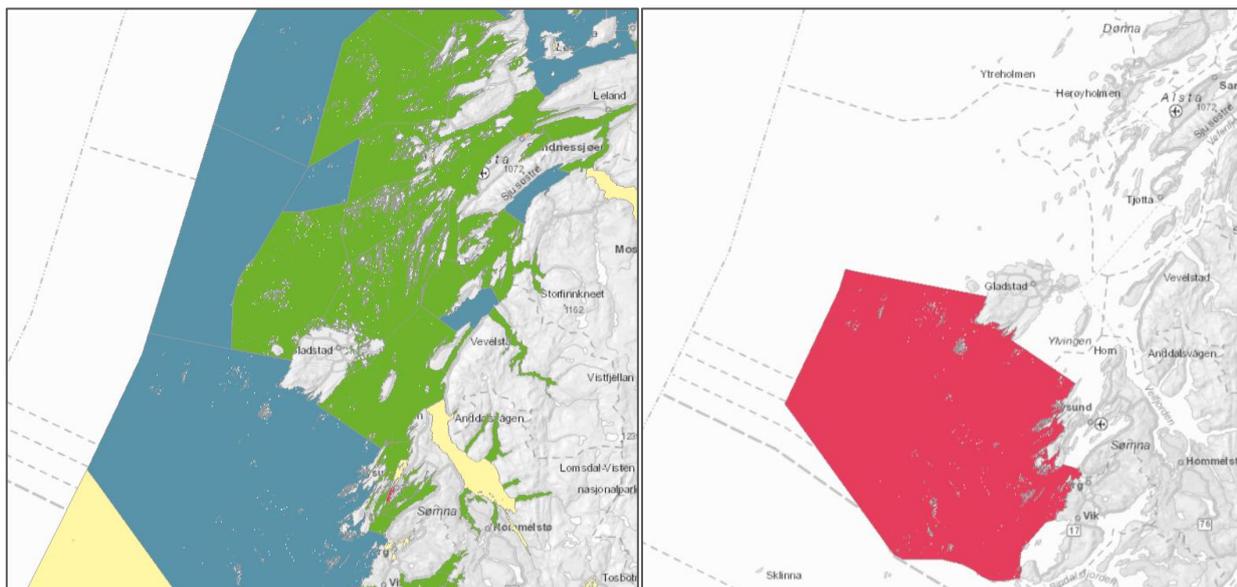


FIGURE 2.6. The coastal waters in the Vega Municipality are monitored as part of national efforts to meet the targets laid out in the EU Water Framework Directive. While water in the area meets the targets for ecological conditions (left: blue is 'very good', green is 'good'), a significant area of the Vega Archipelago's seawater is not good enough to meet the threshold for chemical conditions (right: red is 'not good'). *Source: Vannportalen*²⁶

²⁵ Direktoratgruppen vanddirektivet (2018) *Klassifisering av miljøtilstand i vann* [online]. Available from: <https://www.vannportalen.no/veiledere/klassifiseringsveileder/>

²⁶ Kartverket (no date) *NVE Temakart* [online]. Available from: https://temakart.nve.no/link/?link=tilstand_biologiske_kvalitetselement

The coastal waters around the Vega Archipelago are divided into two water areas for monitoring purposes: Bindal-/Velfjorden and Vefsnfjorden/Leirfjorden.²⁷ While the ecological conditions are found to be ‘good’ or ‘very good’, a large area of Vega Archipelago’s sea does not meet the threshold for good chemical standards (Figure 2.6). This indicates that actions need to be taken to improve conditions locally. Reports note that challenges for managing the environmental conditions of the water in these areas include agricultural pollution, wastewater, fisheries, aquaculture and salmon parasites.²⁸

This situation should be seen in the broader context of the phenomenon of ‘coastal darkening’ that has been recorded along the coast of Norway (Figure 2.7). More correctly known as light attenuation, this is caused by human impacts, such as increased discharge of organic matter into water systems, which end up in the sea (Figure 2.8). The situation seems to be exacerbated by climate change and it is predicted to increase in the future. Sea water becoming darker affects marine organisms dependent on photosynthesis with reduced growth particularly in deeper waters (e.g., kelp, seagrass), as well as affecting visual predators (e.g., fish).

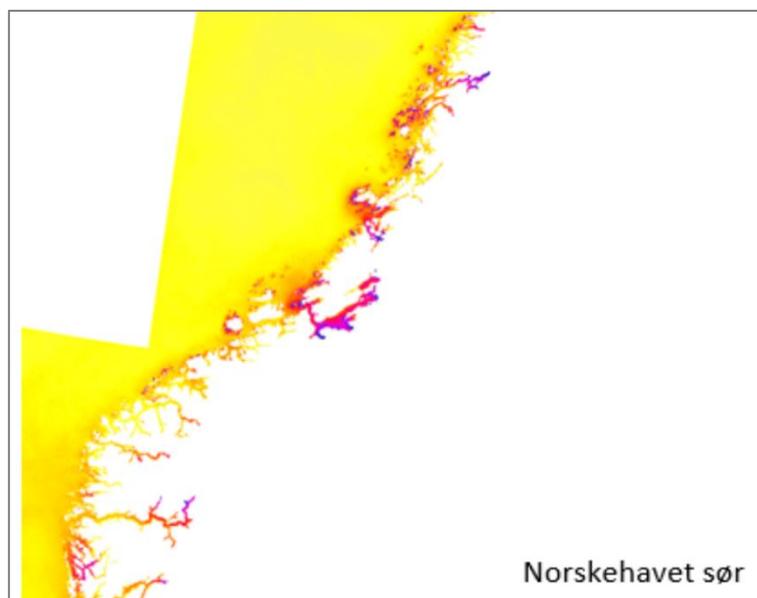


FIGURE 2.7. Estimated light attenuation for the southern stretch of the Norwegian Sea coast; the darker the colour, the higher the light attenuation. The Vega Archipelago, like many areas along Norway’s coast, is seen to suffer from this ‘coastal darkening’ with negative impacts on marine ecosystems. *Source: Trine Bekkby/NIVA*²⁹

²⁷ Nordland Fylkeskommune (2015) *Regional plan for vannforvaltning i vannregion Nordland og Jan Mayen (2016-2021)* [online]: 31. Available from: <https://www.vannportalen.no/vannregioner/nordland/bindalsfjorden-vannomrade/bindalsfjorden2/plandokumenter2/>

²⁸ Vannportalen (no date) *Om Bindalsfjorden vannområde* [online]. Available from: <https://www.vannportalen.no/vannregioner/nordland/bindalsfjorden-vannomrade/bindalsfjorden2/om-bindalsfjorden-vannomrade2/>

²⁹ Frigstad, H., Harvey, T., Deininger, A. & Poste A. (2020) *Increased Light Attenuation in Norwegian Coastal Waters – a literature review*. NIVA Report 7551. NIVA: 14. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2711599>

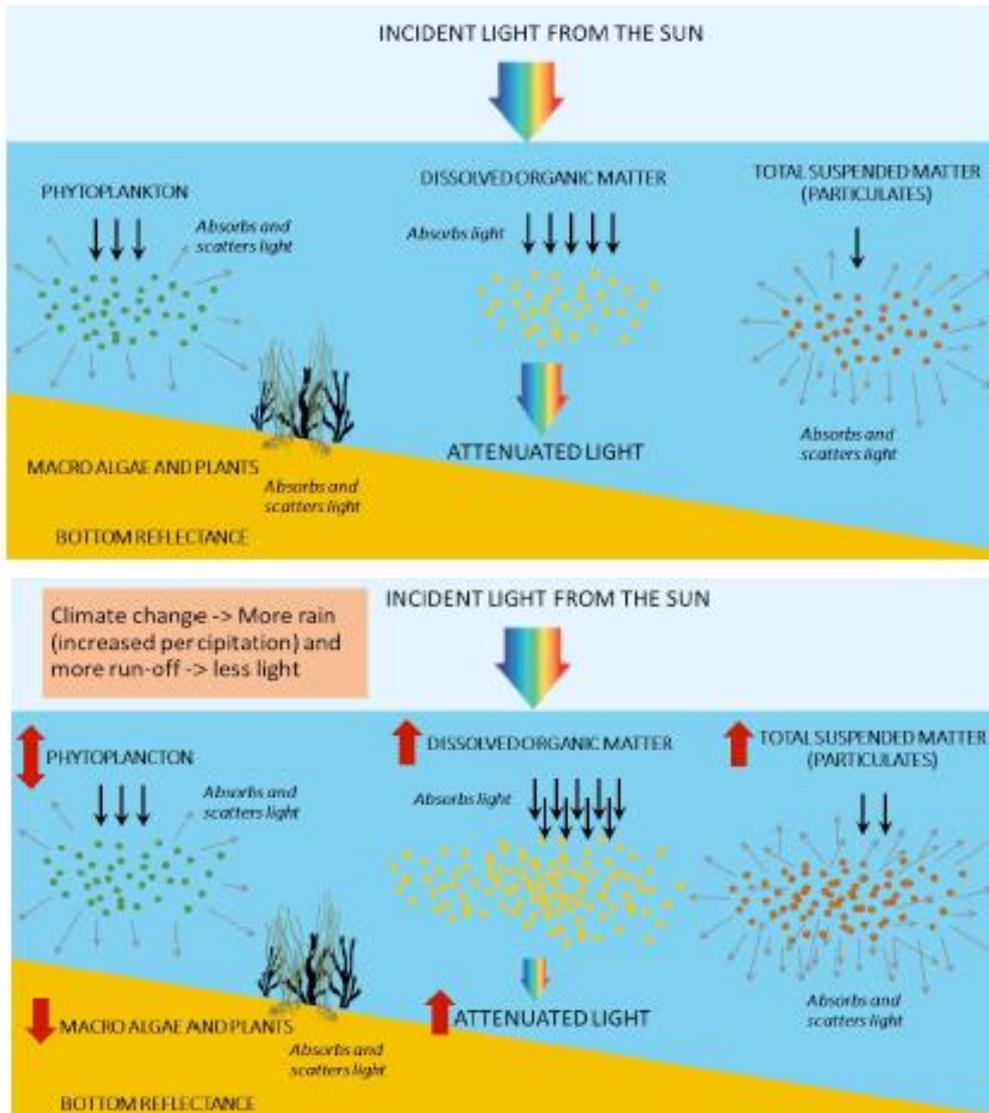


FIGURE 2.8. Light conditions in coastal ecosystems can be affected by various factors within the seawater, some of which are caused by humans, such as increased dissolved organic matter (first image). However, climate changes are affecting these light conditions and causing light to be more attenuated, which impacts on marine ecosystems (second image). Source: NIVA³⁰

³⁰ Frigstad, H., Harvey, T., Deininger, A. & Poste A. (2020) *Increased Light Attenuation in Norwegian Coastal Waters – a literature review*. NIVA Report 7551. NIVA: 12. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2711599>

2.3 ECOSYSTEMS, HABITATS AND BIODIVERSITY

2.3.1 Ecosystems and habitats

Under the sea, kelp forests and maerl beds host rich marine life, sustaining abundant fish stocks and other seafood which have attracted humans and other animals to the area throughout history. On land, the semi-natural habitats are of highest significance, not least because the continuous presence of people over centuries and their management of the land has produced greater plant diversity. This in turn translates into important wildlife habitats.

The Vega Archipelago hosts a range of habitats within its landscape, both underwater and on land.³¹ Of these, many are nationally or regionally significant³² and many are on the Norwegian Red List of Ecosystems.³³ A Nordic Council of Ministers review of coastal ecosystems in 2018 highlighted that, among others, the kelp forests and breeding seabird colonies on islands along the Norwegian coast were globally important habitats. While noting that these areas are often formed by large concentrations of common species, for their overall composition and value to local ecosystems, it is considered important to preserve these coastal areas to ensure biodiversity and ecosystem services in the region.³⁴

These habitats present the most relevant unit of the natural environment for the purposes of this impact assessment. Therefore, the contributions to this work by the Norwegian Institute for Water Research (NIVA) and the Norwegian Institute for Bioeconomy Research (NIBIO) largely focused on the habitats in the Vega Archipelago, characterising them for the purposes of creating a baseline for the assessment (see section 2.3.2 and Appendices 2 and 3). Table 2.1 lists the principal habitats that they identified within the Vega Archipelago. It should be noted that while mapping of terrestrial habitats and vegetation is more advanced, mapping of the marine environment is still underway and there is much less known, as was already noted in the nomination file for the inscription of 'Vegaøyane – The Vega Archipelago' onto the World Heritage List.³⁵ Those key habitats indicated in Table 2.1 with an asterisk as being of particular interest to this impact assessment are explored further in tabular overviews provided in section 2.3.2. These tables characterise the habitats and note their connections to specific species and processes.

³¹ The habitats mentioned in this assessment are adapted from the classification system *Nature Types in Norway* (NiN 2.2), which was developed by the Norwegian Biodiversity Information Centre, and the related *Norwegian Red List of Ecosystem Types*.

³² Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO.

³³ Artsdatabanken (2018). *Norsk rødliste for naturtyper 2018* [online]. Available from: <https://www.artsdatabanken.no/rodlistefornaturtyper>

³⁴ Belgrano, A. (ed.) (2018) *Biodiversity and ecosystem services in Nordic coastal ecosystems: an IPBES-like assessment. Volume 1. The general overview*. Nordic Council of Ministers.

³⁵ Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: 46.

TABLE 2.1. The main terrestrial and marine habitats found in the Vega Archipelago and their status on the Norwegian Red List of Ecosystems and Habitat types. NB: habitats considered of particular importance to this impact assessment are marked with an asterisk. Source: NIBIO and NIVA³⁶

HABITAT TYPE	RED LIST STATUS
Semi-natural terrestrial habitats	
*Coastal heathland	Endangered
Boreal heathland	Vulnerable
*Hay meadows	Critically endangered
*Semi-natural Pastures	Vulnerable
(Semi-natural) beach meadows	Endangered
Natural terrestrial habitats	
Calcareous shallow soils in southern boreal zone	Vulnerable
Calcareous and rich ponds, dams and lakes	Vulnerable
Calcareous helophyte-swamps	Vulnerable
Marine habitats	
*Kelp forests	Near threatened + Endangered
*Maerl beds	Vulnerable
*Deep trench	Vulnerable
Seagrass meadows	Least concern ³⁷

Some additional comments on the marine habitats are important at this initial stage in the report, because their high productivity is what sustains the human presence in the Vega Archipelago (section 2.4). They will be discussed in greater detail in subsequent chapters as being the habitats most likely to be impacted by the proposed aquaculture projects.

The Vega Archipelago hosts both tangle and sugar kelp. Kelp forests are recognised as one of the most highly productive ecosystems in the world, supporting one of the highest levels of biodiversity under the sea. They grow in relatively clear, shallow water, where the algae benefit from sunlight. While tangle kelp is more robust and can survive in fairly exposed waters, the archipelago's inner, more protected waters provide a suitably sheltered habitat for the rarer sugar kelp (Figure 2.9). As forests, they form a three-dimensional habitat which hosts a high diversity of species of fish, invertebrates and others, which find shelter in the kelp, using it for spawning or as a nursery for juveniles. They are particularly significant for their capacity in supporting food webs, which include shellfish, fish, seabirds (including the eider duck³⁸) and sea mammals.³⁹

³⁶ See Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO; and Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA.

³⁷ 'Eelgrass meadows comprise a large proportion of the seagrass beds in Norway. There is a documented reduction in a number of occurrences of eelgrass meadows in certain places in southern Norway, but there is insufficient available evidence to say whether the reduction is significant enough to warrant red listing this major ecosystem type.' Gundersen, H., Bekkby, T., Oug, E., Norderhaug, K. M., Fredriksen, S. and Rinde, E. (2018). *Marine shallow waters. Norwegian Red List of Ecosystems 2018*. Norwegian Biodiversity Information Centre. Available from: https://www.biodiversity.no/Pages/317604/Marine_shallow_waters

³⁸ Follestad, A., Moe, B. & Thomassen, J. (2017) Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugl-drift i Vegaøyen verdensarvområde. NINA Rapport 1405 [online]: 17. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

³⁹ Direktoratet for naturforvaltning (2007). *Kartlegging av marint biologisk mangfold. DN Håndbok 19-2001*. Direktoratet for naturforvaltning: 23-25.

Information from local fishers and researchers indicates that there were dense kelp forests throughout the archipelago until the 1970s.⁴⁰ Since then over a third of tangle kelp forests have disappeared due to overgrazing by sea urchins.⁴¹ Even more significant is the fact that 88% of sugar kelp in the Norwegian Sea and Barents Sea has disappeared, meaning that it is now registered as ‘endangered’ on the Norwegian Red List of Habitats.⁴² It is described as ‘the most seriously threatened of Norway’s marine habitats’ in a report by the Ministry of the Environment to the Norwegian parliament (Figure 2.10).⁴³ The resultant ‘urchin barrens’ are areas where the kelp has been removed but also where related fish and other species are consequently found in dramatically reduced numbers or are absent. The causes of this phenomenon are still not entirely clear, although in addition to the overgrazing, changes in water quality, and other factors related to climate change have been suggested (section 4.2).⁴⁴

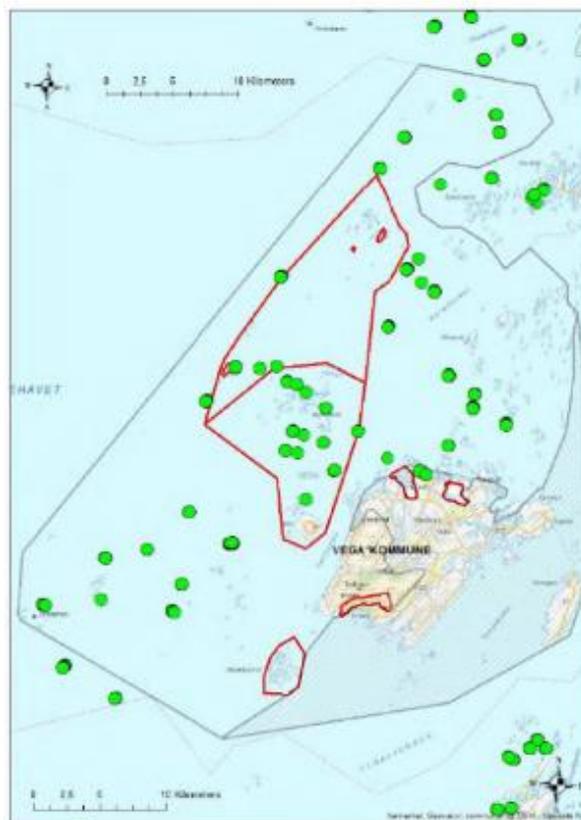


FIGURE 2.9. Locations where sugar kelp has been found in the Vega Archipelago. Although sugar kelp has not been systematically mapped, point data was collected as part of the ‘National Programme for Mapping Biological Diversity – Coast’. Source: NIVA⁴⁵

⁴⁰ Fylkesmannen i Nordland (2014) *Forvaltningsplan for Vegaøyane*

verdensarvområde (2015 – 2022) [online]. Available from: <https://www.verdensarvvega.no/no/forvaltningsplan>

⁴¹ Gundersen, H., Bekkby, T., Norderhaug, K. M., Oug, E., Rinde, E. & Fredriksen, F. (2018). Stortareskog i Norskehavet og Barentshavet, Marint gruntvann. *Norsk rødliste for naturtyper 2018*. Artsdatabanken. Available from: <https://artsdatabanken.no/RLN2018/343>

⁴² Gundersen, H., Bekkby, T., Norderhaug, K. M., Oug, E., Rinde, E. & Fredriksen, F. (2018). Sukkertareskog i Norskehavet og Barentshavet, Marint gruntvann. *Norsk rødliste for naturtyper 2018*. Artsdatabanken. Available from: <https://artsdatabanken.no/RLN2018/344>

⁴³ Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]: 51. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20152016/id2468099/>

⁴⁴ Araújo, R. M., Assis, J., Aguillar, R., Airoidi, L., Bárbara, I., Bartsch, I., Bekkby, T., Christie, H., Davoult, D., Derrien-Courtel, S., & Fernandez, C. (2016) Status, trends and drivers of kelp forests in Europe: an expert assessment. *Biodiversity and Conservation* 25: 1319–1348.

⁴⁵ Hillersøy, G. (2021) *Opplevelser i verdensarvens strandsoner. Marine ressurser som grunnlag for kunnskapsbaserte opplevelser*. Vega Verdensarvsenter/Stiftelsen Vegaøyane Verdensarv.

Ongoing monitoring of the kelp at Vega shows signs that it is slowly returning in places.⁴⁶ However, it is estimated that 8,000 km² of current barren seafloor along the Helgeland coast is suitable kelp habitat and has potential for reforesting,⁴⁷ which if achieved would increase primary productivity and could help enhance biodiversity.⁴⁸

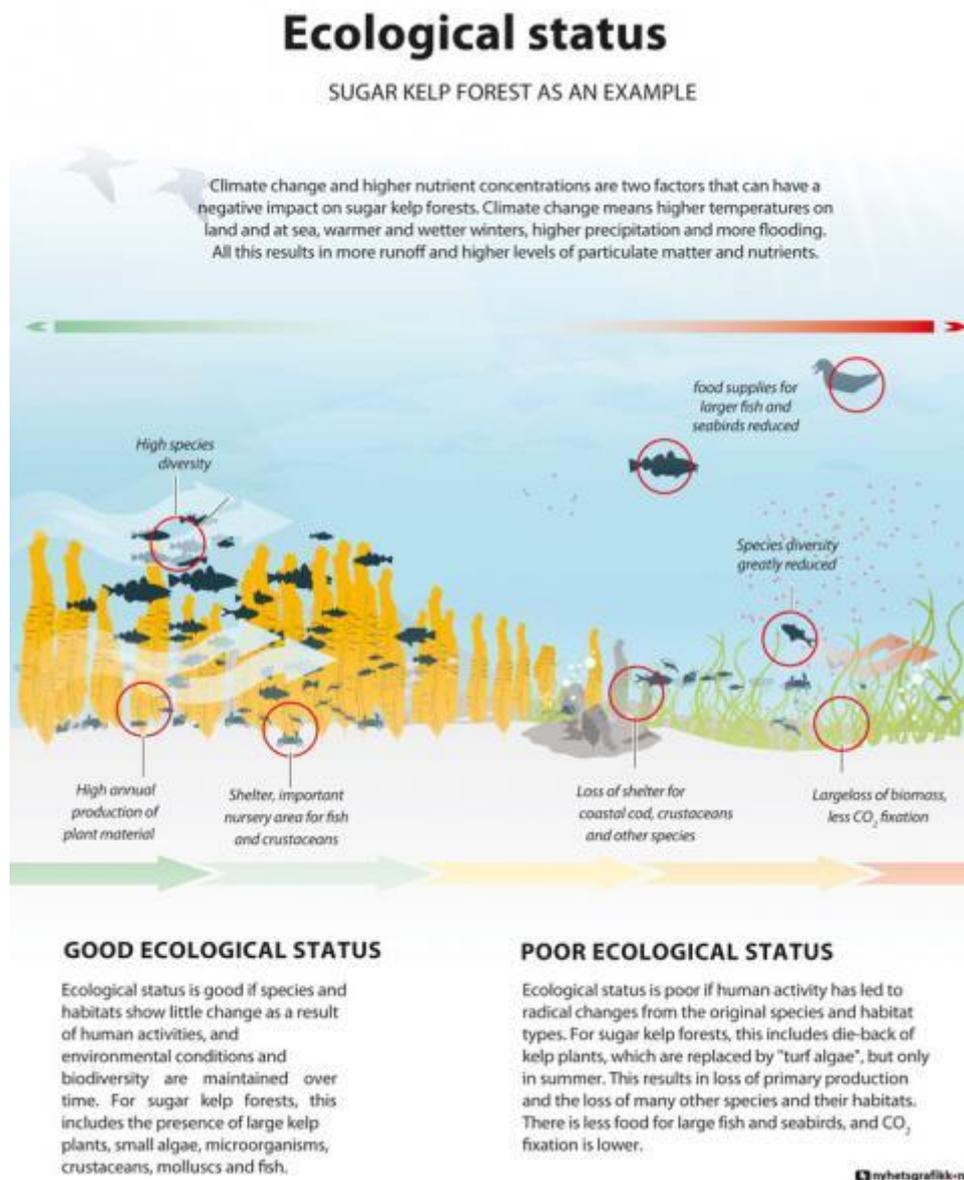


FIGURE 2.10. The status of sugar kelp forests along the Norwegian coast is considered to be endangered. *Source: Nyhetsgrafikk/Ministry of Climate and Environment*⁴⁹

⁴⁶ Steen, H., Norderhaug, K. M. & Moy, F. (2020) *Tareundersøkelser i Nordland i 2019. Rapport fra Havforskningen 2020-9*: 50.

⁴⁷ Gundersen, H., Christie, H., de Wit, H., Norderhaug, K.M., Bekkby, T., Walday, M.G. (2011) *Utredning om CO₂-opptak i marine naturtyper. NIVA-rapport 6070-2010*: 25.

⁴⁸ Christie, H., Norderhaug, K. M., & Fredriksen, S. (2009) Macrophytes as habitat for fauna. *Marine Ecology Progress* 396: 221–233.

⁴⁹ Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20152016/id2468099/>

Another key marine habitat is maerl. Recent research shows that the maerl beds can potentially host greater biodiversity than kelp forests⁵⁰ and studies to date indicate that more than 500 animal and 300 algae species are associated with this habitat.⁵¹ Vega hosts areas of maerl around the archipelago, as they prefer locations with currents providing freshwater flows but sheltered from destructive wave action. Maerl beds are vulnerable to damage from human activities which can kill them, reducing their ability to sustain local fish populations.⁵²

Within a global survey of maerl beds, it has been noted that Norwegian maerl is poorly understood.⁵³ The international scientific community recommends that the conservation and management of Norwegian maerl is taken into consideration in coastal planning.⁵⁴ The maerl beds are not mapped in detail in the Vega Archipelago or anywhere along the Norwegian coast. However, on the basis of available data, researchers have suggested that the Norwegian maerl beds are unique with regards to their extent and untouched condition, as compared to other European maerl areas, which have all been commercially harvested.⁵⁵ Maerl has been observed at multiple locations within the archipelago, including near the Rørskjæran locality proposed for an aquaculture facility (section 3.3.2).⁵⁶ Maerl has begun to be used in paleoecology and paleoclimatic studies because of the way their growth rings can be measured. Although this has not been attempted at Vega, if carried out it would complement other research into the prehistoric environment, the changing land- and seascapes.⁵⁷

Finally, some brief comments on eelgrass are offered here, although due to a lack of available mapping and other information for the Vega Archipelago, no detailed description of this habitat is provided in the summary tables. Eelgrass meadows are highly productive and are important breeding and spawning areas for various fish species,⁵⁸ including coastal cod.⁵⁹ Eelgrass meadows have many of the same functions as kelp forests,⁶⁰ although the flora and fauna associated with them are different from the communities associated with kelp.⁶¹ Together they underpin a great deal of the biodiversity of the Norwegian Sea coast.

⁵⁰ Riosmena-Rodríguez, R., Nelson, W. & Aguirre, J. (eds) (2017) *Rhodolith/Maerl Beds: a global perspective*. Springer.

⁵¹ Hillersøy, G. (2021) *Opplevelser i verdensarens strandsoner. Marine ressurser som grunnlag for kunnskapsbaserte opplevelser*. Vega Verdensarvsenter/Stiftelsen Vegaøyan Verdensarv: 8.

⁵² Kamenos, N.A., Moore, P.G., & Hall-Spencer, J.M. (2004) Small-scale distribution of juvenile gadoids in shallow inshore waters; what role does maerl play? *ICES Journal of Marine Science* 61.3: 422-429.

⁵³ Riosmena-Rodríguez, R. (2017) Natural History of Rhodolith/Maerl Beds: their role in near-shore biodiversity and management. In: Riosmena-Rodríguez et al. (eds) *Rhodolith/Maerl Beds: a global perspective*. Springer: 3-26. Direktoratet for naturforvaltning (2007) *Kartlegging av marint biologisk mangfold. DN Håndbok 19-2001*. Direktoratet for naturforvaltning: 35-7.

⁵⁴ Riosmena-Rodríguez, R., Nelson, W. & Aguirre, J. (eds) (2017) *Rhodolith/Maerl Beds: a global perspective*. Springer: 8.

⁵⁵ NIVA (2019) *Ruglbunn til begjær: ønsker høsting av sjelden og sårbar marin naturtype* [online]. Available from: <https://www.niva.no/nyheter/ruglbunn-til-begjaer-onsker-hosting-av-sjelden-og-sarbar-marin-naturtype>

⁵⁶ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA.

⁵⁷ Kamenos, N. A., Cusack, M. & Moore, P. G. 2008. Red coralline algae are global paleothermometers with bi-weekly resolution. *Geochimica et Cosmochimica Acta* 72: 771–779.

⁵⁸ Pihl, L. & Wennhage, H. (2002) Structure and diversity of fish assemblages on rocky and soft bottom shores on the Swedish west coast. *Journal of Fish Biology* 61: 148-166.

⁵⁹ Bekkby, T., Rinde, E., Espeland, S. H., Olsen, H., Thormar, J., Grefsrud, E. S., Bøe, R., Freitas Brandt, C. og Moy, F. E. (2020) *Nasjonal kartlegging – kyst 2019. Ny revisjon av kriterier for verdisetting av marine naturtyper og nøkkelområder for arter*. NIVA-rapport 7454: 33. Fjøsne, K. & Gjøsæter, J. (1996) Dietary composition and the potential food competition between 0-group cod (*Cadusmorhua* L.) and some other fish species in the littoral zone. *ICES Journal of Marine Science* 2: 757-770.

⁶⁰ Bostrom, C., Baden, S., et al. (2014) Distribution, structure and function of Nordic eelgrass (*Zostera marina*) ecosystems: implications for coastal management and conservation. *Aquatic Conservation-Marine and Freshwater Ecosystems* 24.3: 410–434.

⁶¹ Direktoratet for naturforvaltning (2007) *Kartlegging av marint biologisk mangfold. DN Håndbok 19-2001*. Direktoratet for naturforvaltning: 39-41.

Eelgrass is widely found throughout coastal Norway, although with an ongoing decrease in its distribution and abundance across the northeast Atlantic region.⁶² This has been linked to its dependency on clear water and good light conditions. Changes in water quality, in particular increased eutrophication from excess nutrients that prompt plant-growth and thereby restricted light, can negatively affect it (section 2.2.3).⁶³

Eelgrass beds were registered in the Vega Archipelago in a 1987 survey, with locations around the Hysvær, Kilvær and Tåvær islands groups. Later surveys have not successfully confirmed the continued existence of all these eelgrass areas, so it is unclear if they have survived or disappeared.⁶⁴ Currently only two of the Hysvær eelgrass beds are included on the national habitat survey (Figure 2.11).

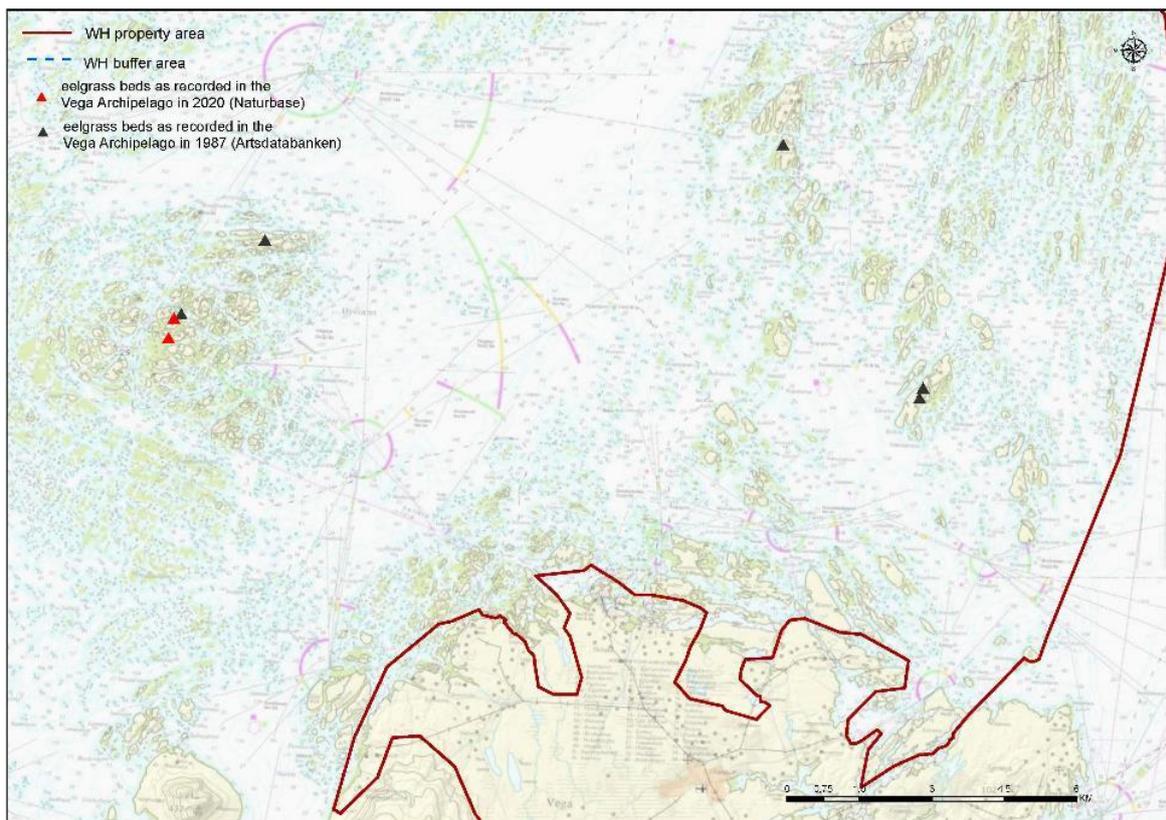


FIGURE 2.11. The areas of eelgrass recorded in the Vega Archipelago in 1987 and 2020. Source: *Instead Heritage*⁶⁵

⁶² Belgrano, A. (ed.) (2018) *Biodiversity and ecosystem services in Nordic coastal ecosystems: an IPBES-like assessment. Volume 1. The general overview*. Nordic Council of Ministers: 83.

⁶³ Gundersen, H., Bekkby, T., Norderhaug, K.M., Oug, E. & Fredriksen, S. (2018) *Marin undervannseng, Marint gruntvann. Norsk rødliste for naturtyper 2018*. Artsdatabanken. Available from: <https://artsdatabanken.no/RLN2018/18>

⁶⁴ Hillersøy, G. (2021) *Opplevelser i verdensarvens strandsone. Marine ressurser som grunnlag for kunnskapsbaserte opplevelser*. Vega Verdensarvsenter/Stiftelsen Vegaøyan Verdensarv.

⁶⁵ Based on data from Artsdatabanken and Naturbase.

2.3.2 Key habitats

The following section offers a summary of the key habitats of the natural environment present at Vega for the purposes of creating a baseline for this impact assessment and which were selected for their relevancy to this particular research. The summary tables below draw on the contributions to this assessment by the Norwegian Institute for Bioeconomy Research (NIBIO) and the Norwegian Institute for Water Research (NIVA); see Appendices 2 and 3 for their complete submission to Instead Heritage.⁶⁶ However, it should be noted that complete mapping of habitats has not yet been undertaken for the entire Vega Archipelago and there are limits to the available data.

⁶⁶ See Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO; and Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA.

Key Vega habitat 1: **COASTAL HEATHLAND**

GENERAL OVERVIEW:

Habitat representativity / distinctiveness:

Found all along the coast, but scarcely distributed, and often in a deteriorated condition. Vega hosts a varied combination of rich and poor variations of this habitat, and with several actively managed and restored areas. The combination of northern, southern, and mountainous species contributes to its distinctiveness. Coastal heathlands were common, but have rapidly diminished, with less than 10% remaining.

Habitat status:

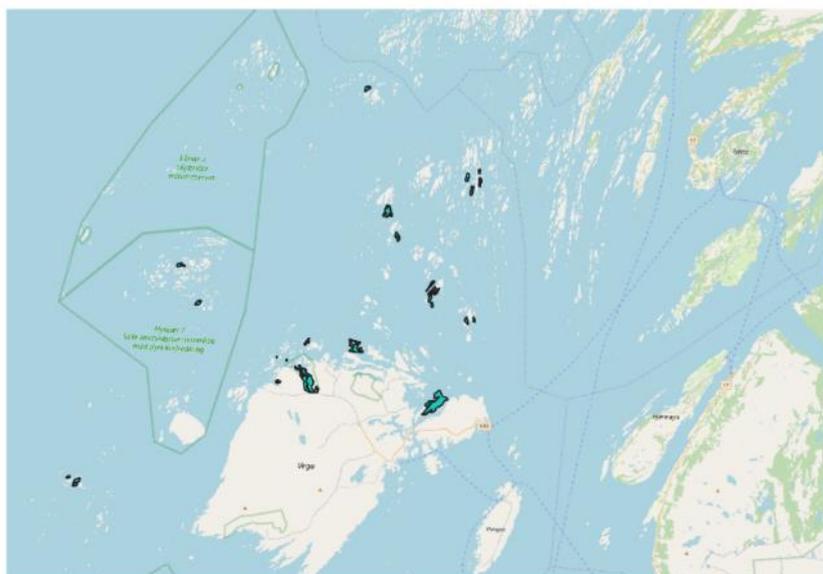
Critically Endangered Endangered Vulnerable Near Threatened Least Concern

Image:



Coastal Heathland at Mangdalsøya at Hysværet, Vega. The mosaic of patches with grass and heath is somewhat visible. Photo: Annette Bär.

Locations:



Coastal heathland is registered both on the main island and throughout the archipelago.

PHYSICAL CHARACTERISTICS:

Height asl:
Mostly 0-100 m asl, but can occur at most elevations.
Bathymetry / topography:
Typically sloped and unfit for more intensive use like hay meadows and semi-natural pastures.
Substrate / soil characteristics:
Nitrogen limited.
Climate:
Typically exposed to wind and weather, but with mild winters due to the oceanic climate.
BIOLOGICAL CHARACTERISTICS:
Dominant and keystone plant species:
Characterized by a mosaic of grass species (<i>Anthoxanthum odoratum</i> , <i>Agrostis cappilaris</i> , <i>Avenella flexuosa</i> , <i>Carexpanicea</i>) herbs (<i>Potentilla erecta</i> , <i>Chamaepericlymenum suecicum</i> , <i>Campanula rotundifolia</i> , <i>Veronica officinalis</i> , <i>Solidavirgaurea</i> , <i>Lotus corniculatus</i>) and heath, mainly <i>Calluna vulgaris</i> , but dominance by <i>Empetrum nigrum</i> and <i>Erica cinerea</i> is also common and depend on water availability and latitude.
Dominant and keystone animal species:
Light livestock like sheep or goats. Important for many spiders and butterflies.
Threatened or protected species:
Southern adders tongue (<i>Ophioglossum vulgatum</i> , NT) Small White Orchid (<i>Pseudorchis albida</i> , VU) Marsh gentian (<i>Gentiana pneumonanthe</i> , VU) “Vegamaure” (<i>Galium normanii</i> , EN)
Biological processes related to dominant and keystone species:
Coastal heathlands are assumed to play an important role for insect life, but this is currently poorly understood.

Key Vega habitat 2: HAY MEADOWS

GENERAL OVERVIEW:

Habitat representativity / distinctiveness:

This habitat was previously common, covering large areas, but nearly all has been converted to farmland or abandoned. Little is remaining, and only part of the remaining patches is well and properly managed. This habitat is therefore among the most threatened habitats in Norway. Well managed and intact habitats are thus rare, and the habitat is therefore critically endangered. Most of this habitat occurs on the mainland, and the occurrence out at sea at Vega is therefore less common, and makes it more distinct.

Habitat status:

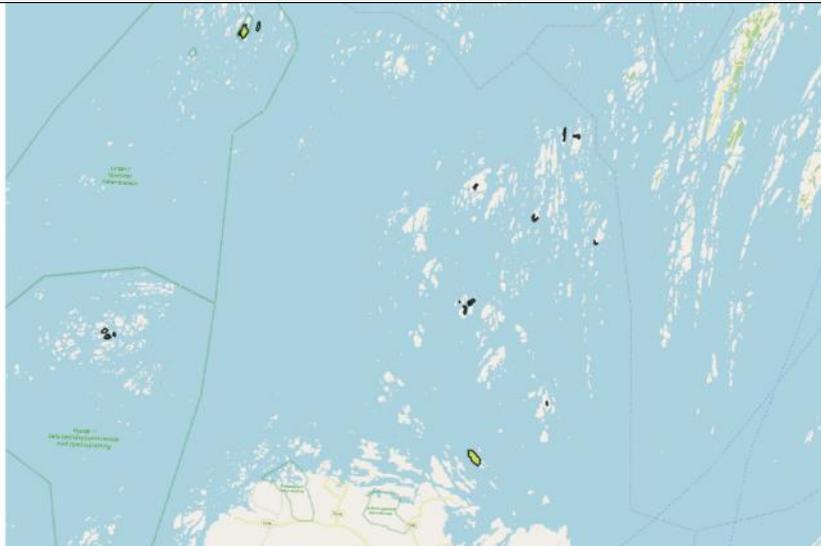
Critically Endangered Endangered Vulnerable Near Threatened Least Concern

Image:



Hay meadow from Steinsholmen at Hysværret, Vega. The areas with shallow soil are dominated by grasses, while the wet areas are dominated by Meadowsweet (*Filipendulaulmaria*), which is more difficult to manage and can dominate if the area is abandoned. *Photo: Annette Bär.*

Locations:



Hay meadows are scattered throughout Vega. They are often found in relation to islands with houses or people living nearby.

PHYSICAL CHARACTERISTICS:
Depth / height asl:
Can vary, and occur at most altitudes, but the majority at Vega occur at lower latitudes, often near houses or farms, but not always.
Bathymetry / topography:
Usually fairly flat terrain, but often now often found in slopes, as these were less attractive for intensified agriculture.
Substrate / soil characteristics:
Removal of hay leads to impoverishment of nitrogen, thus making the habitat suitable for weaker competitors which require less nutrients. Calcareous soils do however increase the biodiversity of plants considerably.
Currents / climate:
The climate at Vega provides mild winters, but this is not a determining factor for this habitat. Hay meadows can also occur in more mountainous areas with long winters.
BIOLOGICAL CHARACTERISTICS:
Dominant and keystone plant species:
Hay meadows are characterised by a mixture of grasses and herbs. More calcareous meadows are characterised by species such as ox-eye daisy (<i>Leucanthemum vulgare</i>), harebell (<i>Campanula rotundifolia</i>), short lived perennial grass (<i>Anthoxanthum odoratum</i>), purging flax (<i>Linum catharticum</i>), as well as several orchids.
Dominant and keystone animal species:
60% of butterflies (Papilionoidea) found in Norway are associated with meadows, and particularly traditional hay meadows. The richness in plant species also leads to an increase in bees and other pollinators. Hay meadows are therefore an important habitat for many pollinators, and the pollinators play an important role in pollinating the plant flora.
Threatened or protected species:
Various red-listed species can be found in the hay meadows at Vega, like: Southern adderstongue (<i>Ophioglossum vulgatum</i> , NT) Blue sedge (<i>Carex flacca</i> , NT) Scandinavian primrose (<i>Primula scandinavica</i> , NT) Hvitkurle (Small White Orchid, VU) Leathery grapefern (<i>Botrychium multifidum</i> , VU) Several other species are connected to hay meadows in general, like: Mountain arnica (<i>Arnica montana</i> , EN) Leafless Hawk's-beard (<i>Crepis praemorsa</i> , VU) Thalictrum simplex subsp. Boreale (VU) Gymnadenia nigra (<i>Nigritella nigra</i> , EN) Several insect species are also often found in hay meadows, like Narrow-bordered five-spot burnet (<i>Zygaenaloniceræ</i>), which is endangered (EN).
Biological processes related to dominant and keystone species:
Interdependencies between the plant and insect communities. This results in important pollination services. The presence of humans can make this habitat suited for eider duck nesting if a shelter is provided.

Key Vega habitat 3: SEMI-NATURAL PASTURE

GENERAL OVERVIEW:

Habitat representativity / distinctiveness:

This habitat occurs fairly regularly around the county at mountainous and coastal areas but is estimated to have declined by 60% from 1950 to 1914. The estimated loss of this habitat is however highly uncertain as the knowledge and mapping of these habitats is limited. As semi-natural pastures are found throughout Norway, they are not unique to Vega.

Habitat status:

Critically Endangered Endangered Vulnerable Near Threatened Least Concern

Image:



Semi-natural pasture at Rognan, Vega. An old breed of sheep is grazing on this old semi-natural pasture.

Photo: Sven Emil Hinderaker

Locations:



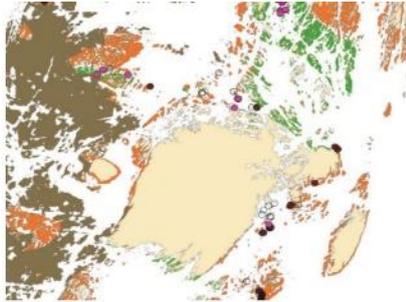
Locations of semi-natural pastures registered in Vega. There are however more locations which are not registered, both on good or poor condition.

PHYSICAL CHARACTERISTICS:
Depth / height asl:
Occur from sea level to mountainous areas. Species composition can therefore include species with salinity tolerance or mountainous species.
Bathymetry / topography:
Typically in more rugged terrain than hay meadows as this was more labour intense to cut, but suitable for animals to graze on.
Substrate / soil characteristics:
Can be shallow or deeper soils, from poor to calcareous rich soils, and wet to dry. All these characteristics affect species composition and diversity. These habitats are typically somewhat deprived in nitrogen, but not to the same degree as hay meadows.
Currents / climate:
The climate at Vega can be windy, but with mild winters. This creates a generally wet environment, but also make the habitat prone to drought as clouds pass over the archipelago and instead falls when it reaches the mountains at the mainland.
BIOLOGICAL CHARACTERISTICS:
Dominant and keystone plant species:
Semi-natural pastures are more grass-dominated than hay meadows, and naturally contain more grazing tolerant species with low growth points or deterring compounds or morphology: Purple moor grass (<i>Molinia caerulea</i>) Matgrass (<i>Nardus stricta</i>) Tufted hairgrass (<i>Deschampsia cespitosa</i>) Sheep fescue (<i>Festuca ovina</i>) Red fescue (<i>Festuca rubra</i>) Alpine bistort (<i>Bistorta vivipara</i>) Catsfoot (<i>Antennaria dioica</i>) Semi-natural pastures can also border to coastal heathlands, semi-natural beach meadows and other wetlands, creating several variations with different species composition.
Dominant and keystone animal species:
Grazing animals such as sheep, goat, horses, or light cattle are key in shaping this habitat and providing a consistent disturbance. Insects are important for pollination of many of the herbs. Fungus (closer to animals than plants): More than 140 species of fungus prefer and occur mainly in unfertilized pastures and may meadows. Several of these are red-listed or threatened.
Threatened or protected species:
Blue sedge (<i>Carex flacca</i> , NT) Fibrous tussock-sedge, (<i>Carex appropinquata</i> , NT) Southern adderstongue (<i>Ophioglossum vulgatum</i> , NT) «Vegamaure» (<i>Galium normanii</i> , EN) Islandskarse <i>Rorippa islandica</i> (EN) As well as several of the species from hay meadows which can find their way into this closely related habitat. European Starling (NT) More than 90 of the fungus associated with semi-natural pastures were in 2006 on the Norwegian red list, and most on other European red lists.

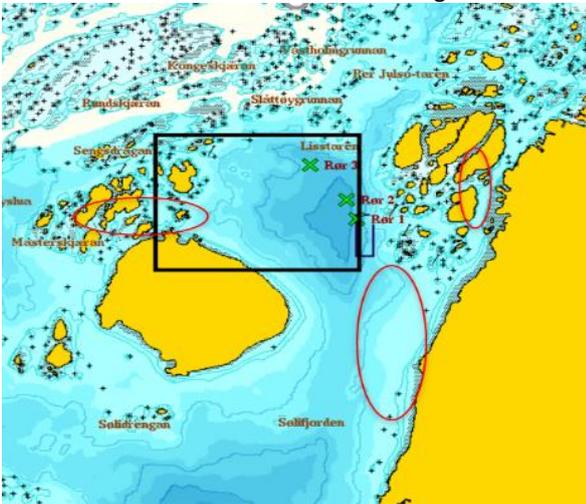
Biological processes related to dominant and keystone species:

Species like starlings (NT) and other birds are dependent on semi-natural meadows like semi-natural pastures. Wet variants of this habitats bordering to wetlands or beach meadows are important for many other bird species as either nesting or feeding habitats.

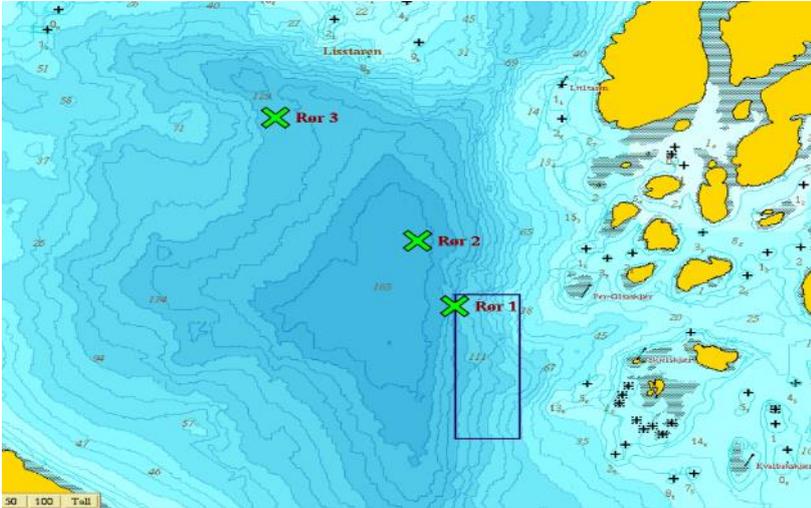
The habitat may also be suitable for Eider ducks, as long as young and curious animals are kept away. The activity of grazing animals can however also be positive by deterring other predators of the eider ducks.

Key Vega habitat 4: KELP FOREST
GENERAL OVERVIEW:
Habitat category:
Marine ecosystem, subtidal from surface to about 30 m depth.
Habitat type:
Kelp forest.
Habitat representativity / distinctiveness:
Common habitat on rocky shores all along the Norwegian coast. Mainly two kelp species are important for building this highly productive and diverse ecosystem. The kelp forests are increasing at Vega due to reduction of grazing sea urchins. Important habitat for production and shelter for fish and other animals.
Habitat status:
<input type="checkbox"/> Critically Endangered <input type="checkbox"/> Endangered <input checked="" type="checkbox"/> Vulnerable <input type="checkbox"/> Near Threatened <input checked="" type="checkbox"/> Least Concern Even if the habitat is abundant and in good condition at the Vega islands, the kelp and its associated animals are vulnerable for local and regional disturbances.
Image:
Forest of tangle kelp (left) and sugar kelp. 
Photo: NIVA.
Locations:
Only tangle kelp has been mapped in the Vega area (brown shading on map), see: https://portal.fiskeridir.no/portal/apps/webappviewer/index.html?id=9aeb8c0425c3478ea021771a22d43476 . Kelp forests are now common all around the Vega islands, tangle kelp at exposed sites and sugar kelp in the more sheltered areas.

PHYSICAL CHARACTERISTICS:
Depth / height asl:
Tangle kelp may create up to 2 m high upright forests, while sugar kelp has long leaves closer to the bottom. Kelp are plants that live in the upper 20-30 m zone depending on light conditions.
Bathymetry / topography:
Kelp is living on most bottom topography except for vertical walls.
Substrate / soil characteristics:
Kelp is fastened with their holdfasts to hard substrate as bedrock, stones, and also to artificial surfaces.
Currents / climate:
The tangle kelp is dominating where wind/waves and currents are strong, and sugar kelp is taking over at more sheltered sites among the islands. Potential temperature increase (climate change) will not be a threat to kelp at the Vega latitude.

BIOLOGICAL CHARACTERISTICS:
Dominant and keystone plant species:
<i>Laminaria hyperborea (tangle kelp) and Saccharina latissima (sugar kelp) are the two keystone kelp species. Other seaweeds, such as the intertidal brown seaweeds, may give similar ecosystem services.</i>
Dominant and keystone animal species:
<i>Thousands of small crustaceans, snails, mussels and worms are key species in transfer of energy from the kelp production up the food chain, to fish and crabs. Different species of fish belonging to e.g. the cod family are key fish species in this system.</i>
Threatened or protected species:
<i>The kelp forests and its inhabitants are common along the Norwegian coast. Kelp in general, and thus the whole ecosystem, have been threatened by sea urchin grazing, and sugar kelp has been threatened by eutrophication further south. The urchins are disappearing at the Vega area, and severe eutrophication problems have so far not been observed in the area.</i>
Biological processes related to dominant and keystone species:
<i>The very high production in kelp forests are important for food chains up to fish, crabs, sea mammals and sea birds. The three-dimensional structure of kelp provide shelter and serve as important nursery grounds for juvenile fish species such as cod. The high numbers of benthic animals living in the kelp forests are important food for e.g. eider ducks.</i>

Key Vega habitat 5: MAERL BED	
GENERAL OVERVIEW:	
Habitat category:	
Marine ecosystem, subtidal from surface to more than 30 m depth.	
Habitat type:	
Maerl bed.	
Habitat representativity / distinctiveness:	
This habitat is not recognised or mapped, but is found commonly along the Norwegian west coast, particularly in mid- and northern Norway.	
Habitat status:	
<input type="checkbox"/> Critically Endangered <input type="checkbox"/> Endangered <input checked="" type="checkbox"/> Vulnerable <input type="checkbox"/> Near Threatened <input type="checkbox"/> Least Concern The status is unknown because it is poorly mapped and not easy to discover.	
Image:	
	Photo: NIVA.
Locations:	
Maerl beds are found in the same areas as shellsand, on flat bottoms. We have observed maerl beds south (Sundsvoll), west (north side of Sjøla) and east (between islands) of the Rørskjæran locality. We have also observed a few maerl beds south and north of Vega.	
	
Maerl beds are found in the areas marked by red circles but are not more detailed mapped or bounded.	
PHYSICAL CHARACTERISTICS:	
Depth / height asl:	
Maerl are characterised as beds where more than 25% of the bottom are covered by live (pink) maerl balls (preliminary suggestion). Live maerl is coralline red algal balls of variable forms, depending on light and can live down to 30 m depth and sometimes further down. The maerl “balls” create a three-dimensional substrate 5-10 cm deep.	
Bathymetry / topography:	
Maerl beds are found on flat bottoms.	
Substrate / soil characteristics:	
Maerl beds are found on flat bottoms mainly on shells and substrate.	

Currents / climate:
Maerl beds are mainly found on sites with currents; sites with good water exchange, but not where wave action is too strong.
BIOLOGICAL CHARACTERISTICS:
Dominant and keystone plant species:
Lithothamnion sp. and Phymatolithon sp. More species have been determined by genetic methods.
Dominant and keystone animal species:
It is a wide diversity of animals (invertebrates such as worms, small crustaceans, snails and mussels) living among the three-dimensional structures of maerl balls. So far this is poorly investigated at the Norwegian coast. Juvenile sea urchins are often abundant in these habitats.
Threatened or protected species:
The maerl species may be threatened by physical and chemical disturbances and should probably be protected. If the maerl becomes affected and die, the animals using maerl beds as habitat will be affected.
Biological processes related to dominant and keystone species:
The slow growing maerl is probably of low value as food or energy supporting any food chain, and the animals living in the maerl bed are likely to depend on organic materials from elsewhere. The animals in maerl beds are potential food organisms for e.g. eider ducks.

Key Vega habitat 6: DEEP TRENCH
GENERAL OVERVIEW:
Habitat category:
Marine habitat, subtidal.
Habitat type:
Deep trench bottoms (also named deep holes as they are restricted deep sites surrounded by shallow areas).
Habitat representativity / distinctiveness:
These habitats could be distinct for regions with extensive shallow coastal flats. They are not particularly focussed along the coast, but they will probably be focussed as carbon sequestration hot spots.
Habitat status:
<input type="checkbox"/> Critically Endangered <input type="checkbox"/> Endangered <input checked="" type="checkbox"/> Vulnerable <input type="checkbox"/> Near Threatened <input type="checkbox"/> Least Concern
Locations:
The map shows the deep hole (165 m) close to the fish farm site. 
PHYSICAL CHARACTERISTICS:
Depth / height asl:
The deep hole bottom is at 165 m depth.
Bathymetry / topography:
The bottom of the hole is expected to be flat.
Substrate / soil characteristics:
Soft bottom of mud/clay.
Currents / climate:
Such deep holes are expected to have limited water movements. The MOM C investigation revealed good water quality in this particular deep hole, but the high organic content in the sediments indicate a deposition area.
BIOLOGICAL CHARACTERISTICS:
Dominant and keystone plant species:
No plants live at such depths.
Dominant and keystone animal species:
A diversity of infauna and epifauna occur rather than some dominant species. By increasing organic deposition some tolerant species will dominate.
Threatened or protected species:
All species living in the sediment in the deep hole will be threatened by organic depositions that lead to oxygen depletion. Mobile epifauna and fish may abandon the area.
Biological processes related to dominant and keystone species:
Not known, but the deep holes are more rare than important for biological processes in the coastal ecosystem.

2.2.3 Biodiversity

2.2.3.1 Plants

The Vega Archipelago's plant life is unusually varied compared to other places at a similar latitude (Figure 2.12). The milder temperatures brought by the Gulf Stream favour more southerly plants of the boreal vegetation zone, which mix with those of northern regions. Both oceanic and mountain species are found. Much of the archipelago provides calcareous soil due to the underlying geology, which favours growth in many plants. Of particular note, are the large number of orchid species found in the Vega Archipelago. There are also large numbers of mosses, liverworts, lichens and fungi, some of which are Red Listed which have symbiotic relationships with the plants.

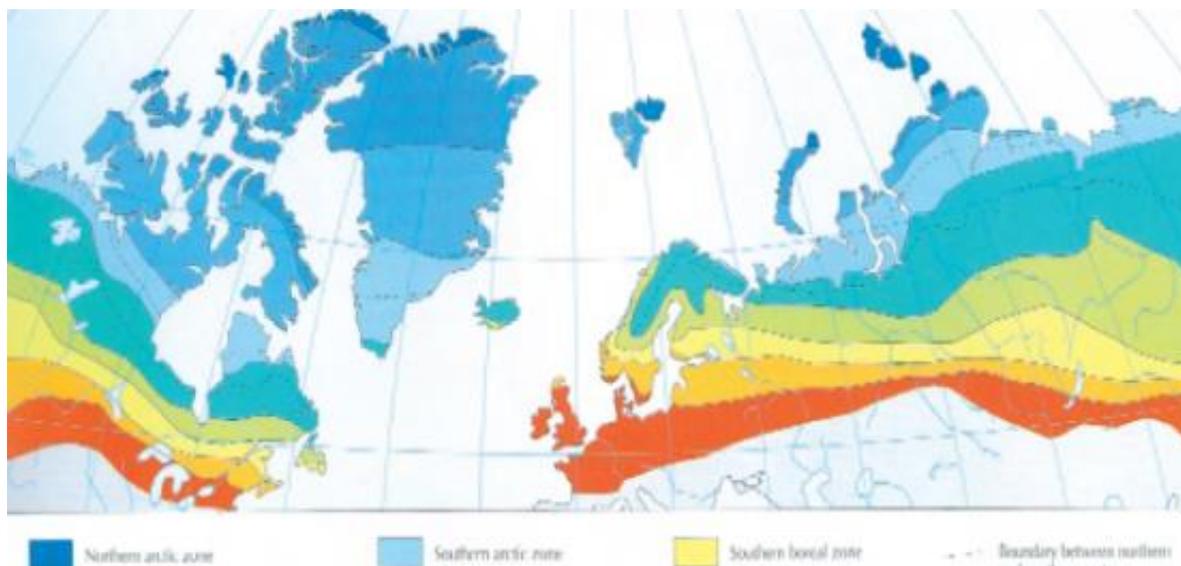


FIGURE 2.12. Vegetation zones, showing that the coastline on which Vega is situated is unusual for hosting middle boreal zone plants (green), which are very different from what is found at locations at similar latitudes (blue). *Source: Moen 1999⁶⁷*

Of particular interest are those examples of plants associated with the presence of large bird populations. For example, the duckweed present in the archipelago is thought to have been introduced by migrating barnacle geese because their distribution is mainly on the western islands (in particular, around Bremstein, Skjærvær and Lånan), where the geese gather in large numbers.

Other plants are associated with human activities. For example, the vegetation of the heathlands is a product of the cycles of grazing and burning that form part of the traditional management of these areas. As a direct result they host a wide variety of grass and other species. One example is the rare sub-species of lesser bedstraw found only in the Vega area, known as Vegamaure (Figure 2.13). Where land has been farmed in the islands, people traditionally added seaweed to the thin topsoil to provide extra nutrients and encourage plant growth. It is interesting to note that the highest density of plant species found in the archipelago are in the hay meadows and semi-natural pastures – habitats formed by human action – with the record being set at Lånan and neighbouring Omnøy, as well as on Skogsholmen. These examples show that the combination of diverse natural habitats and traditional land management, over time, has produced conditions which

⁶⁷ Moen, A. (1999) *National Atlas of Norway: Vegetation*. Kartverket.

support a high number of plant species, including many Red-Listed plants. The variety of plants species hosts a diverse range of insects (significantly, pollinators, such as butterflies), bird and other animal life. In addition, it should be noted that the human presence in the semi-natural habitats makes these suitable nesting areas for the eider duck.

<p>Vegamaure <i>Galium normanii</i></p> <p>Kjennetegn 3–10 cm. Plante i maurefamilien. 5-7 smale blad står i krans oppover stengelen. Blomstene sitter i skjermkranser og er gulhvite.</p> <p>Voksested og skjøtselsbehov Arten er knyttet til grunnlendt beitemark på kalkgrunn, med hei- eller engpreg. Den går noe tilbake på grunn av redusert utmarksbeite, opphørt utslått, og påfølgende gjengroing.</p> <p>Utbredelse i Nord-Norge Forekomsten er begrenset til Vega i Nordland. Arten finnes både på hovedøya og på noen øyer i Vegas skjærgård.</p> <p>Rødlisterstatus Vegamaure vurderes som sårbar (VU) på rødlista for arter på grunn av et meget lite og isolert areal i Norge.</p> <p>Tradisjonell bruk Ikke kjent</p> <p><small>Informasjon hentet fra artsdatabanken og NIBIO.</small></p>	 <p>Foto: Thomas H. Carlsen, NIBIO - Norsk Institutt for Bioøkonomi</p>  <p>Funn registrert i Artskart, Artsdatabanken</p>
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FIGURE 2.13. The Vegamaure is a sub-species of bedstraw which is only found in the Vega Archipelago area; they are dependent on coastal heathland and their continued human management. *Source: Thomas H. Carlsen | NIBIO*⁶⁸

2.2.3.2 Birdlife

The Vega Archipelago is noted for the number and concentrations of bird species that it attracts thanks to its rich marine and terrestrial habitats, including wetlands, salt marshes and kelp forests, as well as shallow waters full of fish and other food. Many bird species are present in the Vega Archipelago – 222 when counted in 2007 – and many of these use key habitats for critical life stages, such as breeding. For example, nearly half the identified bird species nest in the archipelago. This number is very high for such a northerly location and is due to the variety of habitats both on the main island of Vega and on other islands across the archipelago.⁶⁹

⁶⁸ Bär, A. (2019) *Vegamaure* [online]. Available from: https://www.nibio.no/tjenester/kilden/vegakilden/_/attachment/inline/0c4db8d4-ddd8-4e4d-928c-3bd68efd6731:5f5236fcfb44ec40616cb15f3449895def92036b/Vegamaure.pdf

⁶⁹ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ærfugl og ærfugldrifft i Vegaøyane verdensarvområde. NINA Rapport 1405* [online]: 10. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

Of all the bird species, the eider duck has the most celebrated connection to the Vega Archipelago. The down from this duck, which it leaves at its nest site after the chicks have hatched, has been gathered for centuries by people living along the Norwegian coast. Over time a reciprocal relationship developed between the eiders and people on the islands who would provide secure nesting areas so that they could collect the down feathers at the end of the nesting season (section 2.4.2). This phenomenon was historically common along the Norwegian coast, it has endured longer in the Vega Archipelago. However, the Vega Archipelago has seen dramatic bird population declines since the early twentieth century, with estimates that there are probably less than 5% of the eider ducks that were present in the 1920s.⁷⁰ Although the eider remains one of the most numerous duck species in the area, research in 2019 recorded one of the lowest population counts and shows a significant decline since the 1980s.⁷¹ It should be noted that the eider population in the Vega Archipelago seems to have some connections to the departure of the human population from the outer islands since the 1950s, although recent efforts to re-establish the practice have contributed to stabilising the situation.⁷²

Other select bird species of interest include:

- *Cormorant*: Vega was previously home the largest breeding colony of cormorants in Norway. The population has been as high as 4,000 pairs, of which 2,000 pairs nested in the Skjærvær area, making it the world's largest nesting colony at that time.
- *Barnacle goose*: nearly the entire world population used to rest in the archipelago during their spring and autumn migrations.
- *Black guillemot*: two of the country's largest colonies breed in Skjærvær and Bremstein.
- *White-tailed eagle*: this large bird of prey is common throughout the year.
- *Greylag goose*: the archipelago has a large breeding population and the archipelago is an important moulting area for them.

In recognition of the Vega Archipelago's importance, Birdlife International has designated the area as an Important Bird and Biodiversity Area. This global network of areas covers just 7% of the earth's land surface and 2% of the sea but is considered vital to sustaining the long-term viability of bird and other species populations. Birdlife International noted that the Vega Archipelago is of particularly high significance for the breeding populations of common eider and cormorant it supports, as well as its migrating barnacle goose population.⁷³

Birds have a key and complex role in the ecosystems of Vega. Migrating birds are likely to have introduced some of the archipelago's rare plant species. Others have been attracted by the human-affected habitats, such as the hay meadows, which have become important resting places for migrating birds, as well as nesting and moulting areas. There are several Red-Listed birds associated with the semi-natural habitats on the islands, including the black guillemot, common eider, common starling and twite, making them vulnerable when traditional practices are abandoned. Other research looking at the declining seabird population

⁷⁰ Follestad, A., Moe, B. & Thomassen, J. (2017) Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugl-drift i Vegaøyane verdensarvområde. NINA Rapport 1405 [online]: 3. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

⁷¹ Follestad, A. (2020) *Vintertellinger av sjøfugl i Vega 2019* [unpublished report]. NINA.

⁷² Vega Verdensarvsenter (no date) *Ærfugltradisjonen* [online]. Available from: <https://www.verdensarvsenter.no/no/aerfugltradisjonen>

⁷³ BirdLife International (2022) *Important Bird Areas factsheet: Vega Archipelago*. Available from <http://datazone.birdlife.org/site/factsheet/vega-archipelago-iba-norway>

highlighted the importance of protecting kelp forests and the value of the marine fauna they contain as part of broader strategies to protect birdlife.⁷⁴

2.2.3.3 Mammals

Most of the mammals found in the Vega Archipelago are common to the Norwegian west coast in general. There are various marine mammals, including Eurasian otters, grey seals, common harbour seals, arctic seals and a several species of whale.

Of note among the livestock species, the Old Norwegian sheep demonstrates the connections between specific habitats, species and people. Following Vega's inscription in 2004, this breed has been the focus of conservation efforts to bring it back from the threat of extinction. As such, sheep products have a recognized legal status when it has been kept according to traditional methods, grazing on coastal heathland.⁷⁵ There are already a few hundred grazing in the Vega area, with plans to encourage more.

2.2.3.4 Fish and other marine species

There is a lack of information concerning the marine species present in the Vega Archipelago. At the time of its inscription as World Heritage in 2004, 800-900 marine macrofauna species had been recorded but estimates based on comparable areas suggested that there may be as many as 2,700 species.⁷⁶

Cod and herring have been the most commercially important fish over time along the Helgeland coast, and continue to be so despite the continued decline of stocks.⁷⁷ Other key species include saithe, ling, haddock, halibut and redfish, and since commercial harvesting started in the 1990s, crabs have become an important fishery around the archipelago.⁷⁸ In relation to the habitats identified above, the kelp forest is an important spawning ground for various fish species (Figure 2.14), while cod, saithe and pollack use maerl beds as nurseries.⁷⁹ Cod and other local fish play key roles as predators and their presence seems to be important in controlling numbers of sea urchins and other grazers in the kelp forests and eelgrass meadows. Studies are presently identifying links between overfishing of these fish and the decline of related habitats.⁸⁰

⁷⁴ Fauchald, P., Barrett, R.T., Bustnes, J.O., Erikstad, K.E., Nøttestad, L., Skern-Mauritzen, M. & Vikebø, F.B. (2015) *Sjøfugl og marine økosystemer. Status for sjøfugl og sjøfuglenes næringsgrunnlag i Norge og på Svalbard*. NINA.

⁷⁵ Forskrift om vern av Villsau frå Norskekysten/Villsau fra Norskekysten som geografisk nemning. Available from: <https://lovdata.no/dokument/SF/forskrift/2010-11-04-1402>

⁷⁶ Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

⁷⁷ Hancke, K., Gundersen, H., et al. (2018) Helgeland: An Atlantic archipelago (Norway). In: Tunón, H. (Ed.) *Biodiversity and ecosystem services in Nordic coastal ecosystems – an IPBES-like assessment. Vol. 2. Geographical case studies*. Nordic Council of Ministers.

⁷⁸ Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

⁷⁹ Kamenos, N.A., Moore, P.G. & Hall-Spencer, J.M. (2004) Small-scale distribution of juvenile gadoids in shallow inshore waters; what role does maerl play? *ICES Journal of Marine Science* 61. 3: 422-429.

⁸⁰ Baden, S., Emanuelsson, A., Pihl, L., Svensson, C.-J., & Åberg, P. (2012) Shift in seagrass food web structure over decades is linked to overfishing. *Marine Ecology Progress Series* 451: 61-73. Östman, Ö., Eklöf, J., Eriksson, B. K., Olsson, J., Moksnes, P.-O., & Bergström, U. (2016) Top-down control as important as eutrophication effects in North Atlantic coastal ecosystems. *Journal of Applied Ecology* 53.4: 1138–1147. Andersen, J. H., Berzaghi, F., Christensen, T., Geertz-Hansen, O., Mosbech, A., Stock, A., Zinglensen, K. B. & Wisz, M. S. (2017) Potential for cumulative effects of human stressors on fish, sea birds and marine mammals in Arctic waters. *Estuarine Coastal and Shelf Science* 184: 202-206.

Nationally, only half the numbers of salmon return from the ocean to spawn in Norway's rivers in comparison to the levels recorded in the 1980s. This dramatic decline has been attributed to human activities that impact on the sea survival of salmon, with the largest population declines in western and central Norway. Farming of salmon, leading to escaped farmed salmon, greater outbreaks of salmon lice and infections related to farming practices, have been described as the greatest anthropogenic threats to Norwegian wild salmon by the Norwegian Scientific Advisory Committee for Atlantic Salmon.⁸¹ The main island of Vega has populations of both salmon and sea trout which return to the fresh water of the Færsetvassdraget river to breed. The Norwegian Scientific Advisory Committee for Atlantic Salmon has classified the salmon stock in the river as moderately achieving spawning/harvesting targets, while the sea trout stocks are poor.⁸²

Another species of note is the northern shrimp which is often considered a keystone species in northern ecosystems due to its central role in food webs, being both a scavenger/predator, as well as an important prey for marine fish, mammals and invertebrates.⁸³

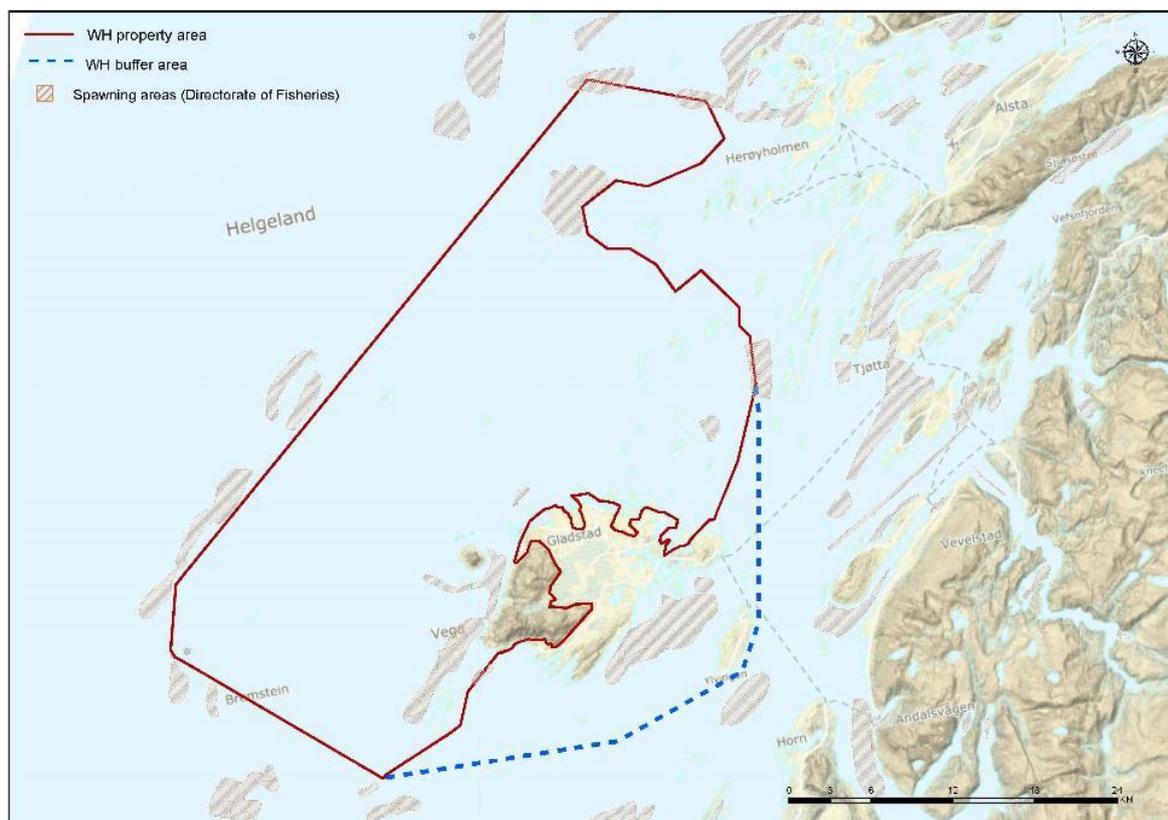


FIGURE 2.14. The main fish spawning areas in the Vega Archipelago as identified by the Ministry of Fisheries. *Source: Instead Heritage*⁸⁴

⁸¹ Thorstad, E.B., Forseth, T. & Fiske, P. (eds) (2021) *Vitenskapelig råd for lakseforvaltning 2021. Status for norske laksebestander i 2021. Rapport fra Vitenskapelig råd for lakseforvaltning 16* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2830680> or the English summary: <https://www.vitenskapsradet.no/Portals/vitenskapsradet/Status%20of%20wild%20Atlantic%20salmon%20in%20Norway%202021.pdf>

⁸² Miljødirektoratet (2021) *Lakseregisteret: Færsetvassdraget* [online]. Available from: [https://lakseregisteret.fylkesmannen.no/visElv.aspx?vassdrag=F%3%A6rsetvassdraget%20\(Ferasetelva\)&id=147.3Z](https://lakseregisteret.fylkesmannen.no/visElv.aspx?vassdrag=F%3%A6rsetvassdraget%20(Ferasetelva)&id=147.3Z)

⁸³ Guijarro Garcia, E. (2007) The Northern Shrimp (*Pandalus borealis*) Offshore Fishery in the Northeast Atlantic. *Advances in Marine Biology* 52: 147-266.

⁸⁴ Artsdatabanken (no date) *Økologiske grunnkart* [online]. Available from: <https://okologiskegrunnkart.artsdatabanken.no/?layers=72&favorites=false>

2.4 PEOPLE AND THE CULTURAL LANDSCAPE

The particular geology and climate of the Vega Archipelago provided the preconditions for abundant marine resources, making the area particularly attractive to early humans despite the harsh conditions found this close to the Arctic Circle. As a result, the landscape has also been shaped by people for 10,000 years, with permanent resident communities being established approximately 1,500 years ago. By exploiting the wide range of natural resources, the people of the Vega Archipelago were able to survive even when there were natural fluctuations in the abundance of individual species. Through continuous occupation of the islands many aspects of nature and culture evolved to become interdependent and were maintained through an evolving tradition of sustainable management of the landscape. While Vega's cultural landscape contains many features that are representative of wider coastal traditions, it is the unique combination of natural resources, their management and cultural traditions surviving today that make the Vega Archipelago distinct.

The first sections that follow recount a past that in many ways has been lost, but not entirely, making the status of the Vega Archipelago fragile. It lies somewhere between what might be called a 'fossil' cultural landscape and a 'living' cultural landscape, one that continues to evolve in varying degrees of continuity with its past. This fragility is also the reason for extensive attention dedicated in Part 2 to understanding the Outstanding Universal Value of the World Heritage property 'Vegaøyen – The Vega Archipelago' itself, both in terms of its heritage significance (section 2.5), its overall management (section 2.6) and management specifically for World Heritage requirements (section 2.7).

2.4.1 The arrival of humans in the Vega Archipelago

Vega island and its surrounding coastline likely emerged from the ice during glacial retreat around 13,000 years ago and the first signs of human activity date to roughly 10,000 years ago (Figure 2.15).⁸⁵ The seascape lay at a higher level, covering the strandflat, such that only the tops of Vega and Sjøla and a few other peaks were visible. The exposed land would therefore have been relatively bare and stony. However, the waters covering the submerged islands would have been shallow providing good conditions for exploiting marine resources, such as fish, seals, whales and birds, and gathering birds' eggs and shellfish,⁸⁶ thereby presenting the conditions for settlement.

There are more than 108 recorded archaeological sites on the main island of Vega alone from this early Stone Age period. The largest settlement was found at Åsgarden, which was made up of perhaps 20 structures and hundreds of thousands of artefacts have been found there. It is no coincidence that the Åsgarden settlement is located in what would have been the best protected, natural harbour at that time.⁸⁷ Other prehistoric structures have been found on Vega island at, for example, Mohalsen, Porsmyrdalen and Middagskarsheia, and these were located near to the ancient shoreline of their time, as the land continued to rise from the sea (Figure 2.16). The structures are typically dug down below ground level, with stone foundations and there is

⁸⁵ Bang-Andersen, S. (2012) Colonizing contrasting landscapes. The pioneer coast settlement and inland utilization in southern Norway 10,000-9500 years before present. *Oxford Journal of Archaeology* 31.2: 103-120.

⁸⁶ Bjerck, H.B. (1989) Mesolithic site types and settlement patterns at Vega, northern Norway. *Acta Archaeologica* 60: 1-32.

⁸⁷ Bjerck, H.B. (1989) Mesolithic site types and settlement patterns at Vega, northern Norway. *Acta Archaeologica* 60: 8.

evidence at some sites for whale bones being used as parts of the structure. There are also many more sites which were probably temporary or seasonal hunting and fishing sites.⁸⁸

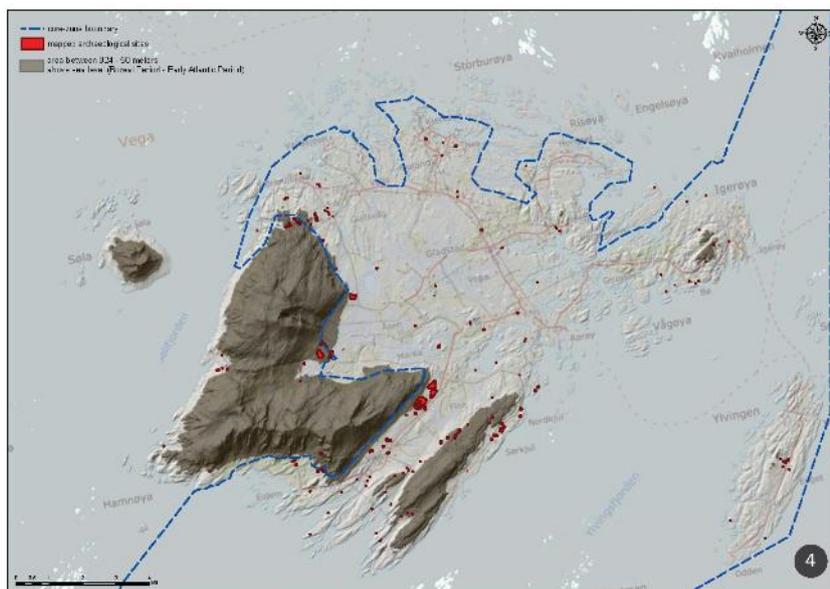


FIGURE 2.15. The location of prehistoric archaeological sites on Vega island (red) in relation to prehistoric coastline: with the sea 50 m higher than current levels, the brown areas would have been the only parts of the archipelago rising out of the sea. The World Heritage property boundary is indicated in blue. *Source: Instead Heritage*⁸⁹

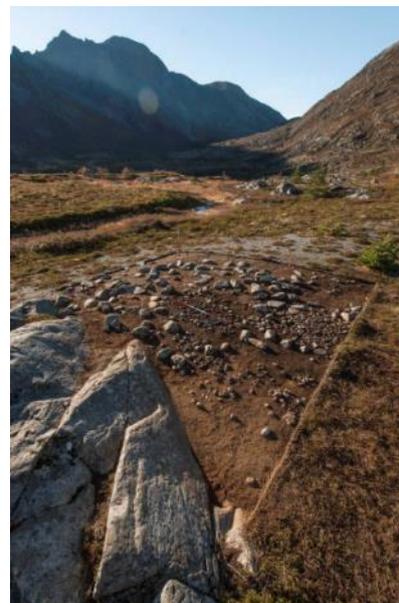


FIGURE 2.16. An excavated Stone Age settlement at Mohalsen on Vega. *Source: Åge Hojem | NTNU*⁹⁰

Over the millennia, the land continued to rise, gradually revealing a larger area of the main Vega island and other lower lying islands and skerries. As land emerged, the climate changed and new plant resources became available, which these early people were able to add to the range of resources they could exploit enabling more permanent settlement around AD 500. Archaeological investigations from a neighbouring archipelago to the north of the Vega archipelago, revealed that by AD 600, in addition to fishing and hunting, farming had been established along this part of the Helgeland coast. From this time onwards, evidence supports continuous human presence in the archipelago and with that the beginning of the long-term management of the land behind the rich and varied environment that can be found today.⁹¹

While areas of land were being transformed through human activity, such as grazing and cultivation, domesticated farm animals introduced new resources.⁹² In addition, people harvested a very wide range of natural resources that could be found on land or in the sea. The tradition of protecting the eider ducks when

⁸⁸ Spjelkavik, S.O.S. (2016) *Mohalsen-I, Vega. En Arkeologisk og geologisk analyse av råstoffvariasjon og landskapsbruk i tidligmesolitikum*. NTNU. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/bitstream/handle/11250/2412836/Spjelkavik%2c%20Skule%20.%20.pdf?sequence=1&isAllowed=y>

⁸⁹ Kartverket (no date) *Geonorge* [online]. Available from: <https://geonorge.no>

⁹⁰ Bjerck, H.B., Breivik, H.M., Fretheim, S.E. & Zangrando, A.F.J. (2016) Excavation of Mohalsen 2012-II, Vega municipality, Nordland. NTNU Vitenskapsmuseet arkeologisk rapport 2016: 4.

⁹¹ Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

⁹² Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

they arrived in the islands each year, allowing people to take some eggs and then harvest the down is central to this. It is also likely to be early evidence for regular trade. Eider tending took place at multiple localities along the coast of north Norway during the Viking period, while at the Vega archipelago it continued through history to the present. At its height, eider houses were constructed on most inhabited islands throughout the archipelago (section 2.4.2).⁹³

2.4.2 Living in the Vega Archipelago

Settlement locations at Vega were determined by the availability of resources, suitable land and connections to fishing areas and sea-routes. This resulted in close correlation with the key habitats and through sustained resource management, greater bio-cultural diversity.⁹⁴ Houses, which ranged from a single dwelling or a small collection of houses with associated farm and fishing buildings, were usually made of timber built on stone foundations. The timber, or even the entire structure, was transported to the islands and the house built in the tradition of Nordland coastal settlements.⁹⁵ However, adaptations were made if suitable driftwood was found and even shipwrecks might be re-purposed for building material. Indeed, useful items that were found washed up by the sea were always considered a resource by the islanders.⁹⁶

Where places on the mainland away from the coast would have offered a limited set of land-based resources, coastal locations offered immediate access to a wide range of both terrestrial and marine resources. This included sealing, whaling, seabird hunting, gathering eggs, harvesting seaweed, collecting driftwood and other flotsam. The strandflat provided access to both shallow, protected waters and to the deeper open sea, providing greater fishing opportunities and with that trade of fish and commodities. Whereas land-based communities, away from established trade routes, would be at risk in years of poor harvest, the diversity of livelihood-supporting activities undertaken by the island households could better compensate for fluctuations in individual food sources. Fishing alone would have risked dependency on variable fisheries, but coupled with farming, eider tending and the trade which developed along fishing routes over time, people had greater security of food and welfare. As trade developed, imported grain and other commodities were available to island households, along with the opportunities to sell their own produce to market. The resultant 'fisher-farmer' culture was a specific response to the conditions in which people lived along the northern Norwegian coast.⁹⁷

One notable feature of life in the Vega Archipelago is that, in each period, sustaining livelihoods were dependant on exploiting as broad a spectrum of natural resources as possible. People in the archipelago did not specialise in a single subsistence activity but were, in turn, variously fishers, farmers, hunters and gatherers as seasonal opportunities determined. A range of activities meant that all members of the household could contribute, so that while men were largely responsible for fishing, women also supported

⁹³ Daugstad, K. & Fageraas, K. (2018) World Heritage and Cultural Sustainability: the farmers and fishermen of Vega, northern Norway. In: Birkeland, I., Burton, R., Parra, C. & Siivonen, K. (eds) *Cultural Sustainability and the Nature-Culture Interface: livelihoods, policies, and methodologies*. Routledge.

⁹⁴ Davies, T. & Stendal, A. (forthcoming) Narratives of fish, trade, and coastal communities: use and resource management as a tool for heritage and environment compensation. *Proceedings of the 27th Annual Meeting of the European Association of Archaeologists*.

⁹⁵ Ellefsen, K.O. & Lundevall, T. (2019) *North Atlantic Coast: A Monography of Place*. Pax Forlag A/S: 50-64.

⁹⁶ Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

⁹⁷ Spjelkavik, S.O.S. (2016) *Mohalsen-I, Vega. En En arkeologisk og geologisk analyse av råstoffvariasjon og landskapsbruk i tidligmesolitikum*. NTNU. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/bitstream/handle/11250/2412836/Spjelkavik%2c%20Skule%20O.%20S.pdf?sequence=1&isAllowed=y>

the family through, for example, farming activities, gathering and eider tending. Of these activities it is eider tending and the stewardship it requires by islanders, which best represents the seasonality of island livelihoods.⁹⁸ This all contributed to ensuring that families had sufficient resources throughout the year and avoided the risk of dependency on a single resource.⁹⁹

Variations occurred in the range of available marine species over time, while fluctuations of fishing stocks are well documented in the historical record.¹⁰⁰ However, overall, fishing was the primary source of income for the archipelago households and, indeed, along the coast of Norway as a whole. In particular, for a long period in Norway's history, the cod trade was hugely dominant, both coastal cod, as well as the skrei, the migrating Atlantic cod. Other significant fisheries included herring and saithe.

Subsistence strategies based on natural resources responded to changes in the natural world over the course of the seasons. According to the time of year, fishers might work local waters within the archipelago. Sometimes they would gather on the outer islands near to the deeper waters, such as at Bremstein, the archipelago's largest fishing settlement. At other times they would travel further, for example, to join in the larger seasonal fishing at Lofoten and Finnmark. Women's responsibility for much of the farm work, freeing the men to be away at sea for longer, enabled the household-organized fisheries which emerged in the medieval period to be commercially viable.¹⁰¹ As well as providing opportunities to trade, fishing triggered secondary activities related to the need to process and preserve the fish, traditionally either by drying or salting.

While there were clear benefits to being located within easy access of the sea, this did mean that the islanders were forced to be flexible regarding their land-based activities, as suitable areas for farming were few. For example, seasonal burning of coastal heathlands made them more suitable for grazing. The outer islands, although closer to the fishing banks, had only thin topsoil, so people enhanced its fertility for growing crops by adding seaweed, old hay, fish entrails and manure. Again, agricultural activities were very much tied to seasons, with times for planting and harvesting being particularly intense. Grazing animals, such as cows, were often taken to different islands for summer pasture and moved back again to the home farm for the harsh winter months. The gathering of land-based resources also varied throughout the year, so that plant-based foods were gathered when they were ripe, birds' eggs were taken during the nesting season, and hunting took place when different species were present in the area.

A critical moment of the year was when the eider ducks came onto the islands during nesting season, which was so important that households' activities were altered to ensure that the birds were not disturbed.¹⁰² Legislation to protect the nesting areas was first adopted in the eleventh century and by the twentieth century at least 15 'egg and down' sites were declared as preservation areas for the eiders (Figure 2.17).¹⁰³ In order to protect the eiders from predators and encourage the ducks to nest nearby, the islanders often

⁹⁸ Enge, J. (2000) *Konflikten om kystverneplanen i Vega: brysom lokalbefolkning, eller myndighetens problem?* Master's Thesis. University of Oslo: 90-123. Wika, H. O. (1961) *Vega bygdebok: bind 1*: 267-299, which discusses livelihoods and incomes at Vega and 299-312 for trade and economy.

⁹⁹Floa, O. (1999) Vega – Landbruksøya. In: Næss, I.E. (ed.) *Vega gjennom 10 000 år*. Vega kommune: 27–32.

¹⁰⁰Wika, H. O. (1961) *Vega bygdebok: bind 1*: 281-288.

¹⁰¹ Kolle, N., Nielssen, A.R., Døssland, A. & Christensen, P. (2017) *Fish, Coast and Communities: a history of Norway*. Fagbokforlaget: 54.

¹⁰² Næss, I.E. & Johansen, R. (2010) *The Vega Archipelago: a World Heritage site*. Orkana.

¹⁰³ Suul, J. & Sønstebo, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

built small houses for them. The income from the sale of eider eggs and down was often a significant contribution to the household income or they were used to pay the rent or taxes in different periods. The eider tending tradition is one that was found all along the coast, but the Vega Archipelago was historically a core area in down production.¹⁰⁴

All these subsistence and livelihood activities contributed to greater bio-cultural diversity through resource management and explain the development of many of the key habitats discussed earlier (section 2.3.3).

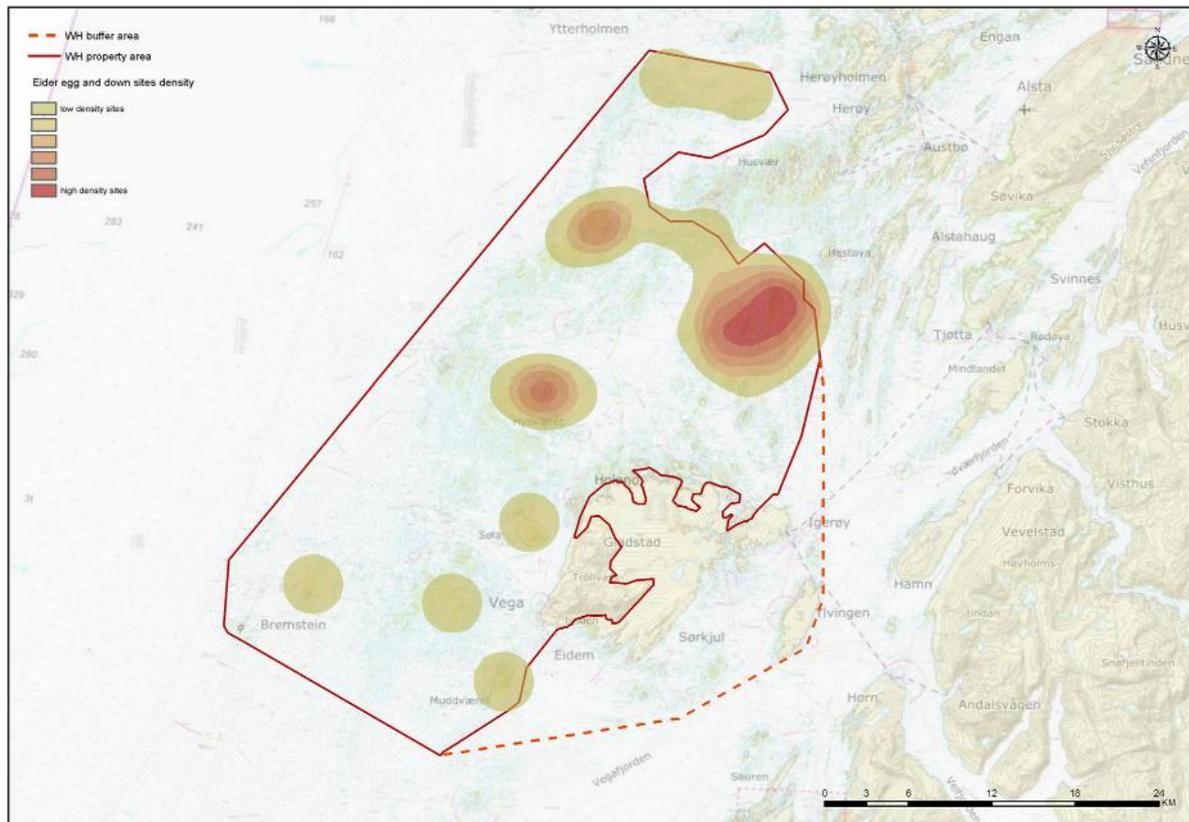


FIGURE 2.17. The density of eider egg and down sites within the Vega Archipelago (dark red to light brown areas).
 Source: *Instead Heritage*¹⁰⁵

While to contemporary eyes the archipelago seems remote, its people have never been isolated from the wider world but were continuously connected by the sea, with boats travelling regularly along the coast and even to other countries. These connections to the wider world can be seen throughout history, for example, an amber bead from the Baltic Sea came to Vega island around 2,000 BC and a necklace, perhaps from Venice or elsewhere in southern Europe, was buried with a woman in Eidem (Vega island) in approximately AD 800.¹⁰⁶ By the nineteenth century the king had formalized these trade connections by establishing trading stations throughout northern Norway. Merchants were given permission to establish a trading post for goods

¹⁰⁴ Suul, J. & Sønstebo, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: 38.

¹⁰⁵ Based on: Suul, J. & Sønstebo, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: Annex 1.E.

¹⁰⁶ Næss, I.E. & Johansen, R. (2010) *The Vega Archipelago: a World Heritage site*. Orkana.

and fish, and these often included a post office and might even offer money lending services.¹⁰⁷ Examples of these include Rørøy on Vega and Tåvær, one of the islands to the north of the archipelago, and they would have been hubs of community activity.

The limited data that exists on the historic population in the Vega Archipelago suggests that the total fluctuated over time, with varying numbers of individuals and households on the different islands seeming to reflect the size of the coastal fisheries. Populations on the islands seemed to grow in particular in the nineteenth century when the archipelago's population was at its largest.¹⁰⁸ For example, 647 Vega men in 143 boats are recorded as participating in the Lofoten fishing season in 1897 and the number of local fishers might have been even more, each with their own household.¹⁰⁹ Among other factors, this reflects positive trends in fish stocks, increasing local ownership of both fishing and trade, and improvements in boats and fishing technology.¹¹⁰ The Vega Archipelago's population reached its peak in 1900 with about 2,800 residents on Vega island alone and at the same time there were, for example, about 70 people on the much smaller Kilvær (Figure 2.18). The main island groups at that time had established shops, schools, chapels and were served by regular transport connections.¹¹¹



FIGURE 2.18. There were about 70 people living on Kilvær at its peak in 1900. Source: Inge Ove Tysnes¹¹²

¹⁰⁷ Bergskaug, E. (2019) *Handelssteder var Nord-Norges forbindelse med verden* [online]. Available at: <https://www.abcnyheter.no/reise/inspirasjon/2019/06/22/195587223/handelssteder-var-nord-norges-forbindelse-med-verden>

¹⁰⁸ Enge, J. (2000) *Konflikten om kystverneplanen i Vega: brysom lokalbefolkning, eller myndighetens problem?* Master's Thesis. University of Oslo: 35.

¹⁰⁹ Wika, H.O. (1975) *Utvandrerne: emigranter fra Vega 1869-1929*. Self-published: 287.

¹¹⁰ Karl Otto Ellefsen and Tarald Lundevall (2021) *North Atlantic coast: a monography of place*. Oslo: Pax Forlag.

¹¹¹ Næss, I.E. & Johansen, R. (2010) *The Vega Archipelago: a World Heritage site*. Orkana: 38.

¹¹² Vega Verdensarvsenter (no date) *Kilvær* [online]. Available from: <https://www.verdensarvvega.no/en/kilvaer>

2.4.3 Twentieth-century continuity and changes

It would be inaccurate to suggest that the livelihoods of those living in the Vega Archipelago over time remained consistent and stable all the time. They were in fact subject to considerable fluctuation, requiring communities to respond to their environmental and social context through innovation and diversity. However, this model of household economies dependent on a broad range of resources developed slowly until the twentieth century.

Over the last century the Vega Archipelago has been transformed by socio-economic changes remodelling livelihoods and with that bringing changes to its environment. Of key significance is the transformation of the fishing industry through technological advances allowing fishing boats to go out into deeper waters further afield and to catch greater quantities of fish. The national government saw this as an opportunity to transform local economies from individuals undertaking multiple jobs to livelihoods focusing on a single activity, such as fishing. State subsidies supported the development of harbours and their facilities, cold storage, and the creation of local fishing cooperatives, which benefitted some areas while disadvantaging others.¹¹³ In parallel agriculture saw a similar shift to full-time farmers.¹¹⁴ Farming has continued on the main Vega island, particularly to the south, although over time more industrial approaches have led to consolidated larger farms, worked by a smaller number of people.¹¹⁵ This largely caused the gradual disappearance of the 'fisher-farmer' at Vega and elsewhere.

In addition, people looking for better living standards and alternative employment moved to the main island of Vega or even to the mainland, emptying the more inhospitable outer islands.¹¹⁶ This trend of depopulation was sped up by government policy for centralization which resulted in the closing of schools and other services on the islands, including reduced transport links. This accelerated the departure of remaining families who were even given incentives to take jobs on the mainland.¹¹⁷

The course of the twentieth century also saw regime changes in the marine ecosystem. For example, from the 1970s coastal fishing stocks declined dramatically, in large part due to overfishing. It is thought that the huge increase in the sea urchin population (section 2.3.1) may have been in part caused by the lack of fish that were their natural predator. This led to destructive over-grazing of the kelp forest, with huge areas left barren, which increased pressure on remaining fish stocks, which were dependent on the kelp as spawning grounds. Seals often came into conflict with local fishers over the remaining fish.

As livelihoods at Vega have been so intertwined with natural resources, the marine environmental degradation led to social impacts. For example, the reduction in total coastal fisheries, as they were consolidated into larger businesses, made it difficult for the local fisher-farmers to continue. This exacerbated the ongoing trends favouring specialised open-sea fishing or people seeking alternative occupation elsewhere. In addition, the fish processing plant at Muddvær closed.¹¹⁸ These social trends then seem to have

¹¹³ Ellefsen, K.O. & Lundevall, T. (2021) *North Atlantic coast: a monography of place*. Pax Forlag.

¹¹⁴ Daugstad, K. & Fageraas, K. (2018) World Heritage and Cultural Sustainability: the farmers and fishermen of Vega, northern Norway. In: Birkeland, I., Burton, R., Parra, C. & Siivonen, K. (eds) *Cultural Sustainability and the Nature-Culture Interface: livelihoods, policies, and methodologies*. Routledge.

¹¹⁵ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 32.

¹¹⁶ Floa, O. (1999) Vega – Landbruksøya. In: Næss, I.E. (ed.) *Vega gjennom 10 000 år*. Vega kommune: 27–32.

¹¹⁷ Næss, I.E. & Johansen, R. (2010) *The Vega Archipelago: a World Heritage site*. Orkana.

¹¹⁸ Vega Verdensarvsenter (no date) *Muddvær* [online]. Available from: <https://www.verdensarvsvega.no/en/muddvaer>

affected the natural environment even further. In particular, the depopulation of the outer islands led to a parallel decline in the numbers of eider nesting there, with the duck population falling to a tenth of its previous size. Similarly, several of the semi-natural habitats on the islands, which had evolved through human management and livestock grazing, began to transform with overgrowth.¹¹⁹

2.4.4 Twenty-first century Vega

When the Vega Archipelago was nominated for World Heritage status in 2004 (section 2.5.1), it was not at its healthiest, either in terms of its natural or cultural heritage, nor was society as thriving as it had once been. It has been noted regarding the coastal society of northern Norway, 'It is a great paradox that one of the country's historically most hardy societies should have such great problems in surviving.'¹²⁰ Since Vega's inscription efforts have been made to turn the tide. This means that the Vega Archipelago today is a society which still has connections to the sustainable ways of life which have characterized it over time, but they remain in a weakened state, requiring careful management to continue their recovery.

The population of Vega in 2020 was 1,200 people, less than half its peak in 1900, and it is currently predicted to continue declining in coming years. This relates to a wider regional trend toward population decline, contrasting with overall national population growth (Figure 2.19).¹²¹ Nearly everyone who is a permanent resident within the Vega Archipelago today, is resident on the main Vega island. Only two people permanently reside on other islands, one person on Omnøy and one on Skogsholmen, while up to 200 people seasonally return to the islands during the summer (Figure 2.20).¹²²

¹¹⁹ Daugstad, K. & Fageraas, K. (2018) World Heritage and Cultural Sustainability: the farmers and fishermen of Vega, northern Norway. In: Birkeland, I., Burton, R., Parra, C. & Siivonen, K. (eds) *Cultural Sustainability and the Nature-Culture Interface: livelihoods, policies, and methodologies*. Routledge.

¹²⁰ Larsen, J.K. (2018) Kystfolk i opprør, *Morgenbladet*, 1 March 2018. Available at: <https://www.morgenbladet.no/ideer/kronikk/2018/03/01/kystfolk-i-oppror/>

¹²¹ Leknes, S. & Løkken, S.A. (2020) *Befolkningsframskrivinger for kommunene, 2020-2050*. Statistisk sentralbyrå. Available at: <https://www.ssb.no/befolkning/artikler-og-publikasjoner/befolkningsframskrivinger-for-kommunene-2020-2050>

¹²² Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: 13.

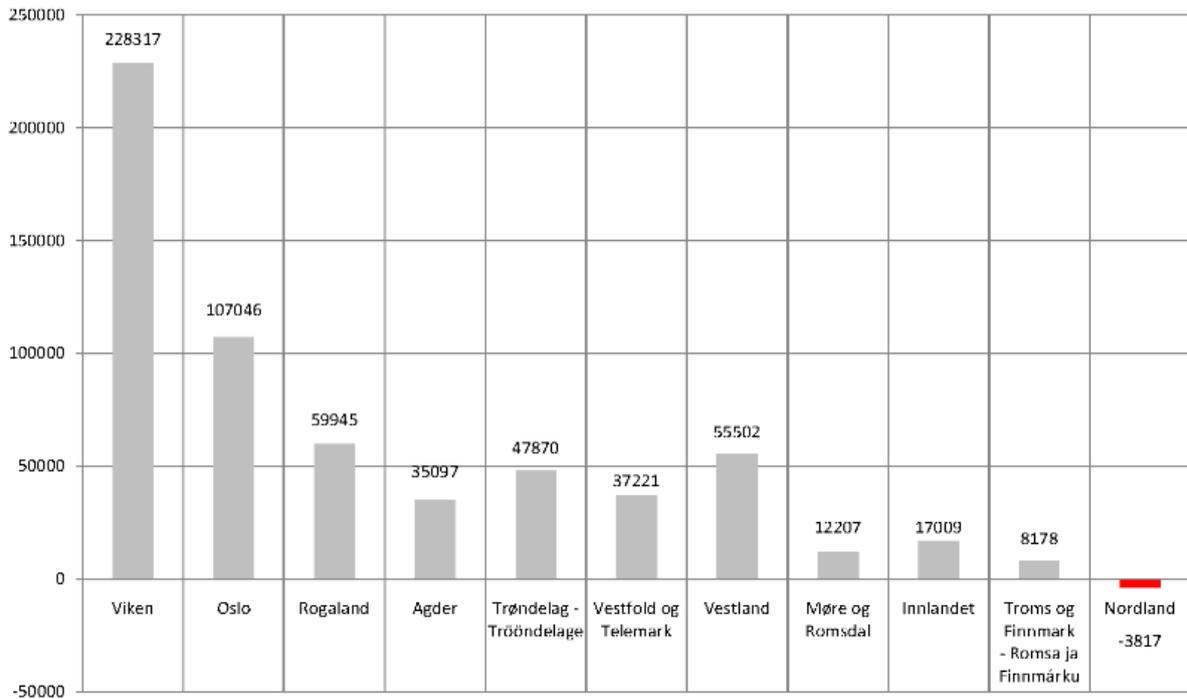


FIGURE 2.19. Population predictions for 2050 show an overall growth in the population of Norway, with the exception of Nordland County, which is expected to decline. *Source: Instead Heritage*¹²³

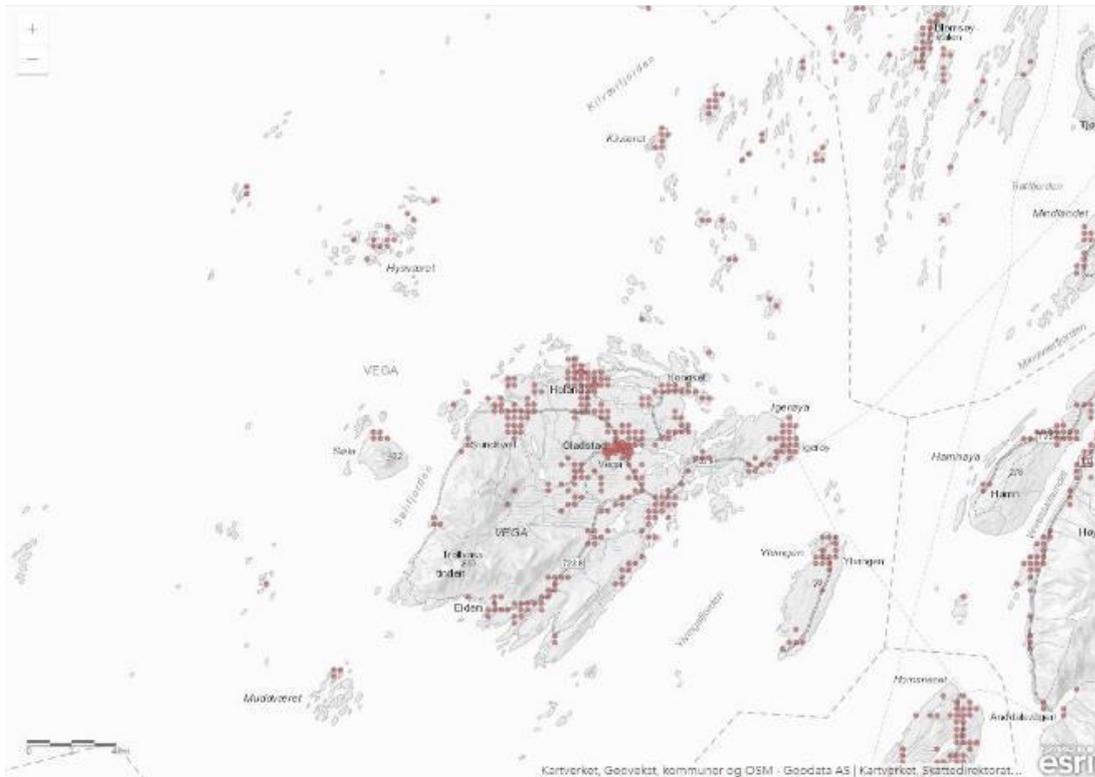


FIGURE 2.20. Population density in the Vega Archipelago at the season of greater presence of inhabitants. *Source: Kartverket*¹²⁴

¹²³ Statistisk sentralbyrå (2022) *Befolkning* [online]. Available from: <https://www.ssb.no/statbank/list/folkemengde/>

¹²⁴ Kartverket (no date) *Demografidata* [online]

<https://geodataonline.maps.arcgis.com/apps/Embed/index.html?webmap=b011473810c045b88d281575a824b9ab>

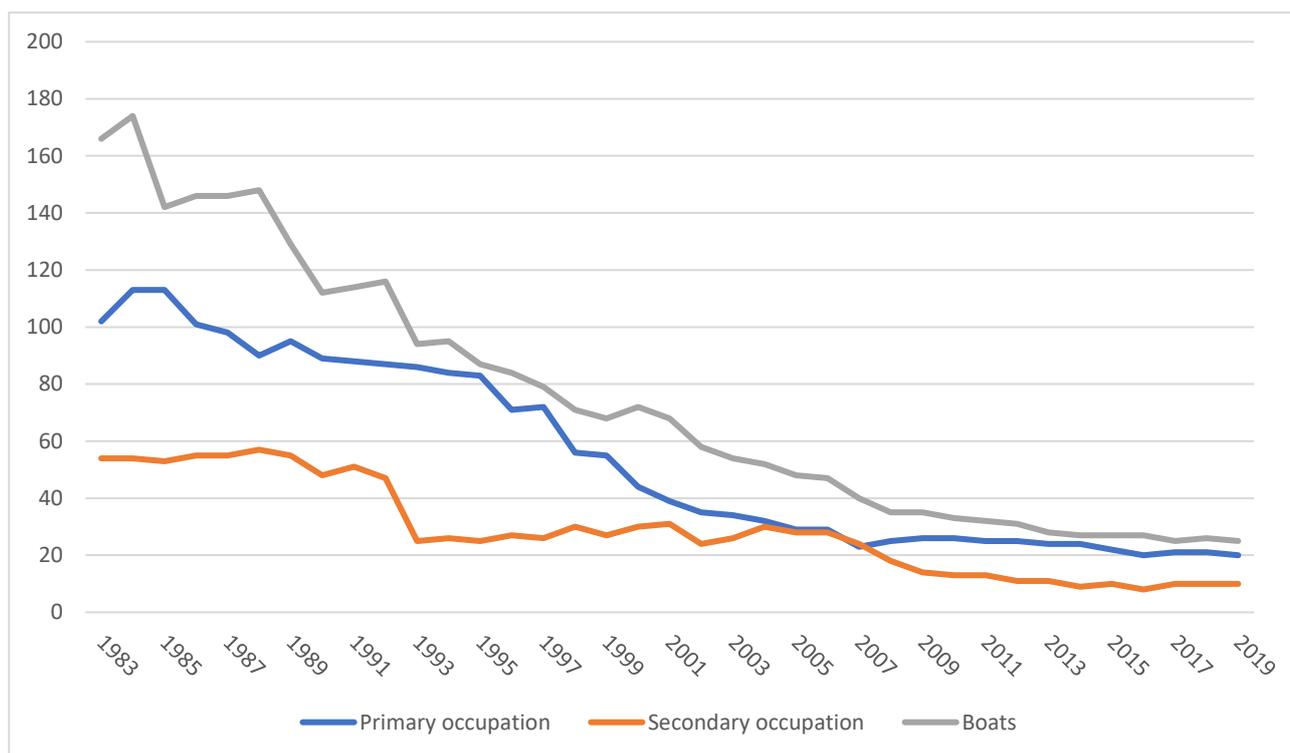


FIGURE 2.21. This graph shows the decline in fishing in Vega in the period 1983-2019. The blue line shows the number of people who fish as their primary occupation; the orange line is the number of people who fish as their secondary occupation; the grey line is the number of registered fishing boats in Vega Municipality. *Source: Directorate of Fisheries*¹²⁵

The employment rate is high in the Vega Municipality, as throughout most of the country, with unemployment at only 2.5%.¹²⁶ While most people living in Vega, also work there, about a quarter of employees commute out of the municipality to work elsewhere. More than a third of people working in Vega, work in the public sector. The multiple activities of the Vega Archipelago World Heritage Centre means its 7-8 permanent employees can extend up to 31 people contributing to various projects in busy seasons.¹²⁷

The decline in fishing means that it is no longer Vega's primary occupation and the reduction in the number of fishers has been greater in Vega than the average, across the county as a whole (Figure 2.21).¹²⁸ In 2019 there were 25 boats and 20 full-time fishers registered in the municipality, while another 10 people combined fishing with other work;¹²⁹ this is compared to 37 full-time and 36 part-time fishers in the Vega Archipelago at the time of its nomination as World Heritage in 2004, representing approximately a 50% reduction.¹³⁰ There has been a parallel decline in the catch obtained by the Vega fleet, with a 60% decrease in the amount of fish caught in the period since 2004 to 2021 (Figure 2.22).

¹²⁵ Extracted from: <https://www.fiskeridir.no/English/Fisheries/Statistics/Fishermen-fishing-vessels-and-licenses>

¹²⁶ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 20.

¹²⁷ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 26.

¹²⁸ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 35.

¹²⁹ Extracted from: <https://www.fiskeridir.no/English/Fisheries/Statistics/Fishermen-fishing-vessels-and-licenses>

¹³⁰ Suul, J. & Sønstebo, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: 28.

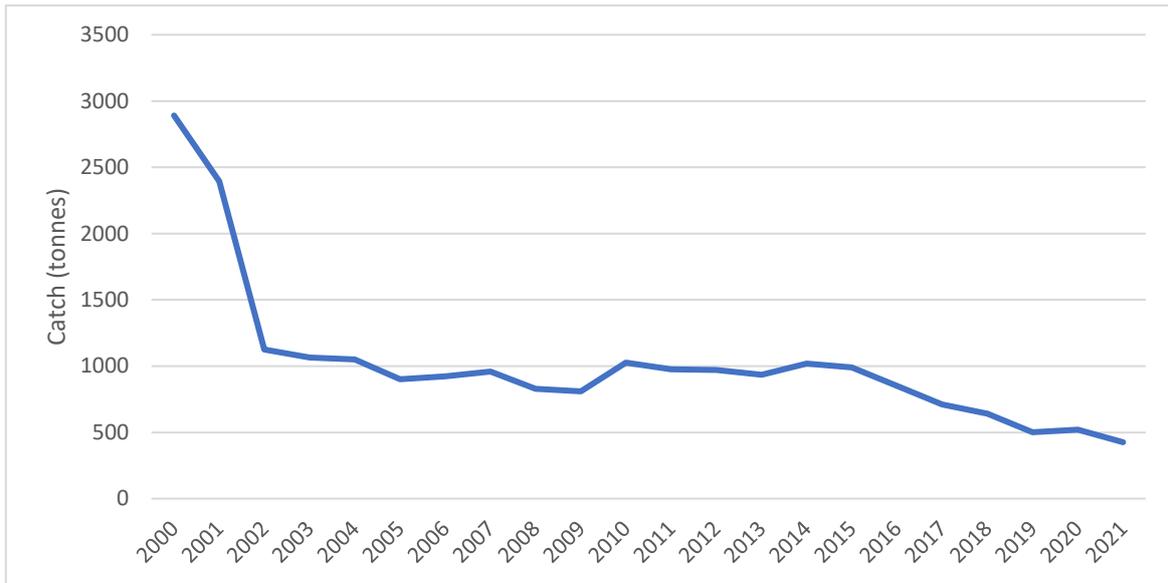


FIGURE 2.22. The quantity of fish caught (in tonnes) by boats registered in Vega over the course of the 21st century. Source: Directorate of Fisheries¹³¹

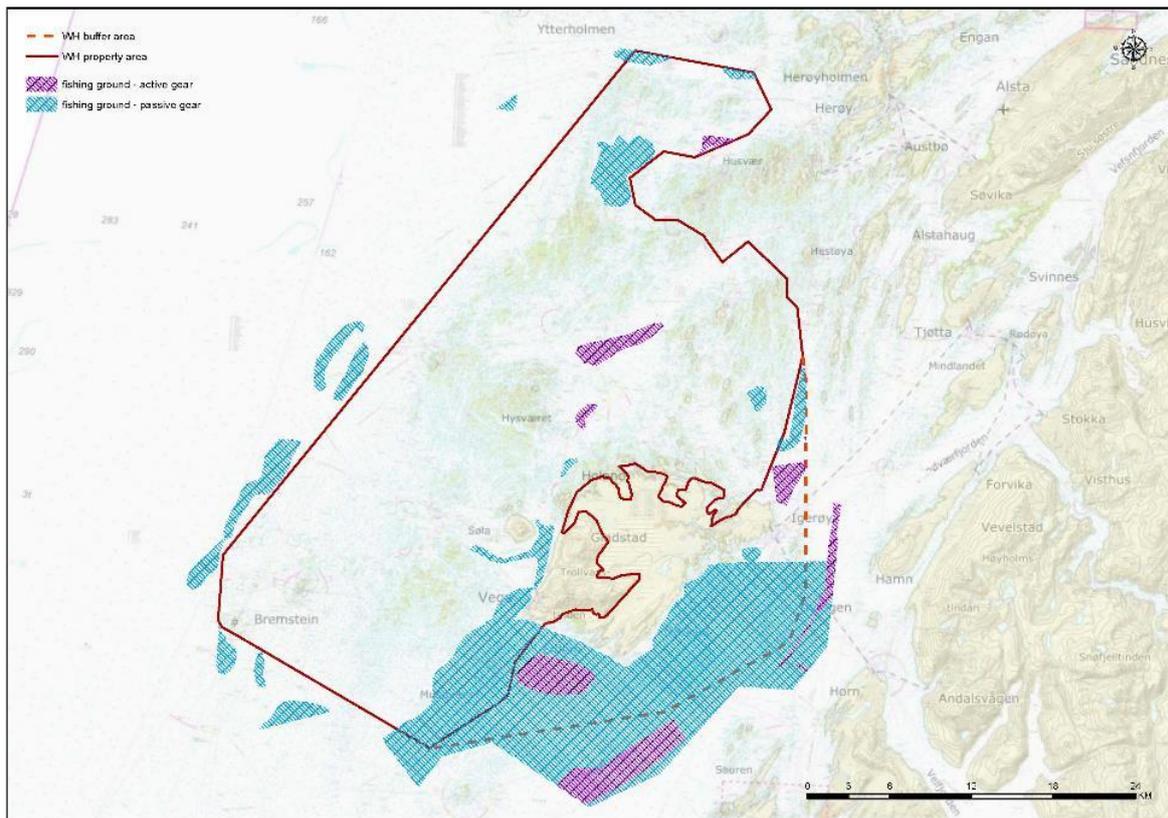


FIGURE 2.23. Fishing grounds within Vega Municipality today. Source: *Instead Heritage*¹³²

¹³¹ Extracted from: <https://www.fiskeridir.no/Yrkesfiske/Tall-og-analyse/Fangst-og-kvoter/Fangst/Fangst-fordelt-paa-fartoeoyfylke>

¹³² Based on data from the Fiskeridirektoratet.

There are eight key fishing grounds within the World Heritage property and three more within the buffer zone (Figure 2.23).¹³³ These are fished by both local boats, as well as boats from other areas. Cod, haddock, saithe and redfish are caught with nets throughout the year. Handlines are used to fish for the deeper cod, saithe and redfish while line fishing takes haddock, cod and ling. There are also shrimp and crab fisheries among the islands.¹³⁴

In the private sector, the two largest businesses are aquaculture companies, while the fourth largest is a company which processes fish for consumption.¹³⁵ These are important to the local economy and there are 21 people directly employed in aquaculture. Another three people are estimated to be indirectly gaining employment from the supply chain, and 15 people work for the fish processing company.¹³⁶ In other places, aquaculture can have ripple effects within the economy when buying supplies and services for their facilities, however, these types of suppliers are not found at Vega. For example, all the fish farmed in Vega are sent for slaughter in Lurøy municipality, along the coast to the north.¹³⁷

Agriculture remains an important industry in Vega, with 76 people working on 52 farms in 2019, estimated to be 22% of local employment.¹³⁸ However, the number of farmworkers has declined significantly in recent years, with a third fewer jobs in agriculture over the last decade. Nearly all the current farms are based on livestock (cows, sheep and pigs), with some fodder, potatoes and vegetables grown.¹³⁹ Agriculture is used to support the cultural landscape, with roughly 850 sheep and 10 cows grazing in key areas across the archipelago in order to maintain the semi-natural habitats.¹⁴⁰

At the beginning of the 21st century, the number of people in the Vega Archipelago tending the eider ducks when nesting was down to six or seven. However, this is one trend which has begun to improve and there are now twenty eider tenderers looking after the nests at eight sites and manually cleaning the down. As recently as 2017, there were over 1,200 ducks nesting in the roughly 3,200 houses maintained for them¹⁴¹ but figures fluctuate dramatically in relation to the disturbance to the nesting ducks.¹⁴² There is a particular revival around the eider tending on Lånan, where the islanders encourage guided visits and have formed a company for selling products, such as duvets.¹⁴³

¹³³ Fishing grounds in the property: Omnøyfjorden, Lisøyråsa, Kilværfjorden, Hysværfjorden, Tåvær, northern Igerøy, Sølundet and Muddværkåsa, as well as a continuous area stretching from the Lånan-Bækken area to Bremstein, which is partially within the property. Fishing grounds in the buffer zone: Bøbukta, Kjulskåsa and Vikadyftet.

¹³⁴ Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: 28.

¹³⁵ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 26.

¹³⁶ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 28.

¹³⁷ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 29.

¹³⁸ Vega kommune (no date) Jordbruk [online]. Available from: <https://www.vega.kommune.no/tjenester/natur-miljo-og-naring/landbruk-2/jordbruk/>

¹³⁹ Johansen, R. Personal communication, 27 June 2022. Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 32.

¹⁴⁰ Johansen, R. Personal communication, 27 June 2022.

¹⁴¹ Vega Verdensarvsenter (no date) *Ærfugltradisjonen* [online]. Available from: <https://www.verdensarvvega.no/no/aerfugltradisjonen>

¹⁴² For example, with otter attacks in Muddvær (2018) and Lånan (2021) the ducks nesting in 2021 dropped to 11; Johansen, R., personal communication, 27 June 2022.

¹⁴³ Utværet Lånan (2017) *Ærfuglene på Lånan*. Utværet Lånan.

2.5 THE WORLD HERITAGE PROPERTY

2.5.1 The inscription of the ‘Vegaøyen – The Vega Archipelago’

The Vega Archipelago’s journey to World Heritage began in the 1990s when it was included within a project organized by the Nordic Council of Ministers to identify heritage places that were felt to have the potential to be nominated as World Heritage.¹⁴⁴ Subsequent detailed analysis of the Vega Archipelago explored its wide range of natural and cultural values (as outlined in sections 2.1-2.4), before focusing in on its cultural landscape aspects when it was included on the World Heritage List.¹⁴⁵ The following text was retrospectively adopted in 2014 to encapsulate the reasons why ‘Vegaøyen – The Vega Archipelago’ was considered to be of Outstanding Universal Value.

BOX 2.1. Vegaøyen – The Vega Archipelago: Statement of Outstanding Universal Value

Brief synthesis

The Vega Archipelago is a shallow-water area just south of the Arctic Circle, on the west coast of Norway – an open seascape and coastal landscape made up of a myriad of islands, islets and skerries. A cluster of low islands centred on the more mountainous islands of Vega and Sjøla bear testimony of how people developed a distinctive, frugal way of life centred around fishing, farming and the harvesting of eider down (the down of the eider duck) in an extremely exposed seascape. The property covers a cultural landscape of 107,294 ha, of which 6,881 ha is land.

Fishermen and hunters have lived on the islands of Vega and Sjøla, where peaks tower to nearly 800 m, for more than 10,000 years. As numerous new islands gradually rose from the sea, the characteristic landscape became shaped by the interaction between fishermen-farmers and the bountiful nature in this exposed area. The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature.

They lived as fishermen-farmers, making the tending of eider ducks the centre of their way of life. The local peoples also built shelters and nests for the wild eiders that came to the islands each spring. The birds were protected from any unnecessary disturbance throughout the breeding season. In return, the people could gather the valuable eider down when the birds left their nests with their chicks. As early as the 9th century, tending eiders was reported to be a way for people in Norway to make a living, and the Vega Archipelago was the core area for this tradition. Women played a key role in this lifestyle, and the World Heritage property of the Vega Archipelago also celebrates their contribution to the tending of eider ducks. The tradition remains alive today, albeit to a smaller extent.

The islands and islets are either in groups or isolated, spread across the 50 km broad strandflat that stretches from the mainland to the edge of the continental shelf. The outermost islands are barren and have just a thin, patchy soil cover, whereas those closer to the mainland feature more nutrient-rich bedrock, are greener and show a farming-related biodiversity, linked to centuries of grazing and haymaking.

The rich maritime resources of the Vega Archipelago not only benefited local peoples, but also as many as 228 species of birds that can be observed in the archipelago, considered as the most important wintering area for seabirds in the Nordic region.

Criterion (v): The Vega Archipelago reflects the way generations of fishermen-farmers have, over the past 1500 years, maintained a sustainable living in an inhospitable seascape near the Arctic Circle, based on the now unique practice of eider down harvesting, and it also celebrates women’s contribution to the eider down process.

¹⁴⁴ Suul, J. (ed.) (1996) *Nordic World Heritage: proposals for new areas for the UNESCO World Heritage List*. Nordic Council of Ministers.

¹⁴⁵ UNESCO World Heritage Centre (2022) *Decision 28 COM 14B.45: nominations of cultural properties to the World Heritage List (Vegaøyen - The Vega Archipelago)* [online]. Available from: <https://whc.unesco.org/en/decisions/128>

Integrity

The boundaries of the World Heritage property encompass 6,500 islands, islets and skerries, as well as the waters north and west of Vega and parts of that main island and its coastal strip. The rest of the island of Vega forms part of the buffer zone of the World Heritage property.

The World Heritage property showcases the diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape. Most of the old buildings are intact, from dwellings to boathouses, warehouses and sheds, beacons and lights; most of them have been renovated, making the area as a whole representative of settlements on the strandflat. Within the boundaries of the property, the interaction between characteristic natural and cultural elements of the cultural landscape allow for the long-term conservation of the area's Outstanding Universal Value.

In areas where grazing and haymaking are no longer practiced and where no appropriate management strategies are in place, some of the cultural landscape is becoming overgrown or eroded. The bird life in the area is vulnerable to human disturbance in the breeding season, and the landscape may show signs of wear and tear if too many people visit the area. The large radio mast on Vega Island also has an impact on the main perspectives to and from the property.

Authenticity

The cultural landscape of the Vega Archipelago continues to be managed in a traditional manner, using time-honoured management techniques. The down tradition and the cultural landscape are taken care of by landowners and the local community in cooperation with the Vega Archipelago World Heritage Foundation and the management authorities. Bird tenders maintain the more than 1,000-year-old tradition of making houses and nests for the eiders on several of the down islets, protecting the birds through the breeding season, gathering the down and making the traditional eider downs.

Protection and management requirements

The management of the Vega Archipelago benefits from a variety of safeguarding measures. 22% of the land surface in the World Heritage property is designated for special nature protection under the Nature Diversity Act of 2009. Five nature reserves, four bird sanctuaries and one protected landscape area have been designated by Royal decrees.

All pre-Reformation (pre-1537) archaeological and historical monuments and sites are protected by the Cultural Heritage Act of 1978. In addition, special protection orders for later cultural heritage have been issued for 29 buildings at Skjærvær and for Bremstein Lighthouse.

The Municipal Plan for Vega contains a strategic part and part relating to land use, in order to monitor any development in other parts of the property and its buffer zone and to safeguard the Outstanding Universal Value of the property.

A Management plan for the property has been drawn up based on the careful documentation of ancient practices and the mapping of the existing biological diversity. Landowners, authorized users, Vega Borough Council, the County Council and national Government authorities work closely together in order to preserve the cultural landscape of the Vega Archipelago. The Vega Archipelago World Heritage Foundation was set up to promote the World Heritage and coordinate the local World Heritage effort. Representatives of management authorities, the Norwegian Nature Inspectorate, the regional museum and the local World Heritage coordinator work jointly to ensure a good follow-up of the Management Plan for the World Heritage property. The Government allocates funds annually to carry out management, dissemination, restoration and local value creation efforts in the Vega Archipelago World Heritage property.

An inventory of the duck nesting houses on the islands has been completed as part of the conservation of these unique structures.

Increasing numbers of grazing livestock and growing haymaking activities in several areas help to restore the overgrown landscape and safeguard the mosaic aspects of the landscape.

The attributes of the property that convey its values are documented and passed on to the local community and visitors by teaching children and young people through "hands-on" projects, research, guided excursions and information via

the Internet, brochures and the like. A local “Society of Friends of the World Heritage Area” is helping to pass on traditional knowledge gained by experience.

Solutions are sought to minimise the visual impact of the radio mast, and challenges related to the number of visitors are followed up through the Norwegian Nature Inspectorate with targeted management of protected areas and by providing information on the values of the area. A vulnerability analysis of traffic in the area has been performed, and there is a separate strategy for tourism and a pilot project for sustainable tourism.

The boundaries of the ‘Vegaøyen – The Vega Archipelago’ World Heritage property and its buffer zone are important to understand since, unusually, the buffer zone does not encircle the property. It extends out only from the south-east side of the property.

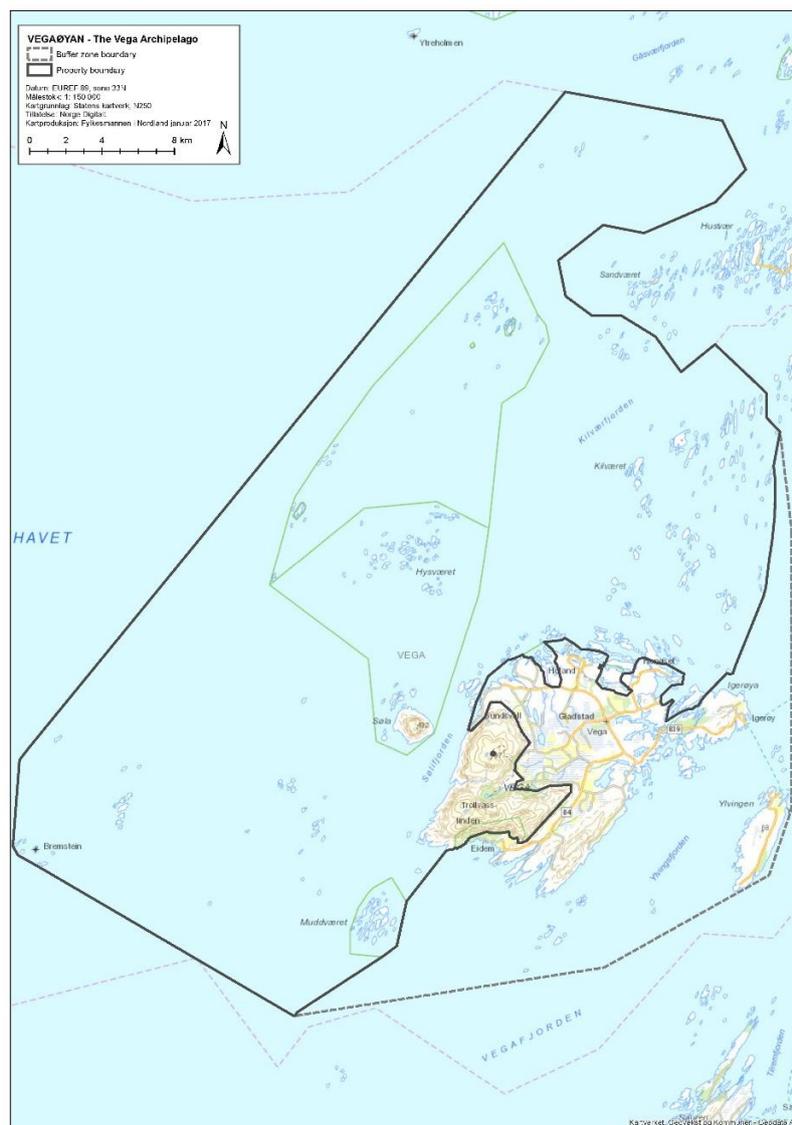


FIGURE 2.24. The World Heritage property of ‘Vegaøyen – The Vega Archipelago’, as defined after the 2017 minor boundary modification; the property is outlined in black and its buffer zone is the dark grey dotted line. Municipal borders are shown with the light grey dotted line. The green lines outline the protected areas within the World Heritage property. *Source: UNESCO World Heritage Centre*¹⁴⁶

¹⁴⁶ UNESCO World Heritage Centre (2022) *Vegaøyen - The Vega Archipelago: maps* [online]. Available from: https://whc.unesco.org/en/list/1143/multiple=1&unique_number=2254

The delineation of boundaries is particularly critical for a World Heritage property for which the Outstanding Universal Value was already recognised as fragile at the moment of inscription. The challenges include the property area needing to contain all attributes of Outstanding Universal Value and to be of a size that meets the requirements for integrity (a World Heritage concept which is particularly critical in a cultural landscape dependent on the health of its own and adjacent ecosystems; section 2.5.2). In the case of marine areas, boundaries are even more difficult choices than on land.

The boundaries are, in part, aligned with the boundaries of Vega Municipality. As the 2017 ICOMOS / IUCN Advisory Mission noted, this may inadvertently be a factor contributing to the pressures arising at the property since the World Heritage Committee recommended that: ‘the State Party consider extending the World Heritage area - or its buffer zone - to include islands and marine areas to the north and northeast’.¹⁴⁷ If combined with inter-municipal planning for aquaculture between Vega and the neighbouring municipalities, a larger buffer zone extending beyond Vega Municipality, may have reduced pressure to develop aquaculture sites within the World Heritage property, and increased number of employment opportunities available to the local population.¹⁴⁸

2.5.2 Outstanding Universal Value: criteria, integrity and authenticity

‘Vegaøyan – The Vega Archipelago’ was included on the World Heritage List in 2004 under criterion ‘v’ as: ‘an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.’ The specific reason for gaining World Heritage status was that it ‘reflects the way generations of fishermen/farmers have, over the past 1500 years, maintained a sustainable living in an inhospitable seascape near the Arctic Circle, based on the now unique practice of eider down harvesting, and it also celebrates the contribution made by women to the eider down process’.¹⁴⁹ This makes ‘Vegaøyan – The Vega Archipelago’ the second type of cultural landscape recognized on the World Heritage List, namely it is a ‘continuing landscape’ which ‘retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time, it exhibits significant material evidence of its evolution over time.’¹⁵⁰

The Statement of Outstanding Universal Value (Box 2.1) also summarises the property’s integrity and authenticity. Integrity is the ‘measures of wholeness and intactness’ of a heritage place, which should include all the elements necessary to express its Outstanding Universal Value and that all necessary features and processes are represented.¹⁵¹ In the case of ‘Vegaøyan – The Vega Archipelago,’ the property area was considered to contain all the elements of the fisher-farmer lifestyle, from settlements to the natural resources that have been harvested over time.

¹⁴⁷ UNESCO World Heritage Centre (2022) *Decision 28 COM 14B.45: nominations of cultural properties to the World Heritage List (Vegaøyan - The Vega Archipelago)* [online]. Available from: <https://whc.unesco.org/en/decisions/128>

¹⁴⁸ ICOMOS & IUCN (2017) *Report on the ICOMOS / IUCN Advisory Mission to Vegaøyan -- The Vega Archipelago (C 1143)* [online]. Available from: <https://whc.unesco.org/en/list/1143/documents/>

¹⁴⁹ UNESCO World Heritage Centre (2022) *Vegaøyan – The Vega Archipelago. Description* [online]. Available from: <https://whc.unesco.org/en/list/1143/>

¹⁵⁰ UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]: paragraph 47bis. Available from: <https://whc.unesco.org/en/guidelines/>

¹⁵¹ UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]: paragraphs 87-95. Available from: <https://whc.unesco.org/en/guidelines/>

Authenticity is a concept which can be expressed through traditions, techniques and management systems.¹⁵² In the case of ‘Vegaøyen – The Vega Archipelago’ being a cultural landscape, authenticity in the Statement of Outstanding Universal Value was interpreted in terms of the continuity of traditional use and management of the natural environment by the local community through a diverse range of activities.

The Statement of Outstanding Universal Value also explores issues regarding protection and management, one of the three pillars that sustain Outstanding Universal Value; these are further explored in section 2.7.2.

2.5.3 Heritage values and attributes

As a key step in the development of this report, the Statement of Outstanding Universal Value (Box 2.1) of the World Heritage property was analysed, together with the information summarized in sections 2.1-2.4 (therefore, also including heritage values of local and national importance), to create a heritage values framework against which to assess impacts (Part 4). This analysis had the aim of being able to:

- understand the reasons that ‘Vegaøyen – The Vega Archipelago’ was considered to exceptional enough to be included on the World Heritage List, i.e., its Outstanding Universal Value
- understand other aspects of the Vega Archipelago that are nationally and locally recognized as making this a distinctly special place, i.e., its heritage and conservation values
- identify the elements of the World Heritage property that convey its Outstanding Universal Value and other heritage/conservation values, i.e., its attributes.

The importance of being able to identify the attributes of ‘Vegaøyen – The Vega Archipelago’ is that they are the elements of a World Heritage property that are the focus of management and conservation activities (sections 2.6-2.7), and which need to be protected and passed on to future generations. This impact assessment will look at the potential impacts on the specific attributes of the World Heritage property (Part 4).

Table 2.2 is a summary of that analytical process and is adapted from Tool 1 in the *Guidance and Toolkit for Impact Assessment in a World Heritage Context*.¹⁵³

TABLE 2.2. The heritage/conservation values and attributes of the Vega Archipelago

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
GEOLOGY AND LANDSCAPE			
‘numerous new islands gradually rose from the sea’	☒	☒	Strandflat topography Sea/landscape, including 17 sub-archipelagos (groups of islands, islets and skerries with intervening areas of sea)
‘an open seascape and coastal landscape made up of a	☒	☒	Strandflat topography

¹⁵² UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]: paragraphs 79-86. Available from: <https://whc.unesco.org/en/guidelines/>

¹⁵³ UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
myriad of islands, islets and skerries'			Sea/landscape, including 17 sub-archipelagos (groups of islands, islets and skerries with intervening areas of sea) Coastal mountains with strandlines Beach areas
'The area as a whole is representative of settlements on the strandflat'	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sea/landscape, including 17 sub-archipelagos (groups of islands, islets and skerries with intervening areas of sea) Settlements and dwellings across the archipelago Buildings (e.g., dwellings, boathouses, warehouses, sheds, farm buildings) Fairways, beacons and lights, Bremstein Lighthouse Eider nesting areas Fishing grounds Farmlands and grazing areas Fishing infrastructure: fishing villages (e.g., Skjærvær and Bremstein), breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses (Bremstein Lighthouse) and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment (e.g., racks or traditional rock drying areas) and traditional processes Trading posts e.g., Rørøy and Tåvær
'diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape'	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Habitats (e.g., coastal heathland, boreal heathland, hay meadows, semi-natural pastures, semi-natural wetlands, semi-natural beach/mesic meadow, calcareous shallow soils, calcareous rich ponds, dams and lakes, calcareous helophyte swamps, kelp forests, maerl beds, eelgrass) Settlements and dwellings across the archipelago Eider nesting areas Fishing grounds Farmlands and grazing areas
Vega's geodiversity includes the largest example of granite from the Laurentian continent (North America) and it is a key area for understanding Caledonian geology	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Laurentian geology Ordovician granite
KEY HABITATS AND BIODIVERSITY			
'bountiful nature'	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Diverse habitats (e.g., coastal heathland, boreal heathland, hay meadows, semi-natural pastures, semi-natural

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
			<p>wetlands, semi-natural beach/mesic meadow, calcareous shallow soils, calcareous and rich ponds, dams and lakes, calcareous helophyte swamps, kelp forests, maerl beds, eelgrass)</p> <p>Biodiversity counts of flora, fauna and fungi</p> <p>High numbers of bird species (228 species)</p> <p>Kelp forest and other seaweed systems (50+ algae species)</p>
‘rich maritime resources of the Vega Archipelago’	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Marine habitats (e.g., kelp forests, maerl beds, eelgrass)</p> <p>Maritime resources and species</p> <p>Plant species, including kelp forest and other seaweed systems (50+ algae species)</p> <p>Animal species, e.g.,</p> <ul style="list-style-type: none"> - mollusks, bivalves, crustaceans (e.g. crab, shrimp), echinoderms, clams, mussels, snails - fish (e.g. Atlantic cod, saithe, pollock, plaice, herring, ling, torsk, haddock, redfish, monkfish, halibut, flatfish, cusk, three-sprined stickleback) <p>birds (eiders, white-tailed eagles, black guillemots, cormorants, shags, barnacle geese, greylag goose, redshank, sparrow, starling)</p> <ul style="list-style-type: none"> - mammals (e.g., grey, common harbour and arctic seals, Eurasian otters, whales)
‘considered as the most important wintering area for seabirds in the Nordic region’ ‘The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds’	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<p>228 bird species, of which 36 are ducks and 29 are waders (shorebirds), including eiders, white-tailed eagles, black guillemots, cormorants, shags, barnacle geese, graylag geese, velvet scoters, gulls, terns, oystercatchers, common snipe, curlews, puffins, crows</p> <p>*Rare birds: Meadow pipit (LC), Eurasian oystercatcher (LC), twite (NT), common starling (NT), willow ptarmigan (NT), parasitic jaeger (NT), common gull (NT), common eider (NT), northern lapwing (EN), eurasian skylark (VU), Eurasian curlew (VU), black guillemot (VU)</p> <p>Four bird sanctuaries</p> <p>Nordværet colony of cormorants</p> <p>Eider and other species nesting sites (including semi-natural pastures)</p> <p>Shallow marine waters of the strandflat with abundant marine food resources (including kelp forests)</p> <p>Variety of habitats (e.g., wetland areas, mudflats, beach meadows)</p> <p>Migration routes</p>
The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Shallow marine waters, clean water, strandflat topography (including islands, islets and skerries and neighbouring coastline), favourable Gulf Stream ocean currents and bedrock</p> <p>Strandflat</p> <p>Clear water and water currents</p>

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
other areas of shallow water in Europe			Rocky seabed with algae, seaweed/kelp vegetation Highly visible areas of shell sand Habitats: wetlands, lakes and ponds, coastal cultural landscapes (semi-natural meadow, fields, cultivated permanent meadow, semi-natural wet meadow), bare rock/hills with past/present nesting grounds, open floodplain, beach and shoreline
HUMAN INTERACTIONS WITH NATURE			
‘The landscape has been shaped by the ongoing interactions between people and nature over 10,000 years’	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Settlements and dwellings on 80 islands across the archipelago Coastal heathlands, hay meadows, semi-natural pastures e.g. at Hysværet, Søla, Store Emårsøy, Omnøy, Skogsholmen, Skjærvær, Muddvær and Lånan Farmers and farm animals (e.g. sheep, cows) Farmlands and field patterns Traditional agricultural activities and land management practices (e.g. mowing, grazing, burning)
‘The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature’	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Settlements and dwellings on 80 islands across the archipelago <u>Fishing:</u> Fish species and other marine resources Fishing grounds (e.g. at Omnøyfjorden, Lisøyråsa, Kilværfjorden, Hysværfjorden, Tåvær, northern Igerøy, Sølundet, Muddværkåsa, Lånan-Bækken area to Bremstein, Bøbukta, Kjulskåsa and Vikadyftet) and traditional knowledge of their locations, species and seasonality Fishers, their equipment (e.g. coastal boats, nets) and fishing practices Fishing infrastructure: fishing villages (e.g. Skjærvær and Bremstein), breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses (Bremstein Lighthouse) and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment (e.g., racks or traditional rock drying areas) and traditional processes <u>Farming:</u> Farmlands including cultivated, mown and grazing areas (e.g., coastal heathlands, hay meadows, semi-natural pastures) (e.g. on Lånan, Skogsholmen, Omnøy, Vega, Sandøya, Hysvær, Tåvær) Farmers and traditional knowledge Farm animals (e.g., sheep, cows)

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
			Farm buildings Seaweed <u>Eider tending:</u> Eider ducks Nesting areas with both natural nest sites and eider houses Eider tenders and traditional knowledge (e.g., locations, seasonality, behaviour, eider house construction, non-mechanical techniques, duvet making)
‘The cultural landscape of the Vega Archipelago continues to be managed in a traditional manner, using time-honoured management techniques’	☒	☒	Settlements and dwellings on 80 islands across the archipelago <u>Fishing:</u> Fish species and other marine resources Fishing grounds (e.g at Omnøyfjorden, Lisøyråsa, Kilværfjorden, Hysværfjorden, Tåvær, northern Igerøy, Sjølasundet, Muddværkåsa, Lånan-Bækken area to Bremstein, Bøbukta, Kjulskåsa and Vikadyftet) and traditional knowledge of their locations, species and seasonality Fishers, their equipment (e.g., coastal boats, nets) and fishing practices Fishing infrastructure: fishing villages (e.g., Skjærvær and Bremstein), breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses (Bremstein Lighthouse) and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment (e.g., racks or traditional rock drying areas) and traditional processes <u>Farming:</u> Farmlands including cultivated, mown and grazing areas (e.g., coastal heathlands, hay meadows, semi-natural pastures) (e.g., on Lånan, Skogsholmen, Omnøy, Vega, Sandøya, Hysvær, Tåvær) Farmers and traditional knowledge Farm animals (e.g., sheep, cows) Farm buildings Seaweed <u>Eider tending:</u> Eider ducks Nesting areas with both natural nest sites and eider houses Eider tenders and traditional knowledge (e.g., locations, seasonality, behaviour, eider house construction, non-mechanical techniques, duvet making)

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
'farming-related biodiversity, linked to centuries of grazing and haymaking'	☒	☒	Farmlands including cultivated, mown and grazing areas (e.g. coastal heathlands, hay meadows, semi-natural pastures) (e.g. on Lånan, Skogsholmen, Omnøy, Vega, Sandøya, Hysvær, Tåvær) Farmers, and farming practices, including transhumance, and traditional knowledge Farm animals (e.g., sheep, cows) Farm buildings Seaweed Plant species e.g., Duckweed, Vegamauren, Adder's tongue Bird species e.g., eider duck, black guillemot, common starling, twite Fungi e.g., Entoloma, Hygrocybe, Ramaria, and Geoglossum
'The local peoples also built shelters and nests for the wild eiders that came to the islands each spring. The birds were protected from any unnecessary disturbance throughout the breeding season'	☒	☒	Eider ducks Nesting areas with both natural nest sites and eider houses Eider tenders and traditional knowledge (e.g., locations, seasonality, behaviour, eider house construction, non-mechanical techniques, duvet making)
ECOSYSTEM SERVICES AND NATURAL RESOURCE USE			
'a distinctive way of life centred around the sustainable use of natural resources, including fishing, farming and eider down harvesting...'	☒	☒	Settlements and dwellings on 80 islands across the archipelago Re-used materials in structures <u>Fishing:</u> Fish species and other marine resources Fishing grounds (e.g. at Omnøyfjorden, Lisøyråsa, Kilværfjorden, Hysværfjorden, Tåvær, northern Igerøy, Sølundet, Muddværkåsa, Lånan-Bækken area to Bremstein, Bøbukta, Kjulskåsa and Vikadyftet) and traditional knowledge of their locations, species and seasonality Spawning grounds and nursery areas (e.g., kelp forests, maerl beds) Fishers, their equipment (e.g., coastal boats, nets) and fishing practices Fishing infrastructure: fishing villages (e.g., Skjærvær and Bremstein), breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses (Bremstein Lighthouse) and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment (e.g., racks or traditional rock drying areas) and traditional processes

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
			<p><u>Farming:</u> Farmlands including cultivated, mown and grazing areas (e.g., coastal heathlands, hay meadows, semi-natural pastures) (e.g., on Lånan, Skogsholmen, Omnøy, Vega, Sandøya, Hysvær, Tåvær) Farmers and traditional knowledge Farm animals (e.g., sheep, cows) Farm buildings Seaweed</p> <p><u>Eider tending:</u> Eider ducks Nesting areas with both natural nest sites and eider houses Eider tenders and traditional knowledge (e.g. locations, seasonality, behaviour, eider house construction, non-mechanical techniques, duvet making)</p> <p><u>Gathering:</u> Egg collecting, berry picking, etc.</p>
'The rich maritime resources of the Vega Archipelago... benefited local peoples'	☒	☒	<p>Fish species and other marine resources Spawning grounds and nursery areas (e.g., kelp forests, maerl beds) Fishing grounds (e.g at Omnøyfjorden, Lisøyråsa, Kilværfjorden, Hysværfjorden, Tåvær, northern Igerøy, Sjølasundet, Muddværkåsa, Lånan-Bækken area to Bremstein, Bøbukta, Kjulskåsa and Vikadyftet) and traditional knowledge of their locations, species and seasonality Fishers, their equipment (e.g., coastal boats, nets) and fishing practices Fishing infrastructure: fishing villages (e.g., Skjærvær and Bremstein), breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses (Bremstein Lighthouse) and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment (e.g., racks or traditional rock drying areas) and traditional processes</p>
'centuries of traditional farming activities, in particular, grazing and haymaking'	☒	☒	<p>Farmlands including cultivated, mown and grazing areas (e.g. coastal heathlands, hay meadows, semi-natural pastures) (e.g. on Lånan, Skogsholmen, Omnøy Vega, Sandøya, Hysvær, Tåvær) Farmers and traditional knowledge Farm animals (e.g., sheep, cows) Farm buildings Seaweed</p>

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
'an important centre for the supply of down and eider down quilts'	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Eider ducks Nesting areas with both natural nest sites and eider houses Eider tenders and traditional knowledge (e.g., locations, seasonality, behaviour, eider house construction, non-mechanical techniques, duvet making)
Participation of Vega's fishers to the cod trade was central contribution to household economics	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Trading posts e.g., Rørøy and Tåvær Harbours and fishing-industry buildings e.g., Vegstein (Jansvika-dock) Fish species and other marine resources Spawning grounds and nursery areas (e.g., kelp forests, maerl beds) Fishing grounds (e.g., at Omnøyfjorden, Lisøyråsa, Kilværfjorden, Hysværfjorden, Tåvær, northern Igerøy, Sølåsundet, Muddværkåsa, Lånan-Bækken area to Bremstein, Bøbukta, Kjulskåsa and Vikadyftet) and traditional knowledge of their locations, species and seasonality Fishers, their equipment (e.g., coastal boats, nets) and fishing practices Fishing infrastructure: fishing villages (e.g., Skjærvær and Bremstein), breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses (Bremstein Lighthouse) and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment (e.g., racks or traditional rock drying areas) and traditional processes
LOCAL COMMUNITY CONTINUITY, RESILIENCE AND ADAPTATION			
'length of human presence in this extremely exposed seascape, with evidence of fishers and hunters for over 10,000 years'	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Archaeological evidence (e.g., at Mohalsen, Åsgarden, Porsmyrdalen) Natural harbours and anchorages
'fishermen/farmers have, over the past 1,500 years, maintained a sustainable living'	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Settlements and dwellings on 80 islands across the archipelago Archaeological evidence (e.g. at Flovær, Vega) Historic buildings Historic eider houses
'ongoing tradition of harvesting eider down that has been practised in Norway since the 9th century' 'Bird tenders maintain the more than 1,000-year-old	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Eider ducks Historic eider houses Nesting areas with both natural nest sites and eider houses Eider tenders and traditional knowledge (e.g. locations, seasonality, behaviour, eider house construction, non-mechanical techniques, duvet making)

HERITAGE VALUES	OUV	NATIONAL/ LOCAL VALUES	ATTRIBUTES
tradition of making houses and nests for the eiders'			
The diversity of ecosystems and consequent diverse natural resource use, have given the archipelago social importance, and a resilient socio-economic model based on multiple income sources	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p><u>Fishing:</u> Fish species and other marine resources Fishing grounds (e.g. at Omnøyfjorden, Lisøyråsa, Kiltværfjorden, Hysværfjorden, Tåvær, northern Igerøy, Sølundet, Muddværkåsa, Lånan-Bækken area to Bremstein, Bøbukta, Kjulskåsa and Vikadyftet) and traditional knowledge of their locations, species and seasonality Spawning grounds and nursery areas (e.g., kelp forests, maerl beds) Fishers, their equipment (e.g., coastal boats, nets) and fishing practices Fishing infrastructure: fishing villages (e.g., Skjærvær and Bremstein), breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses (Bremstein Lighthouse) and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment (e.g., racks or traditional rock drying areas) and traditional processes</p> <p><u>Farming:</u> Farmlands including cultivated, mown and grazing areas (e.g., coastal heathlands, hay meadows, semi-natural pastures) (e.g., on Lånan, Skogsholmen, Omnøy, Vega, Sandøya, Hysvær, Tåvær) Farmers and traditional knowledge Farm animals (e.g., sheep, cows) Farm buildings Seaweed</p> <p><u>Eider tending:</u> Eider ducks Nesting areas with both natural nest sites and eider houses Eider tenders and traditional knowledge (e.g. locations, seasonality, behaviour, eider house construction, non-mechanical techniques, duvet making)</p> <p><u>Gathering:</u> Egg collecting, berry picking, etc.</p>

2.5.4 The state of conservation of the World Heritage Property

As outlined in the sections above on the heritage place (sections 2.1-2.4), there has been significant continuity over time in terms of human interaction with the cultural landscape and its natural resources, which is at the heart of the Outstanding Universal Value, even while recognizing evolution and fluctuation. However, the twentieth century saw dramatic changes to both the natural and cultural environment, so that when the Vega Archipelago was included on the World Heritage List in 2004, it was in very poor state of health (section 2.4.3-2.4.4). Some of the concerns already noted in the nomination file included a declining population which had almost stopped residing on the outer islands, a reduced number of people involved in harvesting natural resources, collapsed or declining populations of key species (e.g., cod, eider), dramatically reduced marine habitats (e.g., eelgrass, kelp), transformation of semi-natural terrestrial habitats (e.g., coastal heath, pasture).¹⁵⁴ All told this situation shows that the poor state of conservation of many attributes of Outstanding Universal Value were placing the most important heritage values of the property at risk, as well as its integrity and the authenticity, at the very time it was listed as World Heritage. It is noted that management efforts have tackled many of these issues, with some of the negative natural and cultural trends being inverted (section 2.7). However, it is noted that, taken holistically, the property's state of conservation is not robust. Therefore, the overall baseline for this impact assessment is delicate and is less able to resist impacts. More significantly, it suggests that all management efforts should be focusing on improving the state of conservation beyond the conditions found at the time of inscription,¹⁵⁵ so that the Vega Archipelago thrives once more, before any further attempts are taken to see how many negative impacts the World Heritage property can withstand.

The following Table 2.3 attempts to provide a general overview of attributes (from Table 2.2) and concerns regarding their current state of conservation.

TABLE 2.3. Existing concerns about the state of conservation of the attributes of the Vega Archipelago

ATTRIBUTES	CONSERVATION CONCERNS
<p>Geology and landscape features</p> <p>Laurentian geology</p> <p>Ordovician granite</p> <p>Strandflat topography (including islands, islets and skerries, neighbouring coastline and intervening areas of sea)</p> <p>Coastal mountains with strandlines</p> <p>Beach areas</p> <p>Shallow, clear marine waters</p> <p>Gulf Stream ocean currents</p>	<p>Reduced light penetration has been observed in the Norwegian coastal current over a long period, possibly as a result of direct runoff to coastal areas and increased organic material¹⁵⁶</p> <p>Norwegian Sea water has risen in temperature and become more acidic as a result of climate change and changes in ocean circulation, which consequences for marine species with calcium-based</p>

¹⁵⁴ Suul, J. & Sønstebo, G. (eds) (2003) *Vegapøyan – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

¹⁵⁵ UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]: paragraph 96. Available from: <https://whc.unesco.org/en/guidelines/>

¹⁵⁶ Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene – Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]: 51. Available from: <https://www.regjeringen.no/no/dokumenter82/meld.-st.-20-20192020/id2699370/>

	shells or skeletons ¹⁵⁷
Habitats coastal heathland boreal heathland hay meadows semi-natural pastures semi-natural wetlands semi-natural beach/mesic meadow calcareous shallow soils calcareous and rich ponds dams and lakes calcareous helophyte swamps kelp forests maerl beds eelgrass	Hay meadows are critically endangered Coastal heathland, beach meadows and sugar kelp forests are endangered Boreal heathlands, semi-natural pastures, maerl beds and calcareous habitats are vulnerable Reduction in marine habitats due to light attenuation Area of tangle kelp is reduced by one third of previous extent, although regrowth is now occurring Area of eelgrass seems reduced but data lacking Maerl is understudied and has not been assessed Invasive species ¹⁵⁸
Species Bird species Eider and other species Terrestrial plant species Marine plant species, including kelp forest and other seaweed systems (50+ algae species) Fungi Fish Other animal species	Many seabird populations in dramatic decline since the early 1980s, presence of many Red-Listed bird species ¹⁵⁹ In particular, it is estimated that half the common eider population has been lost in last 25 years ¹⁶⁰ Reduced nesting sites for some bird species, e.g., semi-natural pastures Many endangered and vulnerable plant species In particular, sugar kelp is endangered Hay meadows associated with Red-Listed insects and fungi Since the mid-1990s the total quantity of pelagic fish species has been recorded ¹⁶¹ Estimated coastal cod population numbers are considered close to a critical limit Decline in herring after 2009 ¹⁶²
Human settlement Archaeological sites Natural harbours and anchorages Historic buildings	Absence of permanent residents across the archipelago Population decline on Vega island

¹⁵⁷ Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene — Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]. Available from: <https://www.regjeringen.no/no/dokumenter83/meld.-st.-20-20192020/id2699370/>

¹⁵⁸ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO; and Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA.

¹⁵⁹ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO. Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene — Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]: 37-38. Available from: <https://www.regjeringen.no/no/dokumenter83/meld.-st.-20-20192020/id2699370/>

¹⁶⁰ Fauchald, P., Barrett, R.T., Bustnes, J.O., Erikstad, K.E., Nøttestad, L., Skern-Mauritzen, M. & Vikebø, F.B. (2015) *Sjøfugl og marine økosystemer. Status for sjøfugl og sjøfuglenes næringsgrunnlag i Norge og på Svalbard*. NINA.

¹⁶¹ Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene — Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]: 33. Available from: <https://www.regjeringen.no/no/dokumenter83/meld.-st.-20-20192020/id2699370/>

¹⁶² Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]: 39. Available from: <https://www.regjeringen.no/no/dokumenter83/meld.-st.-14-20152016/id2468099/>

<p>Historic eider houses Settlements and dwellings on 56 islands across the archipelago Re-used materials in structures Trading posts Trade routes and transport connections to landowners on mainland</p>	
<p>Fishing traditions Fishing grounds Traditional knowledge Spawning grounds and nursery areas Fishers and their equipment Fishing infrastructure: fishing villages, breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses and beacons, harbours and anchorages, slipways, etc. Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel Fish processing equipment and traditional processes Harbours and fishing-industry buildings</p>	<p>Concerns related to fishing grounds, spawning and nursery areas related to habitats and species (above) Number of fishers and fisher-farmers dramatically declined Consequent disappearance of traditional knowledge Fish processing shifting to locations out of Vega</p>
<p>Farming Farmlands including cultivated, mown and grazing areas Farmlands and field patterns Farmers and traditional knowledge Farm animals Farm buildings Traditional agricultural activities and land management practices</p>	<p>Reduced number of farmers Consequent disappearance of traditional knowledge Reduction in areas farmed in outer islands Changes in land use</p>
<p>Eider tending Nesting areas Eider tenders and traditional knowledge</p>	<p>Reduced number of eider tenders Consequent disappearance of traditional knowledge</p>

2.6.1 The policy context for land-use planning and environmental protection

The Ministry of Climate and Environment published a government whitepaper in 2020 which sets out current goals for Norwegian cultural heritage policy.¹⁶³ The ‘New Goals for Norway’s Cultural Environment Policy: involvement, sustainability and diversity’ report specifically connects cultural heritage to the wider natural environment and relates it to the broader framework of climate and environmental, and other national policies, including Agenda 2030. It is explicit in promoting a holistic approach to heritage conservation so that heritage is not just engaged in preserving traces of the past but also, through the uses of heritage, in finding solutions to the challenges facing society today. It establishes three new national goals with the overall aim of ensuring that the ‘cultural environment contributes to promoting a positive and sustainable societal development’:

- everyone should have the opportunity to get involved and take responsibility for the cultural environment
- the cultural environment shall contribute to sustainable development through comprehensive community planning
- a diversity of cultural environment must be taken care of as a basis for knowledge, experience and use.

The recommendations of this whitepaper should be considered within the context of Norwegian regional reform and devolution of many responsibilities to local government (e.g., county councils and municipalities). These institutions have a key role in guiding the development of local communities and in spatial planning. The policy suggests that safeguarding cultural heritage is not simply another responsibility of local authorities but that it should be considered a resource that can provide both economic and social benefits for communities. Local institutions are reminded to use their planning and discretionary powers when considering the cultural environment, such that decisions are based on knowledge and awareness of consequences, both for the heritage but also for the community. Local policies therefore need to be informed by cultural and natural heritage both for planning purposes but also to ensure the safeguarding of that heritage. The whitepaper concludes that landscapes need more active management and coordination of changes should be better agreed between institutions such that sustainable development might be achieved.¹⁶⁴ It is also noted that a lot of cultural heritage in Norway can be linked to agricultural and fishing traditions and that this could contribute to increasing knowledge about food culture and the sustainable use of materials and natural resources.¹⁶⁵

¹⁶³ Klima- og Miljødepartement (2020) *Meld. St. 16 (2019-2020) Nye mål i kulturmiljøpolitikken. Engasjement, bærekraft og mangfold* [online]. Available from: <https://www.regjeringen.no/en/dokumenter/meld.-st.-16-20192020/id2697781/>

¹⁶⁴ Klima- og Miljødepartement (2020) *Meld. St. 16 (2019-2020) Nye mål i kulturmiljøpolitikken. Engasjement, bærekraft og mangfold* [online]: 66. Available from: <https://www.regjeringen.no/en/dokumenter/meld.-st.-16-20192020/id2697781/>

¹⁶⁵ Klima- og Miljødepartement (2020) *Meld. St. 16 (2019-2020) Nye mål i kulturmiljøpolitikken. Engasjement, bærekraft og mangfold* [online]: 66. Available from: <https://www.regjeringen.no/en/dokumenter/meld.-st.-16-20192020/id2697781/>

Policy on environmental protection is based on areas- and ecosystems-based approaches.¹⁶⁶ Both terrestrial and marine habitats are recognized as playing key roles in Norway's biodiversity.¹⁶⁷ While responsibility lies with the municipalities in delivering implementation and proper management of their resources locally.¹⁶⁸

Sustainable development policy surrounding Sustainable Development Goal 15 'Life on Land', details the requirement to employ the Planning and Building Act in a manner which achieves sustainable development without damaging the natural environment.¹⁶⁹ There has also been recognition of the impacts on semi-natural habitats by changes in agriculture¹⁷⁰ and the discontinuation of traditional management practices.¹⁷¹ The national environmental policy produced in 2006 noted that about 35 percent of the species on the Norwegian Red List were located in the agricultural landscape and the need to address changes in traditional land management in order to protect natural biodiversity.¹⁷²

Regarding the marine environment, efforts towards Sustainable Development Goal 14 'Life under water' are rooted in recognition of Norway's dependency on continued harvesting of food from a clean sea with high biodiversity. It is noted that this requires an ecosystems-based approach so that coastal areas and their marine resources are sustainably managed.¹⁷³ Rebuilding depleted coastal fishing stocks as quickly as possible is a priority,¹⁷⁴ while aquaculture is considered a way to sustainably increase consumption of marine resources.¹⁷⁵ The most recent report to the Norwegian parliament on this subject outlined a national plan for the conservation of important areas for marine nature: however, the entire environmental plan was built on the premise of a marine economy, taking an approach that emphasized human uses of the sea. Of note is the recognition that continued mapping and information gathering are required to overcome existing data gaps to support effective management.¹⁷⁶

Integrated ocean management plans have been developed for Norway. In this context, the area of the Helgeland coast between Vikna and the Vega Archipelago has been identified as being a 'particularly valuable

¹⁶⁶ Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20152016/id2468099/>

¹⁶⁷ Klima- og Miljødepartement (2007) *Meld. St. 26 (2006-2007) Regjeringens miljøpolitikk og rikets miljøtilstand* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/Stmeld-nr-26-2006-2007-/id465279/>

¹⁶⁸ Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20152016/id2468099/>

¹⁶⁹ Kommunal- og distriktsdepartementet *Meld. St. 40 (2020 – 2021) Melding til Stortinget Mål med mening Norges handlingsplan for å nå bærekraftsmålene innen 2030* [online]: 157. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-40-20202021/id2862554/>

¹⁷⁰ Kommunal- og distriktsdepartementet *Meld. St. 40 (2020 – 2021) Melding til Stortinget Mål med mening Norges handlingsplan for å nå bærekraftsmålene innen 2030* [online]: 150. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-40-20202021/id2862554/>

¹⁷¹ Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20152016/id2468099/>

¹⁷² Klima- og Miljødepartement (2007) *Meld. St. 26 (2006-2007) Regjeringens miljøpolitikk og rikets miljøtilstand* [online]:75. Available from: <https://www.regjeringen.no/no/dokumenter/Stmeld-nr-26-2006-2007-/id465279/>

¹⁷³ Kommunal- og distriktsdepartementet *Meld. St. 40 (2020 – 2021) Melding til Stortinget Mål med mening Norges handlingsplan for å nå bærekraftsmålene innen 2030* [online]: 139. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-40-20202021/id2862554/>

¹⁷⁴ Kommunal- og distriktsdepartementet *Meld. St. 40 (2020 – 2021) Melding til Stortinget Mål med mening Norges handlingsplan for å nå bærekraftsmålene innen 2030* [online]: 141. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-40-20202021/id2862554/>

¹⁷⁵ Kommunal- og distriktsdepartementet *Meld. St. 40 (2020 – 2021) Melding til Stortinget Mål med mening Norges handlingsplan for å nå bærekraftsmålene innen 2030* [online]: 148. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-40-20202021/id2862554/>

¹⁷⁶ Klima- og miljødepartementet (2021) *Meld. St. 29 (2020–2021) Heilskapleg nasjonal plan for bevaring av viktige område for marin natur* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-29-20202021/id2843433/>

and vulnerable area' in relation to the seabirds¹⁷⁷ and again the southern part of Nordland County, with specific reference to the islands and skerries in Vega Municipality is 'particularly valuable'.¹⁷⁸ This has consequences for management of the Vega Archipelago because 'the management regime will take special account of the need to protect vulnerable habitat types and species in particularly valuable and vulnerable areas' and 'activities will be conducted with special care and in such a way that the ecological functioning and biodiversity of these areas are not threatened.'¹⁷⁹

2.6.2 Management of cultural landscapes and protected areas

The Vega Archipelago is managed by the Vega Municipality, which has jurisdiction over the land areas in addition to one nautical mile of sea from the coastal baseline. Approximately 90% of the land within the Vega Archipelago is privately owned. The municipality has responsibility for spatial planning through the Vega Municipal Master Plan and associated planning guidelines (currently for 2007-2020) (Figure 2.25),¹⁸⁰ while some locations on the main Vega island require more detailed zoning plans. These plans are all regulated by the Planning and Building Act, which requires municipalities to address the 'physical, economic, social, aesthetic and cultural development of local areas' both on land and at sea.¹⁸¹

The Vega Municipal Master Plan also sets out the planning regulations within the World Heritage property and its buffer zone, with a focus on visual impacts on the cultural landscape and the need for sympathetic design of any new buildings when they are permitted. The Master Plan notes that Vega's key industries (identified as fishing, agriculture, eider tending and nature-based tourism), will be facilitated whenever possible while respecting World Heritage. The Master Plan focuses on land-based spatial planning, whereas planning for sea areas is considered within the Vega section of the Helgeland Coastal Plan, which is the subject of this impact assessment (section 3.2). It should be noted that areas of sea deeper than 2m are state owned.¹⁸²

As a result of the changes over the course of the twentieth century, particularly depopulation of the islands and changes in livelihoods, many buildings and other structures within the Vega Archipelago became less used or fell into disuse. Recent efforts to protect key cultural elements included the listing or designation of various buildings and monuments. There are currently 315 entries for the Vega area in the cultural heritage database (Figure 2.20), which include:

- 241 archaeological sites
- 71 structures/infrastructure
- 2 churches

¹⁷⁷ Klima- og miljødepartementet (2021) *Meld. St. 29 (2020–2021) Heilskapleg nasjonal plan for bevaring av viktige område for marin natur* [online]: 48. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-29-20202021/id2843433/>

¹⁷⁸ Klima- og miljødepartementet (2021) *Meld. St. 29 (2020–2021) Heilskapleg nasjonal plan for bevaring av viktige område for marin natur* [online]: 50. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-29-20202021/id2843433/>

¹⁷⁹ Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene – Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]: 37-38. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-20-20192020/id2699370/>

¹⁸⁰ Vega kommune (2010) *Kommuneplanens arealdel 2010/2020. Planbeskrivelse og bestemmelser*. Available from: <https://www.vega.kommune.no/tjenester/planer/kommuneplan/kommuneplan/>

¹⁸¹ Planning & Building Act: Lov om planlegging og byggesaksbehandling (plan- og bygningsloven). Available from: <https://lovdata.no/dokument/NL/lov/2008-06-27-71>

¹⁸² Vega kommune (2010) *Kommuneplanens arealdel 2010/2020. Planbeskrivelse og bestemmelser*. Available from: <https://www.vega.kommune.no/tjenester/planer/kommuneplan/kommuneplan/>

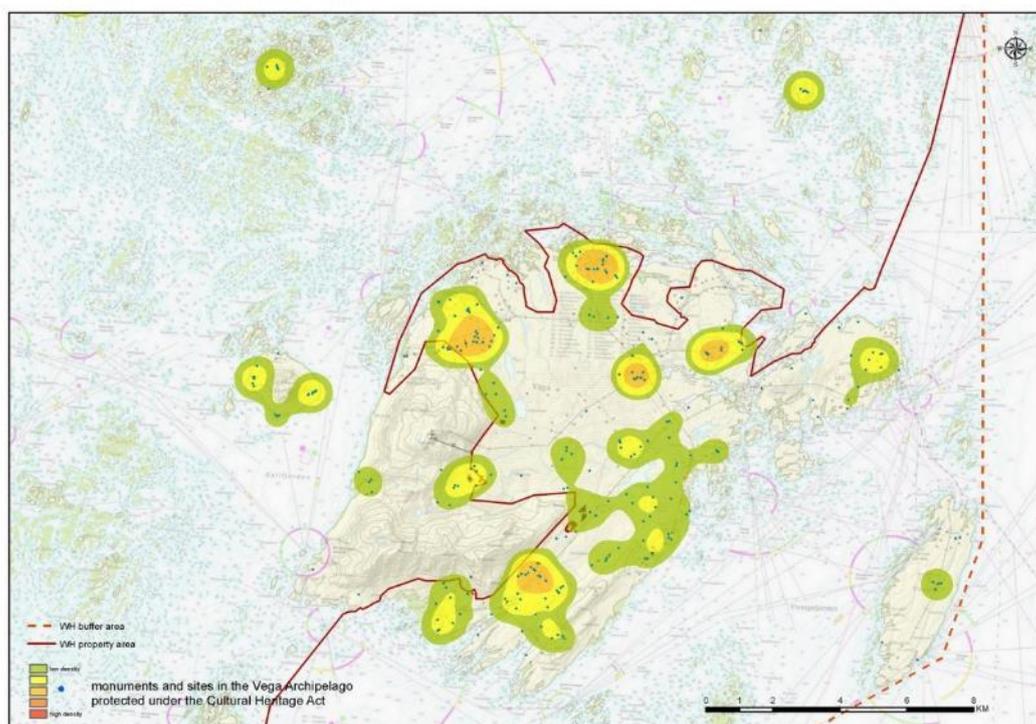


FIGURE 2.26. Distribution of monuments and sites in the Vega Archipelago protected under the Cultural Heritage Act.
 Source: *Instead Heritage*¹⁸⁶

TABLE 2.4. In the 1990s a survey of pre-1900s structures across the archipelago identified the range of building types and where they survived, even after almost all permanent residents had left the outer islands. Source: *SEFRAK*¹⁸⁷

	Dwelling	Barn	Boat-house	Wharf store-house	Shed	Cooking house	Fisher-man's shack	Ruin	Misc.	Total
Tåvær	3	1		1		1		4	2	12
Kvalholmen	3	1			1			9	1	15
Kilvær	3	2		1	1	1		4	2	14
Skogsholmen	6	3	2	3	1			10		25
Omøy	1	1				1		1	1	5
Æmårsøy	1							4	1	6
Stakkøya	1							6		7
Nautøya	1							2		3
Flovær	1				4					5
Lånan	2		1	1				1		5
Sørvær	1	1								2
Mudvær	4	4	3	3	1	1	3	1	2	22
Bremstein							4	12		16
Skjærvær	4	4	1	4	4	1	4	5	4	31
Hysvær	9	2	1	1				11	1	25
Total	40	19	6	14	12	5	11	70	14	193

¹⁸⁶ Based on: Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyen – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: Annex 1.F.

¹⁸⁷ Miljødirektoratet (no date) Miljøstatus [online]. Available from: <https://miljoatlas.miljodirektoratet.no/KlientFull.htm>

The SEFRAK database is a national register of buildings built before 1900.¹⁸⁸ The Vega Archipelago was surveyed and nearly 200 surviving structures (excluding eider houses) were recorded in the outer islands (Table 2.4), with many more on the main island of Vega.¹⁸⁹ It was noted that the islands of Muddvær and Skjærvær were particularly significant for having examples of nearly all types of building still present.¹⁹⁰ While inclusion on the SEFRAK register does not automatically offer protection, it is mandatory for a municipality to assess the conservation values before giving any planning permission to change or demolish the building if it was built before 1850.

Nearly a quarter of the World Heritage area at Vega is protected by a national conservation designation. Table 2.5 below provides a summary of protected areas, while Figure 2.27 shows their locations.

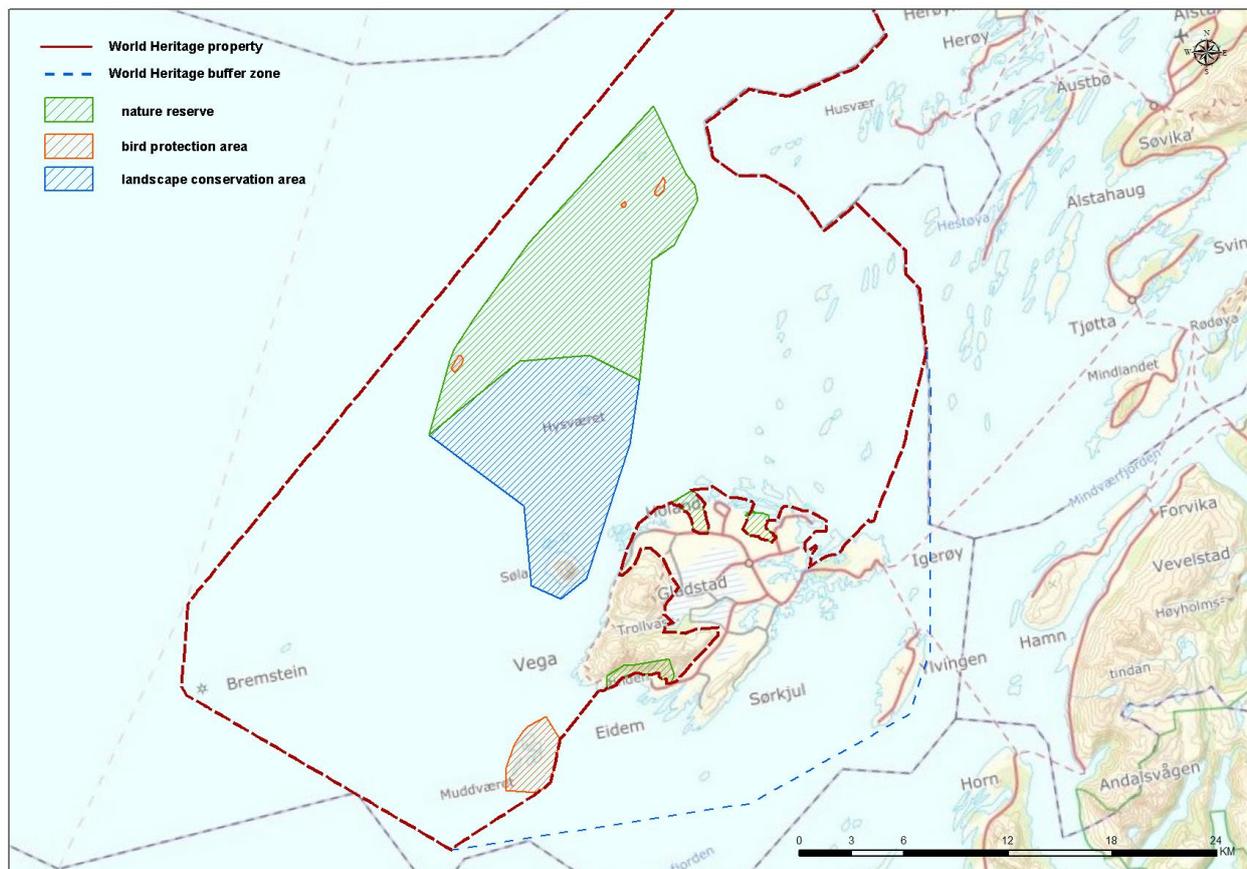


FIGURE 2.27. This map shows the various protected areas that lie within the World Heritage property.
Source: *Instead Heritage*¹⁹¹

¹⁸⁸ Riksantikvaren (2021) *SEFRAK-registeret* [online]. Available from: <https://www.riksantikvaren.no/les-om/sefrak/>

¹⁸⁹ Damman, Å. (2020) SEFRAK kontrollregistrering 2020, Vega kommune, Nordland fylke. *NIKU Oppdragsrapport 65/2020*.

¹⁹⁰ Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

¹⁹¹ Based on: Suul, J. & Sønstebø, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning: 104.

TABLE 2.5. The protected areas located in the Vega Archipelago

NATURAL PROTECTED AREA	DESIGNATION	LOCATION	APPROX. AREA	PURPOSE OF DESIGNATION
Eidemsliene	Nature reserve - <i>strongest form of protection: natural values must not be negatively affected</i>	South coast of Vega Island	292 ha	To preserve a unique area of natural and plant geography, including many heat-loving and regionally rare plant species, as well as the associated fauna
Holandsosen	Nature reserve - <i>strongest form of protection: natural values must not be negatively affected</i>	North coast of Vega Island	250 ha (of which 170 ha is land, 9 ha is fresh water and 71 ha is sea)	To preserve an important wetland area with naturally associated vegetation and wildlife. To protect the area's central importance for wetland birds in all seasons
Kjellerhaugvatnet	Nature reserve - <i>strongest form of protection: natural values must not be negatively affected</i>	North coast of Vega Island	199 ha (of which 160 ha is land)	To preserve an important wetland area with naturally associated vegetation and wildlife. To protect the area's central importance as a migration and nesting area for wetland birds and the botanically rich bog areas that are found there
Lånan / Skjærvær	Nature reserve - <i>strongest form of protection: natural values must not be negatively affected</i>	Immediately north of the Hysvær/Søla Landscape Conservation Area; it extends to cover the area from the Lånan to the Skjærvær archipelagos, including the islands in between.	11,292 ha (of which 11,049 ha is sea)	To safeguard a nationally valuable coastal area, with the naturally associated plants and wildlife. Special value is associated with the area as a resting place for white-cheeked geese on spring migrations, as a nesting, moulting and wintering area for seabirds and for the occurrence of special plant species / plant communities
Lånan, Flovær and Skjærvær	Bird protection areas - <i>activities that affect species and their living conditions must be limited</i>	Three areas roughly corresponding to the islands after which they are named, within the much wider Lånan/Skjærvær Nature Reserve	71 ha (of which 37 ha is sea)	To preserve a good and undisturbed nesting and rearing area for seabirds
Muddværet	Bird protection areas - <i>activities that affect species,</i>	Area to the south-west of Vega Island surrounding the Muddværet archipelago	959 ha (of which 755 ha is sea)	To preserve a good and undisturbed nesting and rearing area for seabirds

	<i>and their living conditions must be limited</i>			
Hysvær / Sjøla	Landscape conservation area	An area to the north-west of Vega Island; it includes the Hysvær archipelago and the island of Sjøla	9317 ha (of which 8603 ha is sea)	To preserve a unique natural and cultural landscape area, and ensure the zoological, botanical, geological and cultural-historical elements that help to give the area its distinctive character

The strongest form of nature protection is afforded by the nature reserve designation and there are three small reserves on the main Vega Island, with a fourth around the Lånan and Skjærvær archipelagos to the north-west. These aim to provide protection for their flora and fauna, with the emphasis on seabirds. In addition, it should be noted that both Holandsosen and Kjellerhaugvatnet (both on Vega island), include wetlands, which in ecologically relate to the national network of wetland areas, including the three RAMSAR sites within the Trollfjell Geopark.

Four focused areas provide specific protection to seabirds so that their nesting and rearing of chicks can take place undisturbed. Three of these lie within the Lånan/Skjærvær Nature Reserve to the north-west of Vega island.

There is also a landscape conservation area that lies immediately to the north-west of Vega Island, adjoining the Lånan/Skjærvær Nature Reserve, which is designated for its natural and cultural landscape so that the distinctive landscape character cannot be significantly changed. The specific objective of which is to preserve a 'unique natural and cultural landscape area, and ensure the zoological, botanical, geological and cultural-historical elements that help to give the area its distinctive character'.¹⁹²

In practice, it is recognized that all Vega Archipelago's protected areas, not only the landscape conservation area, have a cultural element and that the semi-natural habitats need managing to maintain the cultural component. This is done through a series of management plans that are drawn up for the Protected Areas Board and which include actions related to traditional practices, such as initiatives to ensure continued grazing.¹⁹³

In 2011 the Ministry of the Environment delegated administrative authority for the protected areas in the Vega Archipelago to the Vega Protected Areas Board, formed by two members from Vega Municipality and one member from Nordland County Council. A protected areas manager works on behalf of the Board. The Board has responsibility for preparing managements plans for each of the protected areas in dialogue with the Norwegian Environmental Agency.¹⁹⁴ In addition, the 2015-2022 management plan for the World Heritage property contains sections detailing requirements for each of the protected areas.¹⁹⁵ The Board

¹⁹² Forskrift om Kystverneplan Nordland, vedlegg 3, Lånan/Skjærvær naturreservat, Vega kommune, Nordland. Available from: <https://lovdata.no/dokument/LF/forskrift/2002-12-06-1400>

¹⁹³ Vega verneområdestyre (no date) *Skjøtselsplaner* [online]. Available from: <https://www.nasjonalparkstyre.no/Vega1/publikasjoner/skjotselsplaner>

¹⁹⁴ Vega verneområdestyre (no date) *Skjøtselsplaner* [online]. Available from: <https://www.nasjonalparkstyre.no/Vega1/publikasjoner/skjotselsplaner>

¹⁹⁵ Fylkesmannen i Nordland (2014) *Forvaltningsplan for Vegaøyen verdensarvområde (2015 – 2022)* [online]. Available from: <https://www.verdensarvega.no/no/forvaltningsplan>

has responsibility for making decisions on applications for exemptions to the protected area regulations and can grant an exemption if it is considered that the proposed action will not adversely affect natural values.¹⁹⁶ These decisions need to be in line with the Nature and Biodiversity Act and other protected area regulations.¹⁹⁷

Much of the funding for the Protected Areas Board, including administrative costs, planning and implementation of key projects, is provided by the Norwegian Environmental Agency. Other funding is accessed according to the specific nature of a project, for example, the Agricultural Development Fund has supported grazing in protected areas or the Norwegian Retailers' Environmental Fund financed a beach clean-up. The Protected Areas Board has an advisory committee made up of local stakeholders, which it shares with the Vega Archipelago World Heritage Foundation, who provide advice on the management of both the protected areas and the World Heritage property. As part of this an administrative contact committee meets regularly to ensure that the work of the Protected Areas Board is integrated into the processes of the municipality.

Finally, ensuring that environmental regulations are complied with in the protected areas is the responsibility of Norwegian Nature Inspectorate.

2.6.3 Trollfjell Geopark

Recognition of the international importance of the geology along the Helgeland coast led to the creation of the Trollfjell UNESCO Global Geopark in 2019.

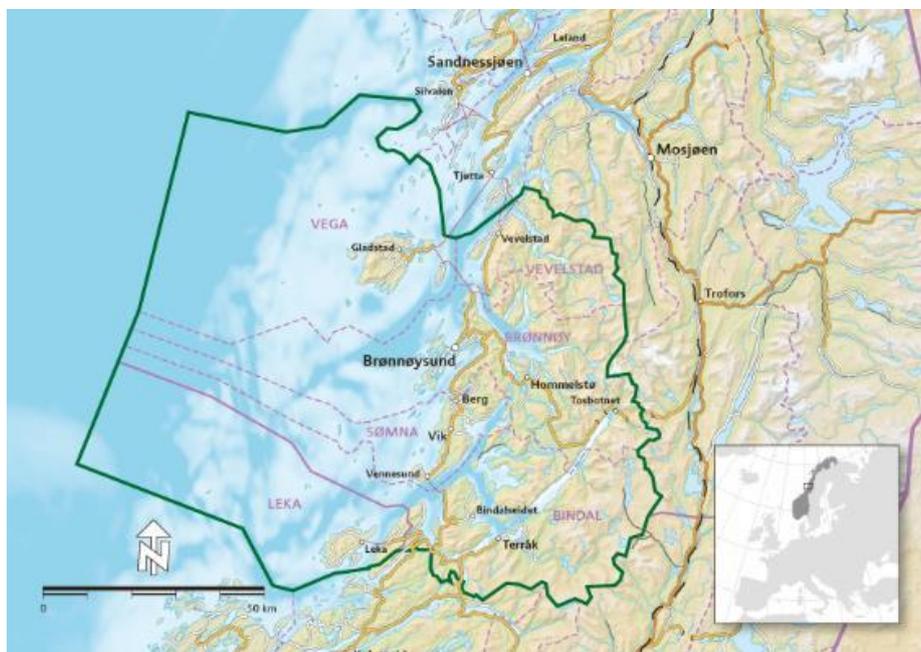


FIGURE 2.28. Map of the Trollfjell Geopark, which includes Vega Archipelago. Source: *Trollfjell Geopark & friluftsråd*¹⁹⁸

¹⁹⁶ Miljødirektoratet (2017) Vedtekter for Vega verneområdestyre [online]. Available from: <https://www.nasjonalparkstyre.no/Vega1/styret/styrets-vedtekter>

¹⁹⁷ Lov om forvaltning av naturens mangfold (naturmangfoldloven). Available from: <https://lovdata.no//NL/lov/2009-06-19-100>

¹⁹⁸ Trollfjell Geopark & friluftsråd (2022) Hvor ligger Trollfjell Geopark? [online]. Available from: <https://www.trollfjellgeopark.no/index.php/no/om-trollfjell-geopark/om-geoparken/hvor-ligger-trollfjell-geopark>

Covering roughly 10,000 km², of which two-thirds is sea, the geopark includes the municipal area of Vega and the neighbouring municipalities of Brønnøy, Vevelstad, Sømna, Bindal and Leka (Figure 2.28). The geopark is operated by the Trollfjell Recreational Council, a collaboration between the relevant municipalities, who appoint a general manager. The nomination for geopark status knowingly incorporated the World Heritage property of 'Vegaøyane – The Vega Archipelago', with clear connections made between the geology, the landscape and the cultural history of the area.¹⁹⁹

In the nomination file for the geopark, the significance of the geology of the Vega area was described in the following terms:

BOX 2.2. The Vega Intrusive Complex²⁰⁰

The same tectonometamorphic event that is so beautifully exposed on the Bolvæer archipelago, led to partial melting of the sandstones and schists. This resulted in the formation of large, granitic intrusions forming the major part of the Vega island and the adjacent archipelago. The emplacement and crystallization of the granite is dated to about 475 million years.

The Vega intrusive complex is a fairly homogeneous body ca. 350 km² in extent, and consists mainly of granitic and granodioritic rocks. Due to westward tilting of the intrusive complex after its formation, subsequent erosion has actually revealed a 7 to 17 kilometre thick crustal section, exposing asymmetrical internal zoning of the intrusive complex. Northeast Vega and the western half of the island Ylvingen consists of biotite granite and garnet-biotite granite with a weak magmatic foliation defined by biotite. Locally the rocks are porphyritic with up to 2 cm long K-feldspar phenocrysts. On Vega, Sjøla and islands southwest of Vega, we find medium-grained garnet-bearing muscovite biotite granite and granodiorite with local magmatic layering and/or foliation. The western part of this unit contains cordierite and sillimanite. The Fugleværet granodiorite occupies a zone along the western contact of the Vega intrusive complex. Cordierite is present as cm-scale phenocrysts; in places, cordierite form large nodules or exhibit spectacular dendritic shapes.

The mineral composition of the granite shows that it crystallised from a melt that was formed by partial melting of rocks similar to the sedimentary rocks occurring to the north of the granite. Compositional variation within the Vega complex is mainly due to unmixing of evolved melt fractions from residual minerals/phases. Migmatitic rocks are commonly present along intrusive contacts, and also occur as dykes that intrude the host rocks, e.g. on northern Ylvingen and northwest Vega. Varieties of migmatite (partially melted rock) are present on the northwestern part of Vega: here, it is possible to envisage the entire process from melting of sedimentary rocks to the formation of a huge batholith. Some of the rocks that resisted melting are present as dark clots and irregular inclusions unevenly distributed in the granite, trapped by the migrating melt. Metasedimentary and mafic enclaves are locally very abundant.

Dioritic rocks occurring on Vega are considered coeval with the granitic rocks. The diorites were probably derived from a deeper mafic source and have isotope composition that differs markedly from the Vega granites. There is no geochemical evidence suggesting mixing between dioritic magmas and the Vega granite magmas. However, emplacement of mafic magmas in the lower crust was probably important in transferring heat to the zone of partial melting. This type of granite is rare in mountain belts, the Vega granite being a world-class example and by far the largest occurrence of its kind in the Caledonian mountain belt in Norway.

¹⁹⁹ Bergengren, A. (ed.) (2016) *Geological Heritage and Geosites*. Trollfjell Geopark: 6.

²⁰⁰ Bergengren, A. (ed.) (2016) *Geological Heritage and Geosites*. Trollfjell Geopark: 19-20.

Currently there are 12 key geosites within the Vega area of the geopark, four of which are considered of international importance (Figure 2.29).

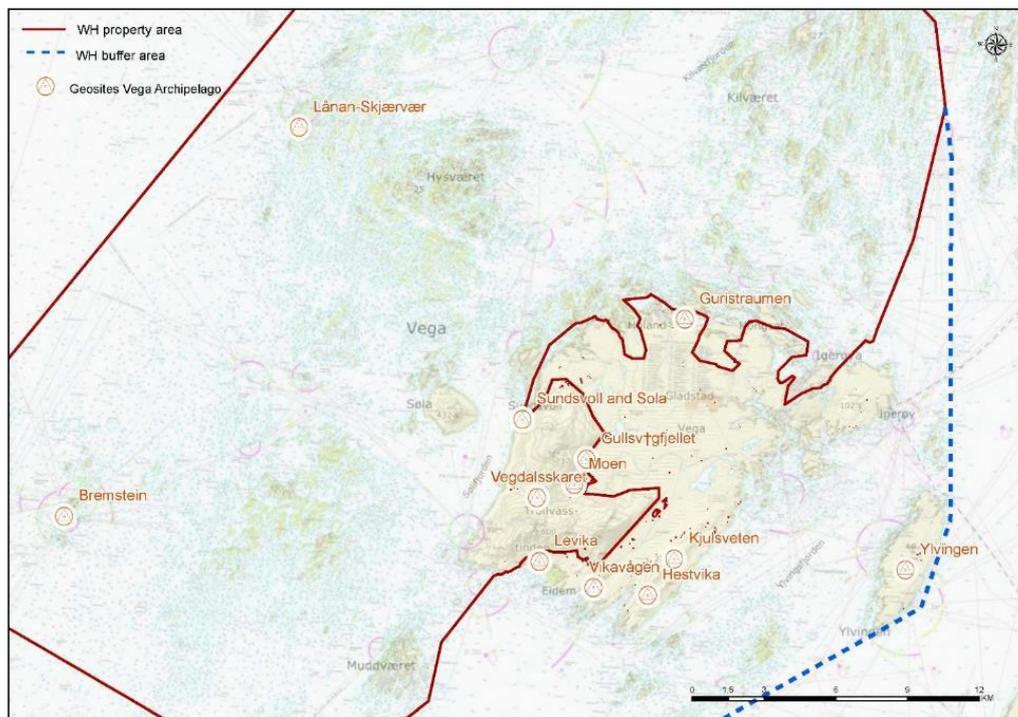


FIGURE 2.29. The geosites within the Vega area which have been identified by the Trollfjell Geopark. *Source: Instead Heritage*²⁰¹

The Trollfjell Geopark has a broad objective of promoting geoconservation and aims to achieve this by working with local communities, promoting sustainable economic activities and increasing public awareness. The major concerns that they have identified are:

- Pressure from development and land-use change (to be protected through municipal planning processes)
- Natural processes, such as vegetation growth and coastal erosion
- Human-induced changes, such as climate change and sea-level rise
- Pressure from tourism
- Quarrying, sand and gravel extraction
- Lack of information, educational activities and knowledge about geology.²⁰²

Many of the geopark's management activities provide opportunities for both residents and visitors so that awareness is raised about the importance of the geology, such as hiking and mountain bike trails, for those who want to explore Vega. Of note are the trails to the top of Gullsvågfjellet and Trollvasstinden, as well as the Eidem-Sundsvoll geology trail,²⁰³ all on the main Vega island, which provide panoramic views towards Sjøla and the proposed site of one of the aquaculture facilities being assessed in this report (section 3.3.2).

²⁰¹ Based on Bergengren, A. (ed.) (2016) *Geological Heritage and Geosites*. Trollfjell Geopark.

²⁰² Trollfjell Geopark & friluftsråd (2022) Strategy for geoconservation [online]. Available from: <http://www.trollfjellgeopark.no/index.php/en/about-trollfjell-geopark/about-the-geopark/sustainable-management>

²⁰³ Trollfjell friluftsråd (2017) *30 Turer i Trollfjell. Sør-Helgeland Regionråd* with Trollfjell Geopark & friluftsråd [online]. Available from: <http://www.trollfjellgeopark.no/index.php/no/geoparken-aktiviteter/vandring/turbrosjyre>

2.7 THE WORLD HERITAGE MANAGEMENT SYSTEM

2.7.1 The policy context for World Heritage in Norway

Norway has been a State Party to the World Heritage Convention since 1977 and it has been a strong champion of World Heritage internationally. It has had three mandates to the World Heritage Committee, most recently for the period 2017-2021, and continues to provide funding to a range of World Heritage initiatives, most notably the World Heritage Leadership programme. The most recent policy report on the cultural environment was presented to the Norwegian parliament in 2020 (section 2.6.1).²⁰⁴ This reconfirmed Norway's commitment to the World Heritage Convention, both at home and on the international stage, in the context of broader aims to support sustainable development.

In a national context, the Ministry of Climate and the Environment is responsible for national implementation of the World Heritage Convention. In this way cultural heritage management is integrated with environmental management at a ministerial level, also through World Heritage Focal Points in its two directorates, the Norwegian Environment Agency and the Directorate for Cultural Heritage. Several other ministries have sector responsibilities for cultural and natural heritage and attempts are being made to raise awareness of the obligations arising from the World Heritage Convention among them and improve their combined efforts, for example, through the Interministerial World Heritage Forum.²⁰⁵

The Norwegian approach to World Heritage has been very much shaped by earlier policy reports presented to the Norwegian parliament, in particular in 2007 regarding the natural environment²⁰⁶ and 2013 regarding cultural heritage, where the overall aim for Norway is to become: 'a beacon for best practice in natural and cultural heritage management, the World Heritage properties will be ensured the best possible condition, management and formal protection.'²⁰⁷

Of particular interest to outsiders to the Norwegian system is the long-established emphasis on decentralization in most sectors, not only heritage, with significant legal mandates and responsibilities assigned to local and county civic authorities or sector-specific public organizations created for the purpose. Marine areas are a curious exception to this culture of locating responsibility and decision-making locally. Indeed, national jurisdiction regarding marine resource use has repercussions on Norwegian coastal communities and ecosystems where locally there is no voice, kelp trawling being a case in point.

A problem not unique to Norway is that international legislation ratified by the State, and for which obligations remain formally at a state level, are integrated with difficulty into legal and institutional frameworks, where adjustments, tools and resources are needed at a local level to meet mandatory

²⁰⁴ Klima- og Miljødepartement (2020) *Meld. St. 16 (2019-2020) Nye mål i kulturmiljøpolitikken. Engasjement, bærekraft og mangfold* [online]. Available from: <https://www.regjeringen.no/en/dokumenter/meld.-st.-16-20192020/id2697781/>

²⁰⁵ Einen, A. (2021) *World Heritage in Norway: national policy for an inclusive and participatory implementation of the World Heritage Convention* [online]. Available from: <https://panorama.solutions/en/solution/world-heritage-norway-national-policy-inclusive-and-participatory-implementation-world>

²⁰⁶ Klima- og Miljødepartement (2007) *Meld. St. 26 (2006-2007) Regjeringens miljøpolitikk og rikets miljøtilstand* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/Stmeld-nr-26-2006-2007-/id465279/>

²⁰⁷ Klima- og Miljødepartement (2013) *Meld. St. 35 (2012-2013) Framtid med fotfeste — Kulturminnepolitikken*. [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld-st-35-20122013/id725021/?ch=4>

requirements. The heritage sector is affected by this in particular since local communities often play multiple crucial roles: assigning importance to heritage, contributing to the meanings of heritage places through traditions and practices, contributing to decision-making and management through their unmatched local knowledge.

In the case of the World Heritage Convention, there has been an admirable and concerted effort in Norway over the last 15 years to create frameworks that empower civil society and civic authority voices at local and county level to contribute to management of Norway's World Heritage properties. The introduction of World Heritage coordinators and advisory boards are examples. They are complemented by innovation in funding for initiatives at the properties. Together they have brought about commendable improvements in the capacity to galvanize efforts for World Heritage locally and strengthen a sense of ownership, responsibility and involvement.

A slight paradox remains, however: this apparent shift towards participatory governance has not been accompanied by parallel developments in regulatory frameworks or due recognition of where decision-making that can impact on Outstanding Universal Value really takes place. In World Heritage properties where ownership is public or in the hands of a few, or where the Outstanding Universal Value is not intensely intertwined with local ways of life, the implications can be modest. However, in the case of a World Heritage cultural landscape like 'Vegaøyen – The Vega Archipelago', the implications are significant, something which emerges from the overview of the current management system in section 2.7.2.

What comes to the fore is that the World Heritage coordinator and the Vega Archipelago World Heritage Board, have no legislative backing. The authority that has the most legislative weight, the municipality, is without suitable tools and resources to align its significant responsibilities with World Heritage requirements. This is something that has already been recognised: already the 2012-2013 Cultural Heritage Policy white paper noted that 'until today, the Norwegian implementation of the Convention has not been sufficiently regulated.'²⁰⁸ However, this issue has yet to be properly resolved.

Moreover, neither the Vega Archipelago World Heritage Board or Vega Municipality have decision-making mechanisms that can effectively draw on expertise from the Ministry of Climate and Environment's directorates or other heritage agencies. They are given the role of observers (e.g., in the case of the Vega Archipelago World Heritage Board) or they have to react to, for example, municipal planning procedures.

These observations may seem beyond the mandate of this supplementary assessment for the Helgeland Coastal Plan with regard to the World Heritage property. However, protection and management are one of the three pillars of Outstanding Universal Value²⁰⁹ and 'Vegaøyen – The Vega Archipelago's' Outstanding Universal Value is inseparable from how communities have sustained livelihoods and managed the natural resources over millennia. This means that governance and management of the Vega Archipelago are an integral part of the heritage place, and these themes need to be properly addressed in order to understand continuity and change over time and find ways for the Vega community to move forward.

²⁰⁸ Klima- og Miljødepartement (2013) *Meld. St. 35 (2012-2013) Framtid med fotfeste — Kulturminnepolitikken* [online]: 4.8e. Available from: <https://www.regjeringen.no/no/dokumenter/meld-st-35-20122013/id725021/?ch=4>

²⁰⁹ Wijesuriya, G., Thompson, J., & Young, C. (2013) *Managing Cultural World Heritage*. UNESCO.: 35.

2.7.2 Outstanding Universal Value: protection and management

Shortly after its inscription in 2004, the Vega Archipelago World Heritage Foundation was founded by the Vega Municipality to take on a central role in promoting and coordinating efforts towards the conservation of the World Heritage property and the safeguarding of its Outstanding Universal Value. It coordinates on World Heritage matters locally and runs the Vega Archipelago World Heritage Centre. This is both a visitor centre but also a management hub as it houses the offices some key players under one roof, those of the Vegaøyan World Heritage Foundation Board, the Vega Protected Areas Board and the Vega Municipality tourism manager in particular. It is also a shared space that gives importance to contributions from other authorities and stakeholders with which these key players work.

While advocacy, engagement and running projects are very much at the heart of activities at the World Heritage Centre, the actual responsibilities and legal obligations for the management of the World Heritage areas reside above all with the Vega Municipality and the Vega Protected Areas Board.

The main reference framework for deciding the focus of activities are the objectives and priorities laid out through a management planning approach, both the current Vega Archipelago World Heritage management plan for 2015-2022,²¹⁰ together with management plans specific to the various protected areas that together make up some 22% of the World Heritage property (section 2.6.2).²¹¹ The stipulations of these long-term plans are translated into action plans for implementation, which the Foundation then funds with a budget obtained from various sources.²¹²

These are perhaps the most visible players among what is, in reality, a multitude of organisations and stakeholders contributing to conservation and management of the World Heritage property and its setting. The following diagram from the Vega World Heritage management plan 2015-2022 only does partial justice to this level of institutional and stakeholder involvement since many other organisations are involved, also through consultative organs such as the World Heritage Advisory Body, consisting of approximately twenty local societies and associations.²¹³

²¹⁰ Fylkesmannen i Nordland (2014) *Forvaltningsplan for Vegaøyan*

verdensarvrområde (2015 – 2022) [online]. Available from: <https://www.verdensarvvega.no/no/forvaltningsplan>

²¹¹ Vega Verdensarvsenter (no date) *Verneområder* [online]. Available from: <https://www.verdensarvvega.no/no/verneomrader>

²¹² For an overview see: Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics.

²¹³ A complete list is available at: <https://www.verdensarvvega.no/no/organisasjon>

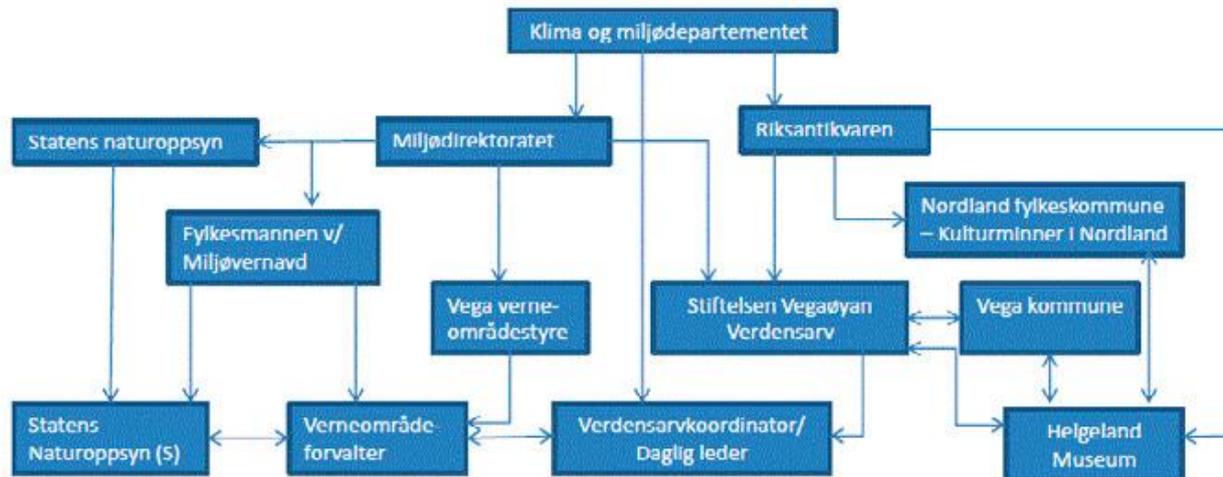


FIGURE 2.30. The organigram shows how the management system for the Vegaøyen World Heritage property, buffer zone and wider setting draws on contributions from multiple actors²¹⁴

A tabular analysis follows attempts to offer an overview of this composite management system by mapping the nature of the various contributions and how they come together to achieve World Heritage conservation and management outcomes. It also includes some first considerations on gaps or opportunities yet to be addressed that have potential repercussions on management effectiveness. This systematic mapping of how all its component parts come together uses the analytical framework proposed in the UNESCO manual on Managing Cultural World Heritage.²¹⁵

²¹⁴ Fylkesmannen i Nordland (2014) *Forvaltningsplan for Vegaøyen verdensarvområde (2015 – 2022)* [online]: 18. Available from: <https://www.verdensarvvega.no/no/forvaltningsplan>

²¹⁵ Wijesuriya, G., Thompson, J., & Young, C. (2013) *Managing Cultural World Heritage*. UNESCO: 53-121.

TABLE 2.6. An analysis of the composite management system of the World Heritage property

GOVERNANCE AND DECISION MAKING: LEGAL AND CUSTOMARY FRAMEWORKS, THE INSTITUTIONAL AND ORGANIZATIONAL FRAMEWORKS			
	LOCAL MANAGEMENT SYSTEM	CONTRIBUTIONS FROM INTERNATIONAL/NATIONAL/COUNTY LEVEL	ASSESSMENT OF GAPS AND OPPORTUNITIES
LEGAL& CUSTOMARY FRAMEWORKS	<p>Legal ownership:</p> <ul style="list-style-type: none"> • Most of Vega Archipelago’s land areas are in private hands • Approx. 5% is owned by Vega Municipality • Marine areas and marine resources fall within Norwegian national jurisdiction with the exception of the first nautical mile from the coastal baseline where planning is the responsibility of the municipality or the Vega Conservation Area Board. <p>Legal mandate to conserve and manage heritage:</p> <ul style="list-style-type: none"> • Vega Municipality's municipal plan and zoning plans and associated building regulations for land areas, including compliance with the Cultural Heritage Act • The Helgeland Coastal Plan for sea areas up to 1 nautical mile from coastal baseline (approval pending for Vega Municipality) • Inter-institutional hearings, referrals and inquiry procedures for planning applications/developer area plans incompatible with existing plans or for unplanned areas coordinated by Vega Municipality, and in the case of the protected areas also the Vega Protected Areas Board • Specific protection regulations of the Vega Protected Areas Board for each protected area • Inter-institutional responses to dispensation applications for the protected areas and appeals, coordinated by Vega Protected Areas Board <p>Customary frameworks to conserve and manage heritage:</p>	<p>International:</p> <ul style="list-style-type: none"> • World Heritage Convention <ul style="list-style-type: none"> ○ The inclusion of ‘Vegaøyen – The Vega Archipelago’ on the World Heritage List • Convention on Biological Diversity • Other relevant UNESCO, UNEP and international conventions <p>National:</p> <ul style="list-style-type: none"> • Nature and Biodiversity Act <ul style="list-style-type: none"> ○ Including the creation of five nature reserves, four bird sanctuaries and one protected landscape area designated by Royal decrees • Cultural Heritage Act <ul style="list-style-type: none"> ○ Including the following listing: all pre-Reformation (pre-1537) archaeological and historical monuments and sites; special protection orders for 29 buildings at Skjærvær and for Bremstein Lighthouse. • Planning and Building Act 	<ul style="list-style-type: none"> • World Heritage has been given a platform for funding and participatory approaches but it is not explicitly recognized in national planning legislation, nor is how national planning legislation can meet World Heritage obligations sufficiently explored at a local level • More legal tools required to recognise: <ul style="list-style-type: none"> ○ interdependencies between cultural heritage and its setting ○ cultural landscapes’ interdependencies with natural values/healthy ecosystems • Liberalisation of planning process to promote principle of decisions being taken locally has led to a planning system at times over reliant on private developers initiating planning processes rather than strategic plan-led approaches which considers geo/bio/cultural

	<ul style="list-style-type: none"> • The traditional knowledge systems behind practices passed on from generation to generation, intrinsic to natural resource use and management in the Vega Archipelago 	<ul style="list-style-type: none"> • World Heritage conservation and management is also influenced by other specific sectoral policy frameworks and legislation (e.g., marine resources, agriculture, aquaculture, welfare and social services, outdoor recreation, fishing, motor traffic on uncultivated Land and in watercourses, pollution control) • Policy development in government periodic white papers on heritage <p>County level:</p> <ul style="list-style-type: none"> • Plans developed by the Nordland County Council, in particular: <ul style="list-style-type: none"> ○ County plan for Nordland ○ Tourism strategy for Nordland ○ Cultural monuments in Sør-Helgeland ○ Regional management plan with action program for water region Nordland 	<p>sensitivity of an area in a holistic way.</p> <ul style="list-style-type: none"> • National jurisdiction for some marine resource use (e.g., kelp trawling) are in sharp contrast to the emphasis on empowering decision-making among local actors in other spheres. • The creation of the World Heritage Coordinators and Boards was driven by an admirable intent to improve cooperation in a complex multilateral management system. However, it can blur the reality on the ground i.e., that the municipality in conjunction with the Protected Areas Board, as the main agents of all legal mandates, are the overall ‘managers’ while the World Heritage Board and Coordinator’s role is central to the continuity of traditional knowledge systems unprotected by law and advocacy work.
<p>THE INSTITUTIONAL / ORGANIZATIONAL FRAMEWORK</p>	<ul style="list-style-type: none"> • Vega Municipality has overall responsibility for the World Heritage property, and as the administrative managing authority its activities, including: <ul style="list-style-type: none"> ○ allocating the use of land and resources under the terms of the Planning and Building Act ○ coastal planning up until one nautical mile from the coastal baseline (hence including all sea areas of the World Heritage property and its buffer zone) ○ guaranteeing and implementing heritage protection 	<p><i>National:</i></p> <ul style="list-style-type: none"> • Ministry of Climate and Environment, among other things, leads implementation and coordination of the World Heritage Convention on behalf of the Norwegian government • Directorate of Cultural Heritage is the advisory body for cultural heritage 	<ul style="list-style-type: none"> • Shortage of expertise and tools in municipalities in relation to their significant responsibility and management role, in particular regarding managing heritage and the natural and cultural environment • The system operates in a way that means County Council and County Governor levels sometimes

	<ul style="list-style-type: none"> ○ providing local services (hospitals, schools, housing, transport links etc.) ○ and, for the 22% of the World Heritage area which is protected areas, shares responsibility with the Vega Protected Areas Board. ● The Vega Protected Areas Board, delegated by the County Governor of Nordland, is the administrative managing authority responsible for the protected areas, land and sea, equivalent to 22% of the World Heritage property. <ul style="list-style-type: none"> ○ The Protected Areas Manager, together with the Board, ensures that the management of the protected areas is carried out in accordance with the regulations for the individual protected areas (management plans), the Nature and Biodiversity Act, national environmental objectives and international obligations, with actions also determined by alignment with the broader management plan for the World Heritage area. ● The Vega Archipelago World Heritage Foundation manages funding specific to the World Heritage property, carries out actions to preserve OUV, fulfils World Heritage reporting duties and runs the World Heritage Visitor Centre. In the absence of specific World Heritage legislation, it is the development by the County Governor and multilateral endorsement of each management planning cycle for the Vega Archipelago that determines how the Foundation prioritises its work. Its multifaceted governance has no regulatory role but promotes a sense of ownership, responsibility and involvement among all parties with a view to local decision-making supporting rather than compromising the World Heritage values of the property. <ul style="list-style-type: none"> ○ The Foundation draws on input from an Advisory Body, consisting of approximately twenty local societies and associations, meets and puts forwards suggests for the 	<ul style="list-style-type: none"> ● Norwegian Environment Agency is the advisory body for environmental issues, including natural heritage ● Norwegian Nature Inspectorate responsible for surveillance and supervision of the environment with regards national conservation values. ● Directorate of Fisheries, the central role in guaranteeing sustainable and profitable fishing and aquaculture industry. ● Norwegian World Heritage (Norges Verdensarv), a network for the Norwegian World Heritage Sites. <p><i>County:</i></p> <ul style="list-style-type: none"> ● County Governor of Nordland (governmental) ensures that municipal planning decisions comply with national legislation, and with particular attention to nature conservation through the Division for Environmental Conservation, and offers a mediation role with central government bodies in the case of objections. ● Nordland County Council (elected) has taken over much responsibility from the Directorate of Cultural Heritage for protection of cultural heritage and for granting exemptions from the Cultural Heritage Act ● The Nordland regional office of the Directorate of Fisheries 	<p>brought into processes too late to be helpful</p> <ul style="list-style-type: none"> ● The World Heritage management plan is a multilateral document of good intent but without any legal leverage. ● In absence of legislation, the World Heritage Board and the World Heritage Coordinator’s role can be effective as long as there are no strong divergences of opinion. ● The emphasis in both the Protected Areas Board and the World Heritage Board on members elected to their institutional role, on one hand, constitutes a greater form of democracy, on the other hand, in particular in small communities, it can lead to conflicts of interests and be at the cost of a diversity of membership that brings high-level sectoral expertise.
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	<p>World Heritage Foundation's work via its representative who reports to the World Heritage Board.</p> <ul style="list-style-type: none"> ○ The Vega Archipelago World Heritage Foundation Board (fulfilling what in other Norwegian WH properties would be a World Heritage advisory board) draws its members from Vega Municipality, Nordland County Council, the County Governor of Nordland, Helgeland Museum and the Norwegian parliament. The observers to the board are the Norwegian Environment Agency, Directorate of Cultural Heritage, Vega Protected Areas Board, and the Norwegian Nature Inspectorate. The institutions represented on the Foundation's board, as members or observers, all have, to varying degrees, a role in the effective conservation and management of the World Heritage property. However, they contribute to the Board on a personal basis, not representing their organizations. ○ The general manager of the Vega Archipelago World Heritage Foundation has been assigned the function of World Heritage Coordinator by the Ministry of Climate and Environment. With the central role in promoting and coordinating efforts towards the conservation of the World Heritage property and the safeguarding of its Outstanding Universal Value, this function includes responsibility for periodic reporting to UNESCO, as well as fostering local networks for anchoring cooperation ● Helgeland Museum, a key role in advocacy for natural and cultural history and funding distribution for building preservation in Helgeland's 18 municipalities. 	<ul style="list-style-type: none"> ● Nordland Eider Duck Association <p><i>International:</i></p> <ul style="list-style-type: none"> ● Nordic World Heritage Association ● UNESCO, World Heritage Committee and World Heritage Centre 	
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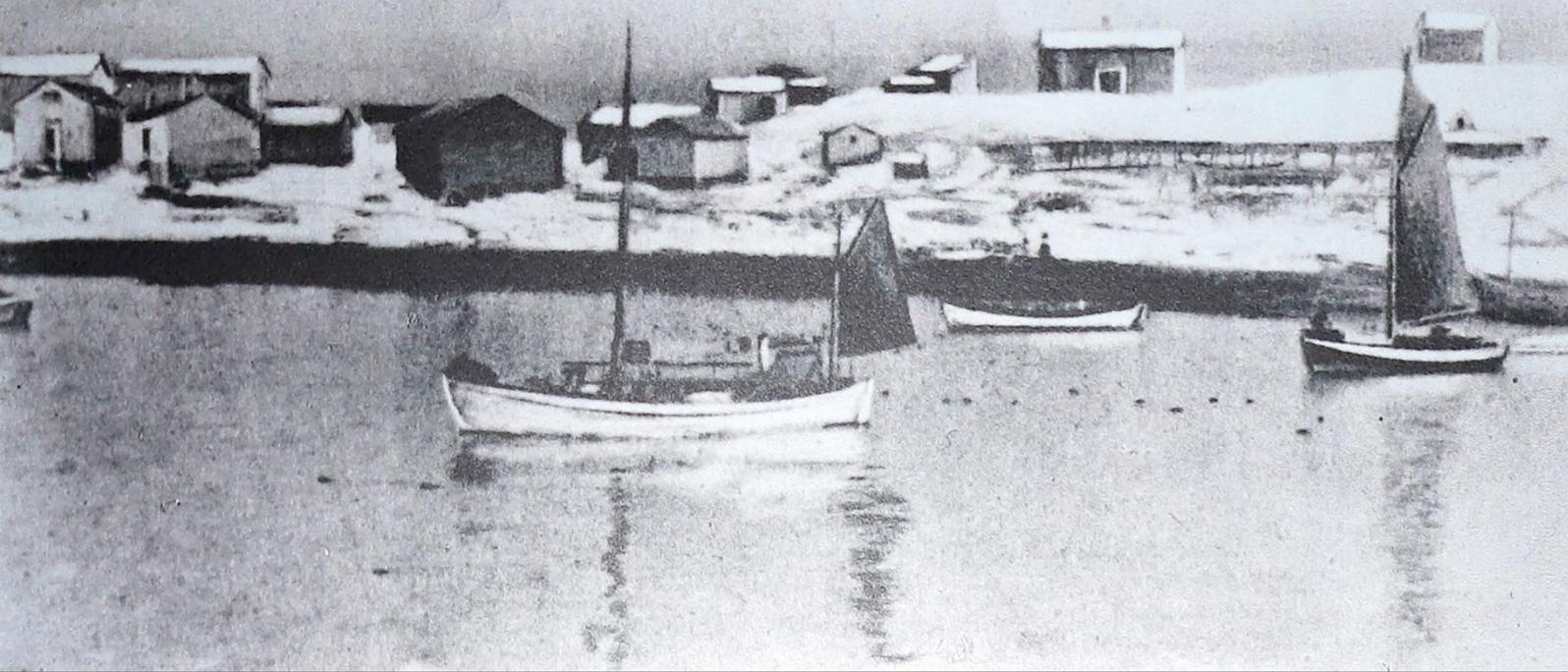
MANAGEMENT CYCLES: OVERARCHING AIMS, PLANNING, RESOURCES, IMPLEMENTATION, MONITORING AND RESULTS			
	LOCAL MANAGEMENT SYSTEM	CONTRIBUTIONS FROM INTERNATIONAL/NATIONAL/COUNTY LEVEL	ASSESSMENT OF GAPS AND OPPORTUNITIES
OVERARCHING AIMS	<p>A brief outline of some priority outcomes identified by the Management Plan for the Vega Archipelago 2015-2022 (which are further enhanced for the natural environment by the specific management plans of Vega's protected areas):</p> <ul style="list-style-type: none"> • The maintenance, or enhancement, of the natural and cultural landscape values that form the basis for 'Vegaøyen – The Vega Archipelago' to be World Heritage, as defined and described in the Retrospective Statement of Outstanding Universal Value, through active, balanced and sustainable use, based on a vibrant local community on Vega • Vega Archipelago as a living knowledge centre for dissemination, management and use of the natural and cultural landscapes along the coast through economically, environmentally and socially sustainable activities and good long-term knowledge-based projects. • Protection through use: the cultural landscape as a result of continuity and change in the natural and cultural environment, the need for further development and innovation within the limits set by sustainable use. 	<p>Overarching aims for Norway's heritage are also delineated by:</p> <ul style="list-style-type: none"> • the periodic government white papers for Norwegian heritage • diverse national legislation and policy frameworks or county-level regulatory frameworks, in particular of the Ministry of Climate and Environment, and the Directorate of Cultural Heritage and the Norwegian Environment Agency on its behalf 	<ul style="list-style-type: none"> • Favouring of natural resource use proposals that are locally based and small-scale • Ensuring that the Vega model spreads into the neighbouring municipalities in recognition that the whole coastal area is interconnected • Initiatives for fishers (and fisher-farmers) are missing • Support could be offered for evolving/new uses of natural resources, not just traditional ones • More heritage-values based tourism management would be beneficial •
RESOURCES	<p><i>Intellectual/human resources:</i></p> <ul style="list-style-type: none"> • Local community/civil society: <ul style="list-style-type: none"> ○ Traditional natural resource use and management handed down through customary practices ○ Accrued knowledge of private owners of built heritage • Vega Municipality staff and outsourced expertise and operational capacity in environmental protection, planning and technical, welfare, finance, tourism etc. 	<p><i>Intellectual/human resources:</i></p> <ul style="list-style-type: none"> • Norwegian Environment Agency and Directorate of Cultural Heritage provide professional advice on natural and cultural heritage issues in general and, through the World Heritage Focal Points, on World Heritage matters specifically • Nordland County Governor - Division for Agriculture: centre of 	<ul style="list-style-type: none"> • World Heritage has been explicitly recognized in multiple national funding programmes • Resources to date are more readily available for land-based initiatives (e.g., eider tending, grazing, etc), than for sea-based initiatives • Incentives for aquaculture but not for fishing

	<ul style="list-style-type: none"> • Human/intellectual resources specific to the Vega heritage designations bring their own knowledge, competencies and skills and operational capacity, but are also active in capacity building others: <ul style="list-style-type: none"> ○ World Heritage Coordinator ○ World Heritage Foundation’s Board and Advisory Body ○ Vega Protected Areas Manager (seconded from the County Governor of Nordland) and the Protected Areas Board • Helgeland Museum supports owners regarding conservation in all 18 municipalities and a specific Buildings Protection Consultant dedicates 50% of his time just to the World Heritage property <p><i>Financial resources:</i></p> <ul style="list-style-type: none"> • Private owners largely maintain their own property and livelihoods • Municipal budget • The World Heritage Foundation has budget that it gains from diverse funding streams 	<p>expertise for the development of multifunctional agriculture and a living cultural landscape</p> <ul style="list-style-type: none"> • Nordland County Council provides advice to landowners and local authorities on all matters relating to archaeological and historical monuments and sites • Collaborations with national research institutes such as NINA, NIVA, NIBIO etc. <p><i>Financial resources:</i></p> <ul style="list-style-type: none"> • Ministry of Climate and the Environment special funding for the World Heritage Foundation and its Coordinator • Norwegian Environment Agency provides funding for activities for Vega’s protected areas including funding the manager • Directorate of Cultural Heritage provides funding for a wide range of actions, this includes grant aid via Nordland County Council for the protection of cultural heritage sites/cultural environments • The County Governor of Nordland provides grant for landowners and institutions like the Foundation for management, mapping and management plans for endangered landscape types 	<ul style="list-style-type: none"> • The municipalities are an important player in overall responsibility and management of the World Heritage area but there seems limited recognition, funding and capacity building to this end.
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		<ul style="list-style-type: none"> • Other national agencies provide project funding e.g., agricultural funds. 	
PLANNING	<ul style="list-style-type: none"> • Master / land-use planning for the Vega municipal area • Coastal planning for the Helgeland municipalities • Management planning for the protected areas • Management planning for the World Heritage property with associated action plans • Other sector specific planning, e.g., that prepared by the Vega Municipality tourism manager • Traditional preparatory work linked to continuity of seasonal practices regarding natural resource use and management and the maintenance of built heritage 	<ul style="list-style-type: none"> • Mandatory institutional contributions to the Vega-specific formal planning tools listed from national and county level authorities • Vega-specific plans drawing on, or aligning with, broader regulatory frameworks, e.g., the tourism strategy for Nordland • Specific contributions, e.g., identifying heritage by Nordland County Governor's Division for Environmental Conservation, responsible for, amongst other things, registering natural features worthy of protection • National planning jurisdiction for the use of sea areas deeper than 2m and marine resources 	<ul style="list-style-type: none"> • An absence in the territorial planning frameworks of mechanisms to consider OUV and a values-based approach proactively, not reactively • Management planning for heritage emphasises conservation actions with few incentives for local people, whose livelihoods are part of OUV • Current management plan analyses the World Heritage (traditional practices, existing biological diversity, etc.) and factors affecting the World Heritage area but less strong in analysing WH area governance/ management mechanisms, congruity with results to be achieved and improvements to be made
IMPLEMENTATION	<ul style="list-style-type: none"> • Municipality delivers services to local people, whose continuity and livelihoods in Vega are part of OUV • Municipal officers check compliance with spatial planning regulations and implementation of municipal services and maintenance • Representatives of management authorities, the Norwegian Nature Inspectorate, the regional museum authority and the local World Heritage Coordinator work jointly to ensure the implementation of the World Heritage management plan cycle currently endorsed 	<ul style="list-style-type: none"> • Norwegian Nature Inspectorate checks compliance with protected areas and wider environmental regulations • Nordland County Governor - Division for Agriculture: implementing governmental agricultural policies in Nordland, in part by administering and verifying financial transfers to agriculture 	<ul style="list-style-type: none"> • Implementation of the various management plans for the World Heritage area perhaps suffer from a lack of clear legal mandate and roles (the case of World Heritage), lack of resources/expertise also in decision-making mechanisms (the case of the protected areas)

	<ul style="list-style-type: none"> • The Protected Areas Manager oversees implementation of protected area plans 	<ul style="list-style-type: none"> • Specific contributions, e.g., Nordland County Governor's Division for Environmental Conservation administering public areas for open-air recreation 	
MONITORING	<p>Monitoring currently covers these three areas:</p> <ul style="list-style-type: none"> • Monitoring and evaluation to better understand the heritage values, attributes, integrity and authenticity of the World Heritage • Monitoring of the state of conservation of the World Heritage area, the buffer zone and the wider setting • Monitoring of activities in relation to funding received or statutory mandate of organization: <ul style="list-style-type: none"> ○ World Heritage Foundation annual reports ○ Annual reports of Protected Areas ○ Municipality transparency and accountability procedures <p>Furthermore, monitoring for World Heritage obligations sees the Vega Archipelago World Heritage Foundation and the Norwegian Nature Inspectorate jointly responsible for reporting to UNESCO and for developing good surveillance and documentation routines for the World Heritage area in accordance with the planning mechanisms and the Retrospective Statement of Outstanding Universal Value</p>	<ul style="list-style-type: none"> • Norwegian Environment Agency, Cultural Heritage Directorate, Protected Areas Board, Norwegian Nature Inspectorate are observers on the World Heritage Foundation board • Norwegian Nature Inspectorate monitors the protected areas • Cultural Heritage Directorate monitors the conservation conditions of SEFRAK (listed) buildings and sites • Specific contributions, e.g., Nordland County Governor - Division for Agriculture: controlling and supervising commercial activities in agriculture and forestry, including ensuring that they are carried out in accordance with the demands for sustainability and the maintenance of biological diversity • The Nordland Regional Directorate of Fisheries: monitoring maritime areas 	<ul style="list-style-type: none"> • Monitoring and review of the effectiveness and efficiency of the overall composite management system and governance for the World Heritage area, the buffer zone and the wider setting is missing • Ecosystems/habitat/species monitoring needs to be more systematic • Visitor data missing • Database integration would benefit long-term management

Parti fra Bremstein

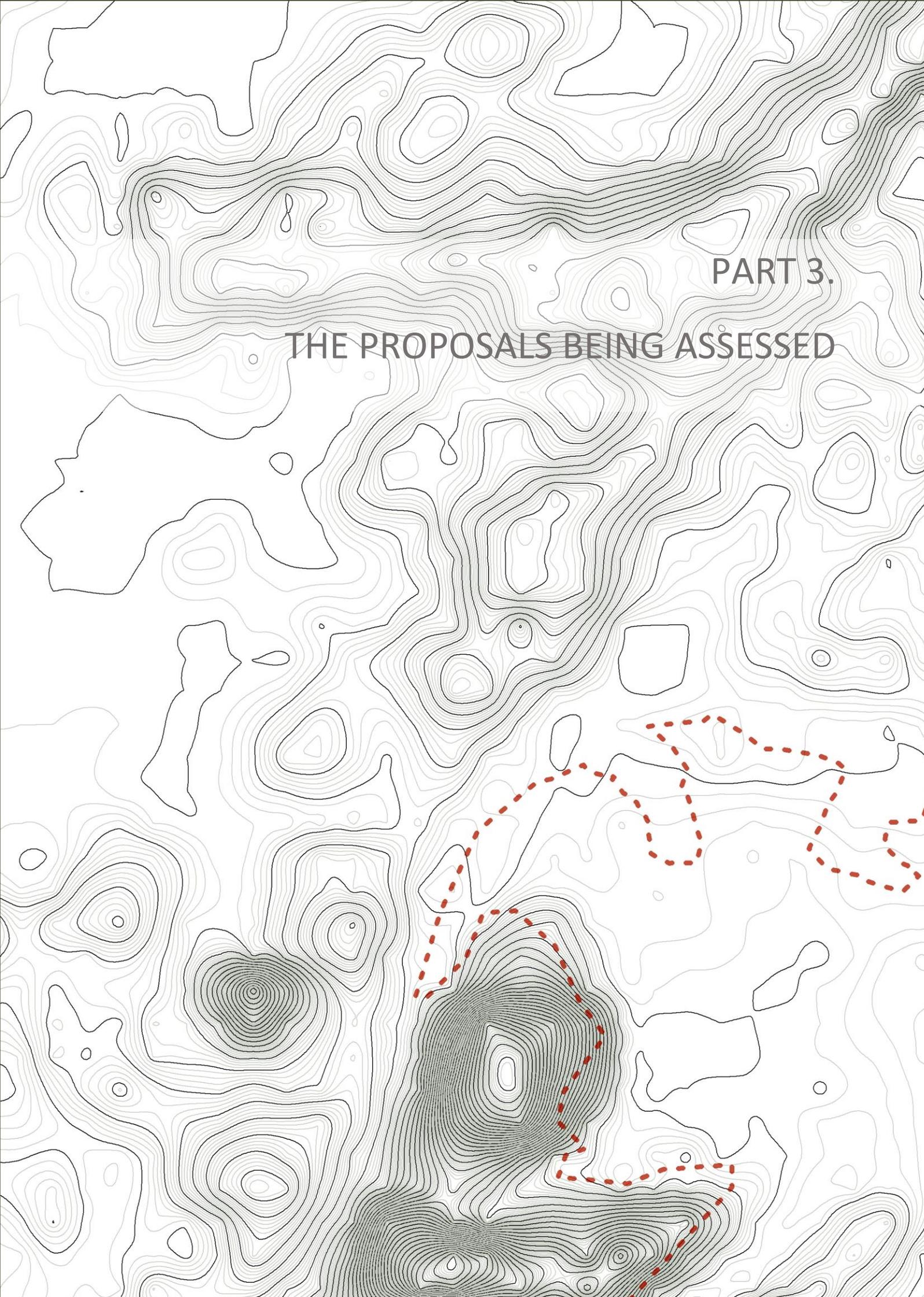


Heimlandet, Bremstein in 1910 and 1974. Source: Vegaøyen World Heritage Foundation





Eider duck tenderers cleaning eider down on the island of Länan. Source: Sarah Court/Instead Heritage

The background of the page is a detailed topographic map. It features numerous contour lines of varying thickness and spacing, representing different elevations. The lines are more densely packed in some areas, indicating steeper slopes, and more widely spaced in others, indicating flatter terrain. A prominent red dashed line is drawn across the map, starting from the lower right, moving towards the center, then curving upwards and to the right, and finally extending towards the top right. This line likely represents a specific route or boundary being discussed in the document.

PART 3.

THE PROPOSALS BEING ASSESSED

3.1 POLICY AND REGULATORY CONTEXT

This Supplementary impact assessment of the Helgeland Coastal Plan for the World Heritage property of 'Vegaøyane – The Vega Archipelago' considers the section of the Helgeland Coastal Plan that concerns Vega Municipality, including two individual proposals for aquaculture facilities. However, these are most usefully understood within the broader context of Norwegian aquaculture and the current policy framework.

3.1.1 The development of aquaculture in Norway

The development of Norwegian aquaculture has largely been a response to the decline in fish stocks. In fact, the first legislation passed by the Norwegian government to preserve the declining salmon stocks in 1848 was a result of the fisheries being under increasing pressure in the nineteenth century, which resulted in hatcheries being established and the first experiments in artificially rearing fish in Norway in order to restock the watercourses.²¹⁶

However, it was not until the 1950s and 1960s that greater efforts were made by pioneer fish farmers to find viable solutions for marine aquaculture, and these mostly came from people living in coastal areas.²¹⁷ These early efforts benefitted from being carried out within communities who could draw on accumulated knowledge of the sea and its conditions, fish, boats and mooring, and sea equipment. These early fish-farmers usually had other jobs, such as land-based farming or fishing, to support them, with aquaculture being a secondary source of income.²¹⁸

By the 1970s aquaculture had grown enough to be an important emerging industry, with a shift from facilities on the waterfront to being in the sea. A public exploratory committee was set up to report to the Norwegian government with an emphasis on ensuring that aquaculture would continue to benefit those communities who were suffering from the collapse of the coastal fisheries. The Lysø Committee, supported by administrative and political hearings, concluded in its final 1977 report that the aquaculture industry should be primarily reserved for the people who worked the installations, with a distinct opposition to large-scale businesses, in order to support local coastal communities. Regulations on licenses ensured restrictions on local ownership and the size of aquaculture companies were maintained until the early 1990s, when the industry was liberalized, allowing small concerns to be bought up and the creation of larger companies. This led to greater efficiency and industrialization, also in the form of an increasing shift from individual manual labour to mechanized processes.²¹⁹ The early years of the industry were largely not very profitable and many companies went bankrupt due to disease outbreaks. Limits and measures responding to environmental concerns, health, quality, and sickness prevention in the fish stocks, together with technical developments, have reduced these problems and led to ever large facilities (Figure 3.1).²²⁰

²¹⁶ Christensen, P. (2017) Fish farming – a new coastal industry, 1970-2015. In: Kolle, N., Nielssen, A.R., Døssland, A. & Christensen, P. (eds) *Fish, Coast and Communities: a history of Norway*. Fagbokforlaget: 292.

²¹⁷ Christensen, P. (2017) Fish farming – a new coastal industry, 1970-2015. In: Kolle, N., Nielssen, A.R., Døssland, A. & Christensen, P. (eds) *Fish, Coast and Communities: a history of Norway*. Fagbokforlaget: 295-6.

²¹⁸ Hovland, E. (2014) *Over den leiken ville han rå: norsk havbruksnærings historie*. Fagbokforlaget.

²¹⁹ Christensen, P. (2017) Fish farming – a new coastal industry, 1970-2015. In: Kolle, N., Nielssen, A.R., Døssland, A. & Christensen, P. (eds) *Fish, Coast and Communities: a history of Norway*. Fagbokforlaget: 291-322.

²²⁰ Svåsand, T. & Ojaveer, H. (eds) (2021) *Workshop on the Norwegian Sea Aquaculture Overview (WKNORAO)*. ICES Scientific Reports 3.116: 24. International Council for the Exploration of the Sea. Available from: <https://doi.org/10.17895/ices.pub.9574>

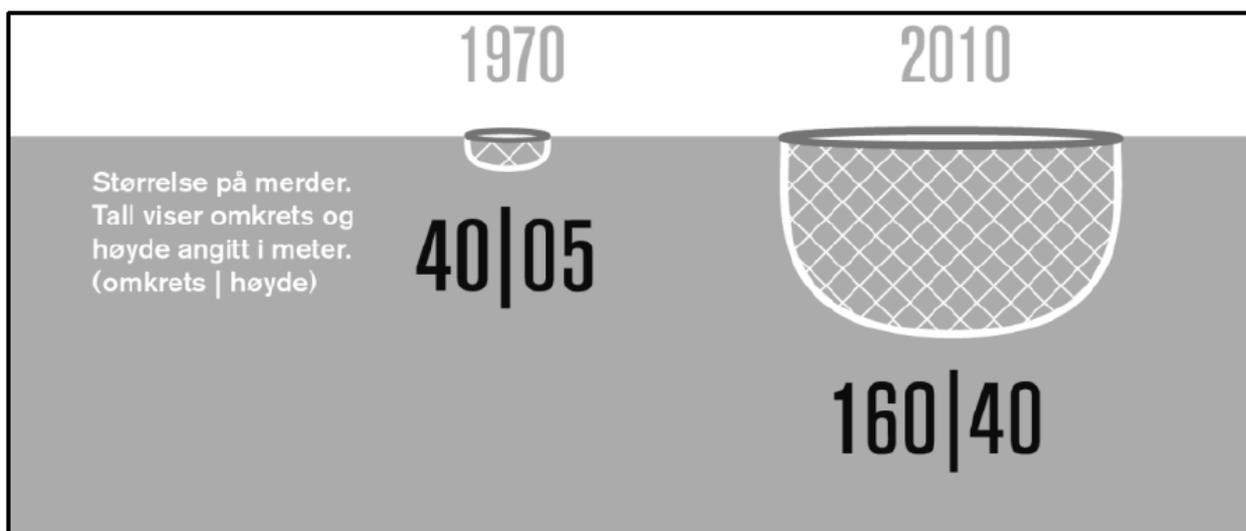


FIGURE 3.1. This illustration shows the growth in aquaculture net pen sizes as the industry has developed from 1980 to 2010. The figures below each net pen indicate the average circumference and height in meters. *Source: Teknologirådet* ²²¹

Today Norway is the largest salmon producer in the world, the seventh largest aquaculture producer globally and the second largest exporter of fish, producing 1.5 million tonnes of farmed fish in 2019.²²² The value of the industry has grown enormously in recent decades: whereas salmon and trout worth NOK 12.36 billion were exported in 2004,²²³ in 2021 3.1 million tonnes of seafood worth NOK 120.8 billion were exported.²²⁴

Atlantic salmon continues to dominate, accounting for 94% of production, although rainbow trout is also farmed, as are echinoderms, molluscs, crustaceans, and algae, but at very low levels compared to salmon.²²⁵ Aquaculture facilities are located along the entire Norwegian coast, with the three counties bordering the Norwegian Sea accounting for about 50% of Norway's aquaculture production in 2019. One of these is Nordland County, where the Vega Archipelago is situated, and it has been noted that the increase in regional aquaculture production since 2010 is mostly due to increases in Nordland alone (Figure 3.2).²²⁶

Employment in aquaculture has increased significantly as the industry has grown, although it has been noted that greater employment opportunities come from fish slaughter, processing and trade than in core aquaculture production.²²⁷ Employment in aquaculture continues to be considered of particular importance for rural coastal communities and a key objective for regional development policies which aim at sustaining rural and coastal communities throughout Norway by job creation and supporting local economies. Research

²²¹ Teknologirådet (2012) *Fremtidens lakseoppdrett* [online]. Available from: <https://teknologiradet.no/wp-content/uploads/sites/105/2018/04/Rapport-Fremtidens-lakseoppdrett.pdf>

²²² FAO (2021) *FAO Yearbook. Fishery and Aquaculture Statistics 2019*. FAO.

²²³ Fiskeri- og kystdepartementet (2005) *The Aquaculture Act: 7*. Available from: <https://www.regjeringen.no/en/dokumenter/the-norwegian-aquaculture-act/id430160/>

²²⁴ Norges sjømatråd (2022) *Sjømateksporten passerte 120 milliarder kroner i fjor* [press release]. Available from: <https://norges-sjoematraad-as.mynewsdesk.com/pressreleases/sjoemateksporten-passerte-120-milliarder-kroner-i-fjor-3153657>

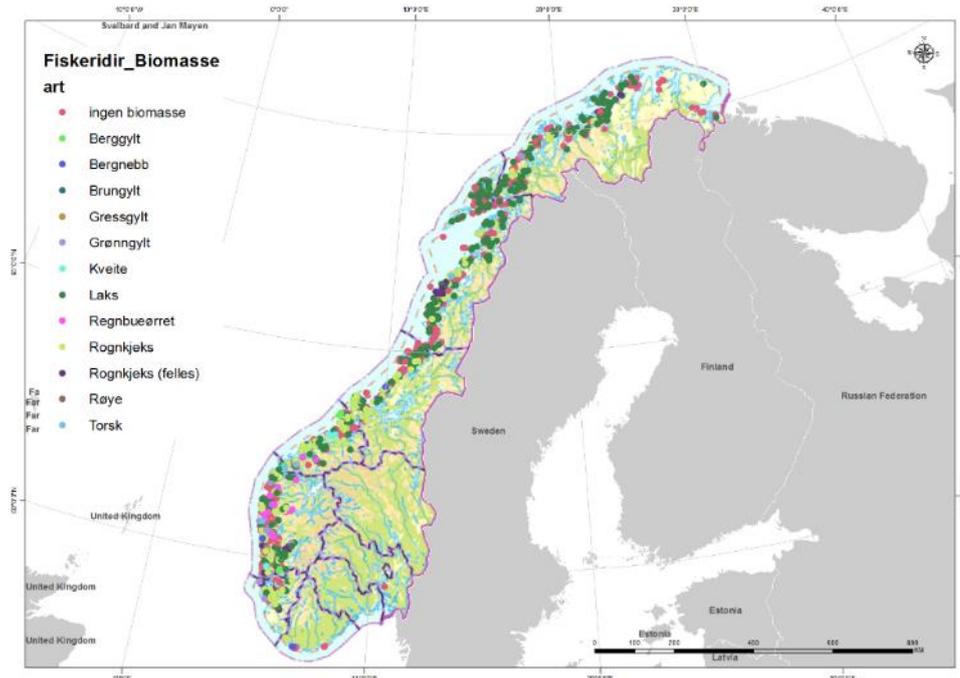
²²⁵ <https://www.fiskeridir.no/Akvakultur/Tall-og-analyse/Akvakulturstatistikk-tidsserier>

²²⁶ Svåsand, T. & Ojaveer, H. (eds) (2021) *Workshop on the Norwegian Sea Aquaculture Overview (WKNORAO)*. ICES Scientific Reports 3:9. ICES. Available from: <https://doi.org/10.17895/ices.pub.9574>

²²⁷ Johansen, U., Myhre, M.S., Richardsen, R. (2020) *Nasjonal betydning av sjømatnæringen. En verdiskapings-og ringvirkingsanalyse med data fra 2004-2019*. SINTEF Ocean AS.

in Arctic Norway, including Nordland County, showed that inhabitants of rural areas are largely supportive of the expansion of aquaculture because of its perceived economic contribution and job creation.²²⁸

The origins of early aquaculture in local ownership within coastal communities survives in part today, with family-owned aquaculture companies currently controlling 38% of total production. Tendentially, family-owned companies have much smaller operations and many of them are partially owned by external companies.²²⁹ Since deregulation of the industry, there has been a notable shift from 800 small companies in 1991 to just 142 in 2019.²³⁰ Significantly, by 2018 a third of Norwegian aquaculture companies were in foreign ownership and nearly half the largest companies have foreign owners.²³¹



²²⁸ Aanesen, M., Falk-Andersson, J., Vondolia, G.K., Borch, T., Navrud, S., Tinch, D. (2018) Valuing coastal recreation and the visual intrusion from commercial activities in Arctic Norway. *Ocean & Coastal Management* 153: 157–167.

²²⁹ Nyrud, T. & Mikkelsen, E. (2021) *Familieierskap i oppdrettsnæringen*. Nofima. Available from: <https://nofima.brage.unit.no/nofima-xmlui/handle/11250/2771854>

²³⁰ Fiskeridirektoratet (2019) *Statistikk for akvakultur 2018 – foreløpige tall*. Available from: <https://fdir.brage.unit.no/fdir-xmlui/handle/11250/2827503>

²³¹ Nøstbakken, L. & S.F. Selle (2019). *Eierskap i norsk oppdrettsnæring*. SNF-Arbeidsnotat 5/19. Samfunns- og næringslivsforskning AS.

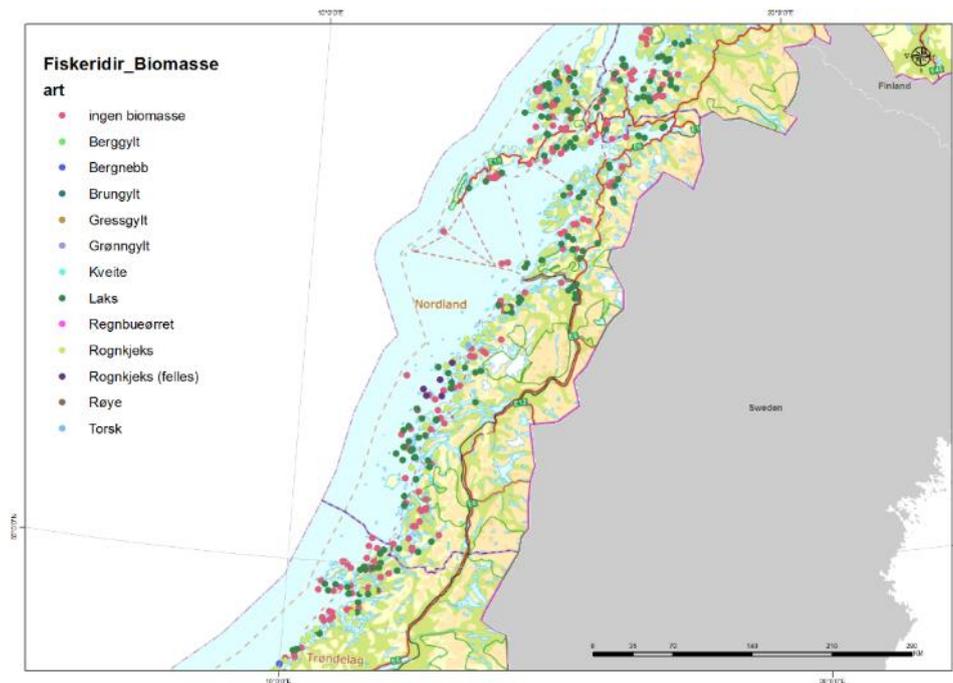


FIGURE 3.2. Above: aquaculture sites for various species are located all along the Norwegian coast. *Below: the concentration of aquaculture in Nordland County. Source: Norwegian Directorate of Fisheries²³²

3.1.2 National policy context for aquaculture

Norway has historically been a country that focused on the sea as a resource. Norwegian national policy related to its territorial waters, and in particular for resource use in marine environments, has evolved differently to parallel policy developments for agriculture and land-based resources. In recent decades, national policy for Norway's marine areas has included increasing emphasis on encouraging aquaculture as a growing industry with a significant contribution to GDP.²³³ The industry is enabled and regulated through the Aquaculture Act, with subsequent revisions and related regulations,²³⁴ which came into force in 2006 with the aim to 'promote the profitability and competitiveness of the aquaculture industry within the framework of a sustainable development and contribute to the creation of value on the coast'.²³⁵

The most recent related national policy was published in 2021 when the Norwegian government presented the report 'Blue Sea, Green Future' which highlighted challenges and opportunities for the marine economy, of which aquaculture was identified as an opportunity for coastal employment and business.²³⁶ This was followed shortly after by a specific aquaculture strategy called 'A Sea of Opportunities' which aims to make the system more efficient in order to facilitate further growth over the next ten years.²³⁷ The government clearly states that it has ambitions for growth in the aquaculture industry and therefore it is crucial that a

²³² Fiskeridirektoratet (no date) Akvakultur [online]. Available from:

<https://portal.fiskeridir.no/portal/apps/webappviewer/index.html?id=87d862c458774397a8466b148e3dd147>

²³³ E.g., Det Kongelige Norske Videnskabers Selskab & Norges Tekniske Vitenskapsakademi (2012) *Verdiskaping basert på produktive hav i 2050*. DKNVS/NTVA. Available from: <https://www.sintef.no/siste-nytt/2012/verdiskaping-basert-pa-produktive-hav-i-2050/>

²³⁴ Lov om akvakultur (akvakulturloven). Available from: <https://lovdata.no/dokument/NL/lov/2005-06-17-79>

²³⁵ Fiskeri- og kystdepartementet (2005) *The Aquaculture Act*. Available from: <https://www.regjeringen.no/en/dokumenter/the-norwegian-aquaculture-act/id430160/>

²³⁶ Nærings- og fiskeridepartementet (2021) *Blått hav, grønn fremtid. Regjeringens satsing på hav og havnæringer*. Available from: <https://www.regjeringen.no/no/dokumenter/regjeringens-havrapport/id2857445/>

²³⁷ Nærings- og fiskeridepartementet (2021) *Et hav av muligheter – regjeringens havbruksstrategi*. Available from: <https://www.regjeringen.no/no/dokumenter/havbruksstrategien-et-hav-av-muligheter/id2864482/>

sufficient number of new areas are allocated for aquaculture in coastal waters.²³⁸ This is not the first time that these ambitions have been stated and it has resulted in coastal planning in Norway where aquaculture is a clear priority.

National planning priorities are defined every four years by the national government, and these form the strategic framework for local planning. In the most recent document (2019-2023), significant emphasis was placed on 'marine-based wealth creation' for the country, with aquaculture as the means of increasing prosperity and employment. One of the national expectations is that 'the county and municipal authorities set aside sufficient areas for the desired growth in fish farming and aquaculture through updated plans, which also safeguard environmental considerations and other societal interests.'²³⁹ This tiering of national-county-municipal planning can be seen in the case of the Vega Archipelago, with aquaculture forming the prominent element of the Helgeland Coastal Plan, facilitated by county guidance on planning.²⁴⁰

However, the drive to increase aquaculture production is always accompanied in official documents with the recognition that this needs to be achieved sustainably and without impacting negatively on the natural environment. Indeed, national policies are explicitly placed in the context of sustainable development. For example, the recent planning guidance clearly set out the aspiration that Norway would be guided by the United Nation's Sustainable Development Goals.²⁴¹ It also acknowledged that sustainable development needs to be based on well-functioning ecosystems in order to deliver ecosystem services.²⁴² Therefore, in parallel, environmental policies also make explicit reference to aquaculture, acknowledging the negative environmental impacts that can occur and referring to the regulations under the Aquaculture Act that need to be respected in order to avoid this.²⁴³ The implications of the Aquaculture Act are that aquaculture facilities must not have any 'appreciable negative consequences for the surrounding environment and wild organisms'.²⁴⁴

3.1.3 Coastal planning for aquaculture

Currently aquaculture in Norway takes place within the coastal zone (defined as being within one nautical mile beyond the coastal baseline), so it falls within the responsibility of municipalities to include seascapes, not just landscapes, when planning at a territorial scale. Therefore, the Planning and Building Act also applies to planning of coastal sea areas. In the case of Vega Municipality, as with many others, planning for the

²³⁸ Nærings- og fiskeridepartementet (2021) *Et hav av muligheter – regjeringens havbruksstrategi*: 61. Available from: <https://www.regjeringen.no/no/dokumenter/havbruksstrategien-et-hav-av-muligheter/id2864482/>

²³⁹ Kommunal- og moderniseringsdepartementet (2019) *Nasjonale forventninger til regional og kommunal planlegging 2019-2023*: 19. Available from: <https://www.regjeringen.no/no/dokumenter/nasjonale-forventninger-til-regional-og-kommunal-planlegging-20192023/id2645090/>

²⁴⁰ For example, section 8.5 of the county planning guidelines state that 'Spatial planning at all levels must ensure that the aquaculture industry receives adequate and satisfactory areas for sustainable production,' see: Nordland Fylkeskommune (2013) *Arealpolitiskeretningslinjerj. Fylkesplanen for Nordland 2013-2025*: 13.

²⁴¹ Kommunal- og moderniseringsdepartementet (2019) *Nasjonale forventninger til regional og kommunal planlegging 2019-2023*. Available from: <https://www.regjeringen.no/no/dokumenter/nasjonale-forventninger-til-regional-og-kommunal-planlegging-20192023/id2645090/>

²⁴² Nybø, S. & Evju, M. (eds) 2017. *Fagsystem for fastsetting av god økologisk tilstand. Forslag fra et ekspertråd. Ekspertrådet for økologisk tilstand* 247 s. Available from: <https://www.regjeringen.no/no/dokument/rapportar-og-planar/id438817/>.

²⁴³ Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]: 92. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20152016/id2468099/>

²⁴⁴ Naturforvaltningsavdelingen (2009) *Norway's National Report on Implementation of the Convention on Biological Diversity*.

Available from:

https://www.regjeringen.no/globalassets/upload/md/vedlegg/rapporter/norways_national_report_on_implementation_of_the_convention_on_biological_diversity.pdf

coastal areas forms a sub-plan of the municipal masterplan. Furthermore, it is considered important to coordinate coastal planning with the neighbouring municipalities across municipal borders so that more effective and coherent planning can be delivered along the Helgeland coast (section 3.2).

While there are several framework documents for aquaculture and some sector-specific guidance (e.g., the Directorate of Fisheries' reference document for the appropriate application of the Planning and Building Act in cases of coastal planning),²⁴⁵ the Norwegian government has acknowledged the need for specific guidance for municipalities who are facing challenges in this area. A recent report on planning for coastal waters, commissioned by the Ministry of Local Government and Regional Development, noted that there was a need for more guidance for local planners so that they could ensure the protection of the natural environment and its biodiversity, while facilitating the national plan for growth of the aquaculture industry.²⁴⁶

Currently there are significant incentives for municipalities to identify appropriate areas within their boundaries for aquaculture facilities thanks to the Aquaculture Fund. This fund is created from the fees paid for operating aquaculture facilities and paid out by the Directorate of Fisheries: in 2020 NOK 6.9 billion were obtained in this way, 80% of this was distributed by the Aquaculture Fund to the municipalities and, to a smaller extent, the county councils, according to the biomass produced in the individual municipalities each year (Table 3.1).²⁴⁷ Additional funds are available when a new site comes into operation for the first two years, which is an additional incentive for expanding existing aquaculture.²⁴⁸ In 2021 a new production tax was introduced that from 2022 will go directly to municipalities and county councils. It is estimated that this will be in the region of NOK 500 million annually. Some individual companies also provide sponsorship of community projects in areas near to their facilities.²⁴⁹

TABLE 3.1. Payments to the Vega Municipality from the Aquaculture Fund for aquaculture facilities in its coastal area. Source: Directorate of Fisheries²⁵⁰

2017	2018	2019	2020	2021
140,104 NOK	6,619,891 NOK	3,121,546 NOK	6,117,700 NOK	6,680,843 NOK

3.1.4 Aquaculture licencing

The Aquaculture Act lays out requirements for obtaining aquaculture licences, which in reality form two parts: a) general licences given for a maximum permitted biomass of a specific species (e.g., number of kilos of live fish), and b) site licences given for a specific location.

²⁴⁵ Kiland-Langeland, T.C, Morvik, K, et al. (2012) *Retningslinjer for arbeid med kystsonoplanlegging i Fiskeridirektoratet*. Fiskeridirektoratet. Available from: <https://fdir.brage.unit.no/fdir-xmlui/handle/11250/130966>

²⁴⁶ AsplanViak (2021) *Forprosjekt. Statlig planretningslinje for planlegging i sjø*. Kommunal- og moderniseringsdepartementet.

Available from: <https://www.regjeringen.no/no/dokumenter/forprosjekt-statlig-planretningslinje-for-planlegging-i-sjo/id2863119/>

²⁴⁷ Nærings- og fiskeridepartementet (2021) *Et hav av muligheter – regjeringens havbruksstrategi*: 18. Available from: <https://www.regjeringen.no/no/dokumenter/havbruksstrategien-et-hav-av-muligheter/id2864482/>

²⁴⁸ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 22ff.

²⁴⁹ These range from broad sponsorship programmes, such as <https://mowi.com/no/sponsor/>, through to the range of donations provided by Vega Sjøfarm to projects in the Vega Archipelago.

²⁵⁰ Fiskeridirektoratet (2022) *Havbruksfondet* [online]. Available from: <https://www.fiskeridir.no/Akvakultur/Tema/Havbruksfondet>

An applicant who wishes to obtain a site licence does so through the relevant county council (in the case of Vega, this is the Nordland County Council), which must approve the site for use (Figure 3.3).²⁵¹ This is judged on:

- whether the site is in environmentally suitable location and in respect of the Nature and Biodiversity Act and the Cultural Heritage Act;
- if it is compatible with any local land-use or coastal plans and respects the Building and Planning Act;
- if relevant permits have been obtained from:
 - the County Governor,
 - the Food Safety Authority,
 - the Coastal Administration
 - and the Water Directorate.

There is also a public hearing process and then the county council takes the final decision.²⁵² To give a measure of the application process, in 2020 1,087 licenses for Atlantic salmon and trout in seawater were issued in Norway.²⁵³

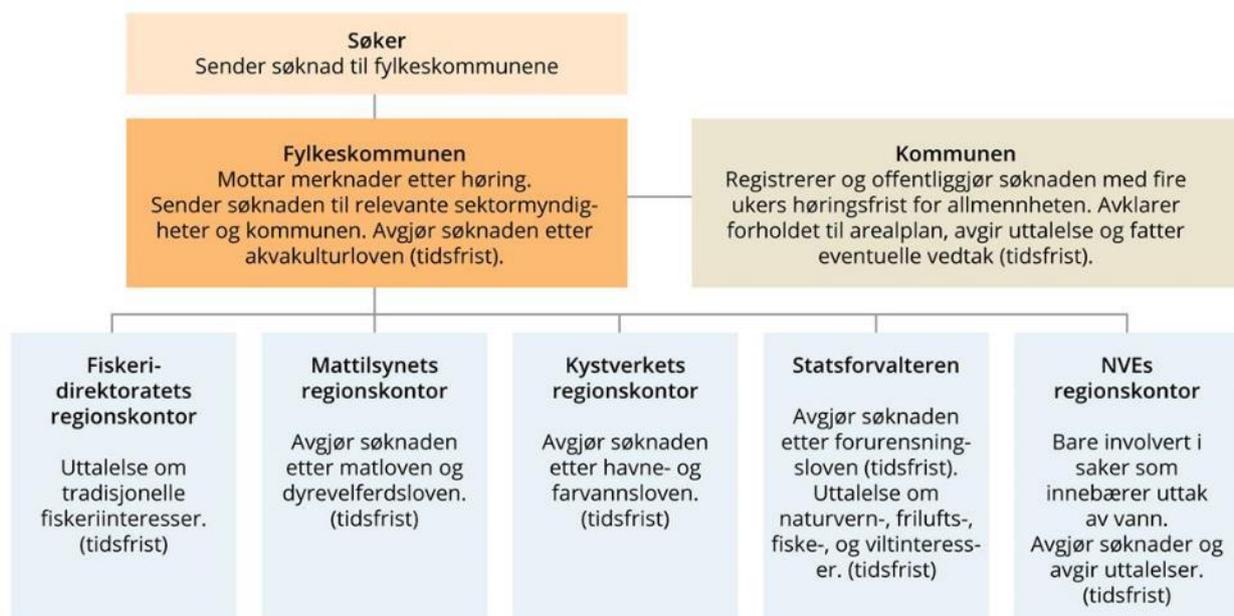


FIGURE 3.3. The application process for the being able to operate an aquaculture facility showing the large number of institutions involved. *Source: Ministry of Trade, Industry and Fisheries*²⁵⁴

The policy frameworks aim to make actors at all levels work to ensure that aquaculture is carried out in an environmentally sound manner. This includes the requirement that aquaculture companies carry out environmental surveys (known as B- and C-surveys) when planning to establish a new aquaculture location, as well as periodic monitoring during operations and closure of a facility. There are two types of seafloor surveys carried out, directly under the facilities and within the vicinity of the aquaculture net pens to monitor

²⁵¹ Fiskeridirektoratet (2020) *Akvakultursøknad* [online]. Available from: <https://www.fiskeridir.no/Akvakultur/Registre-og-skjema/Skjema/Akvakultursoeknad>

²⁵² Svåsand, T. & Ojaveer, H. (eds) (2021) *Workshop on the Norwegian Sea Aquaculture Overview (WKNORAO)*. ICES Scientific Reports 3.116: 15. International Council for the Exploration of the Sea. Available from: <https://doi.org/10.17895/ices.pub.9574>

²⁵³ Mowi (2021) *Salmon Farming Industry Handbook*. Mowi: 81.

²⁵⁴ Nærings- og fiskeridepartementet (2021) *Havbruksstrategien – Et hav av muligheter* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/havbruksstrategien-et-hav-av-muligheter/id2864482/>

the environmental conditions related to a specific facility in accordance with relevant national standards.²⁵⁵ B-surveys describe general trends in environmental conditions in the immediate vicinity of a site by taking samples from the seafloor. In order to understand the degree of impact on the seabed from aquaculture they include chemical measurements and a qualitative assessment of sediments, and note the presence/absence of fauna. The results grade conditions from '1: very good' to '4: very poor'.²⁵⁶ C-surveys are more comprehensive and are intended to assess the impacts of aquaculture on the surrounding area, with samples taken i) close to the aquaculture facility, ii) at an intermediate distance and iii) at a greater distance. These surveys measure the chemistry and composition of the seabed sediment, fauna analysis, etc., as well as assessing if the organic material comes from the aquaculture facility or other nearby sources.²⁵⁷ The results of the surveys then indicate how soon the next round of monitoring takes place, with poorer results requiring more frequent monitoring and, should conditions deteriorate more seriously, may suggest the need to leave a site fallow for a period.

Another form of monitoring is done at the level of so-called 'production zones' along the coast, which was introduced in 2015 in acknowledgement that while individual facilities were monitored, there was no measure of the cumulative impact of multiple facilities on the environment. As a result, a traffic-light system was established to determine where and when it is appropriate to increase or reduce aquaculture production. Several indicators were originally considered but only one was selected: salmon lice levels within aquaculture facilities, which has been a particular concern not only for the mortality rate of the farmed fish but also their transmission to wild stocks.²⁵⁸ The salmon lice levels are reported weekly to the Norwegian Food Safety Authority and subsequently the production area is given a colour coding (red, amber, green). Red areas with significant lice problems are required to reduce production by 6%; yellow areas remain at the same level of production; facilities in a green area that have a lower than 10% mortality rate are invited to buy increased production capacity of up to 6%. This approach is intended to achieve predictable growth of aquaculture while considering environmental sustainability.²⁵⁹ However, it is noted that the only indicator used to inform production levels is the impact on wild salmon of lice originating from farmed fish and not, for example, the other environmental impacts which are illustrated in Figure 3.4.²⁶⁰

²⁵⁵ Standard Norge (2016) *NS 9410: Miljøovervåking av bunnpåvirkning fra marine akvakulturanlegg*. Standard Norge.

²⁵⁶ Fiskeridirektoratet (2020) *B-undersøkelser* [online]. Available from: <https://www.fiskeridir.no/Akvakultur/Drift-og-tilsyn/Overvaaker-miljoepaavirkningen/B-undersokelser>

²⁵⁷ Fiskeridirektoratet (no date) *C-undersøkelser* [online]. Available from: <https://www.fiskeridir.no/Akvakultur/Drift-og-tilsyn/Overvaaker-miljoepaavirkningen/C-undersokelser>

²⁵⁸ Klima- og miljødepartementet (2015) *Meld. St. 14 (2015–2016) Natur for livet — Norsk handlingsplan for naturmangfold* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20152016/id2468099/>

²⁵⁹ Nærings- og fiskeridepartementet (2015) *Meld. St. 16 (2014–2015) Forutsigbar og miljømessig bærekraftig vekst i norsk lakse- og ørretoppdrett* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-16-2014-2015/id2401865/>

²⁶⁰ Svåsand, T. & Ojaveer, H. (eds) (2021) *Workshop on the Norwegian Sea Aquaculture Overview (WKNORAO)*. ICES Scientific Reports 3.116: 16. International Council for the Exploration of the Sea. Available from: <https://doi.org/10.17895/ices.pub.9574>

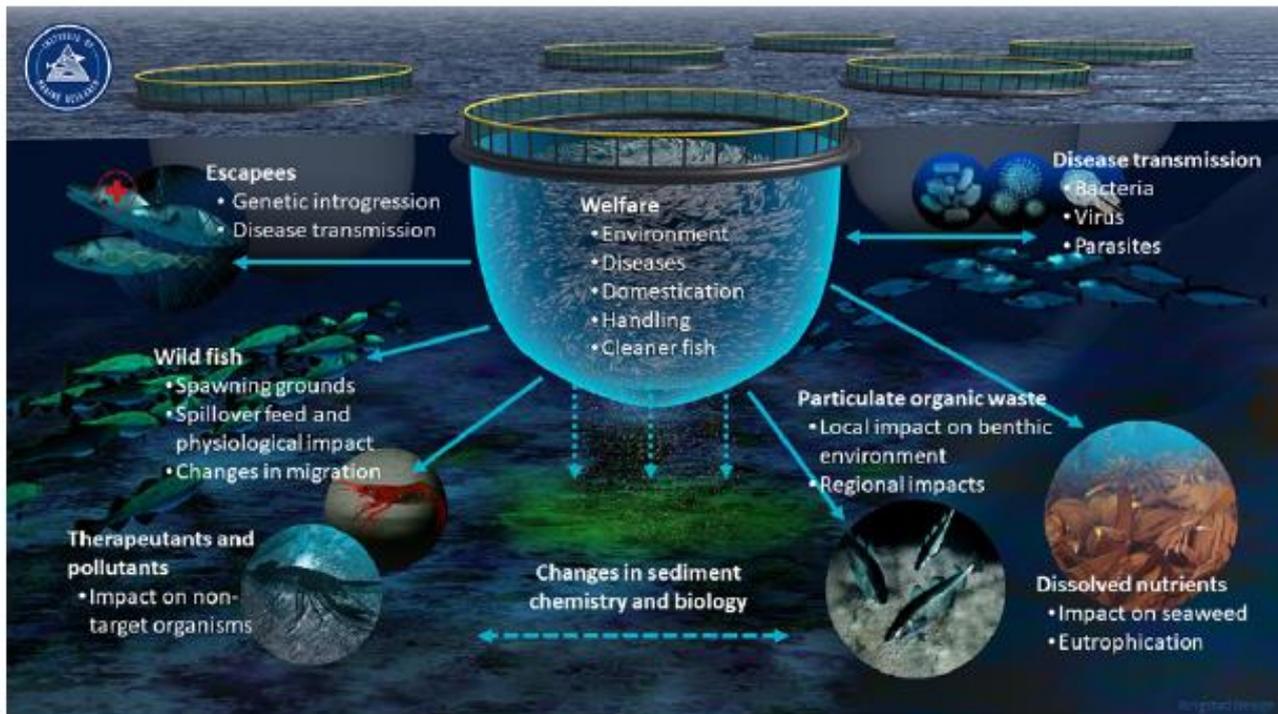


FIGURE 3.4. Environmental impacts of fish farming in open net pens and identified risk factors. These show other potential indicators of the impact of aquaculture on the environment, which in addition to salmon lice, could be monitored more regularly. Source: Havforskningsinstituttet²⁶¹

Finally, in addition to recording lice levels, the aquaculture facilities also report to the Norwegian Food Safety Authority on any lice countermeasures taken, such as medical treatments, mechanical removal or the use of cleaner fish. They are also required to report suspected outbreaks of infectious viral diseases (pancreas disease or infectious salmon anaemia).

3.1.5 The Vega Archipelago and aquaculture

The issue of aquaculture and its relationship to the Outstanding Universal Value of 'Vegaøyen – The Vega Archipelago' was first raised during the nomination process, when existing and planned aquaculture within the property and buffer zone was noted. The ICOMOS evaluation of the nomination file highlighted a lack of a knowledge base of the marine ecosystems as a problem in evaluating this factor.²⁶² The IUCN evaluation noted the discrepancy between only allowing traditional or low impact methods of resource use within the property when related to land-based agriculture and not applying this to aquaculture. It was recommended that it be regulated to avoid or minimize environmental impacts, particularly considering the environmental damage documented at other places in Norway by aquaculture.²⁶³

This led the World Heritage Committee to add a request to its decision to inscribe 'Vegaøyen – The Vega Archipelago' on the World Heritage List, explicitly asking the State Party to 'develop a specific strategic plan for the World Heritage property that will contribute to the overall Master Plan for the archipelago' which

²⁶¹Svåsand, T. & Ojaveer, H. (eds) (2021) *Workshop on the Norwegian Sea Aquaculture Overview (WKNORAO)*. ICES Scientific Reports 3.116: 17. International Council for the Exploration of the Sea. Available from: <https://doi.org/10.17895/ices.pub.9574>

²⁶²ICOMOS (2004) Vega (Norway) No 1143 [online]. Available from: <https://whc.unesco.org/en/list/1143/documents/>

²⁶³IUCN (2004) World Heritage Nomination: IUCN Technical Evaluation Vegaøyen The Vega Archipelago (Norway) Id N° 1143 [online]. Available from: <https://whc.unesco.org/en/list/1143/documents/>

should address, among other issues, 'the interface between conservation and sustainable development in respect of aquaculture.'²⁶⁴

An Advisory Mission to the Vega Archipelago by ICOMOS and IUCN took place in 2017 with the aim of considering the relationship between aquaculture and the property's Outstanding Universal Value, particularly considering two new proposed facilities.²⁶⁵ The recommendations of the Advisory Mission are provided in Box 2.3.

BOX 2.3: Recommendations for revisions of plans and planning policies relating to aquaculture

Source: Report on the ICOMOS / IUCN Advisory Mission to Vegaøyen - The Vega Archipelago

Recommendation 1: The State Party should consider what additional policy mechanisms are available to raise the profile of World Heritage within the Norwegian Planning System.

Recommendation 2: In finalising the Vega Municipal Plan, the relevant authorities should consider additional policies or supplementary guidance (such as locational guidelines) to ensure that aquaculture developments within the World Heritage property do not impact adversely on OUV. Possible policies could include requirements for Heritage Impact Assessments (HIAs)/aquaculture capacity assessments, as well as detailed Environmental Impact Assessments (EIAs) to inform site selection, and requirements to consider mitigation.

Recommendation 3: The State Party should review the way in which plans that affect World Heritage properties are assessed within the Strategic Environmental Assessment (SEA) context, and the adequacy of cultural and environmental impact assessment procedures for individual aquaculture developments within the property. If these are found to be deficient in considering impacts to defined attributes of the property's OUV, then an improvement programme should be initiated, on the basis of the ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011). Guidance in Scotland for marine fish farming EIA (RPS 2007) may also be useful.

Specific recommendations in relation to the management of the property and aquaculture development

Recommendation 4: The State Party should not determine the two aquaculture licences until:

- The revised Vega Municipal Master Plan has been adopted with limitations on aquaculture in the World Heritage property - and with the clear need to ensure aquaculture does not impact on OUV;
- Adequate HIA and EIA have been undertaken, including an assessment of the potential for cumulative impacts to arise, in line with the ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011) and the IUCN World Heritage Advice Note on Environmental Assessment, respectively;
- The findings of the Vega working group, set up to investigate the impact of aquaculture on eider-duck husbandry, which is due to report in August 2017, is available and can be used as part of the HIA process. The report of this working group should be peer-reviewed and made publicly available as part of the overall assessment processes.

Recommendation 5: If the HIA and EIA (including the report on eider duck husbandry) conclude that aquaculture development would impact adversely on the attributes of OUV and there are no options to avoid these impacts or mitigate them to a satisfactory extent, then the licences should not be approved.

Recommendation 6: Depending on the results of the current eider-aquaculture impact work, consideration should be given to further strategic studies to investigate this issue. Such a study could include a properly developed monitoring

²⁶⁴ UNESCO World Heritage Centre (2022) *Decision 28 COM 14B.45: nominations of cultural properties to the World Heritage List (Vegaøyen - The Vega Archipelago)* [online]. Available from: <https://whc.unesco.org/en/decisions/128>

²⁶⁵ ICOMOS & IUCN (2017) *Report on the ICOMOS / IUCN Advisory Mission to Vegaøyen -- The Vega Archipelago (C 1143)* [online]. Available from: <https://whc.unesco.org/en/list/1143/documents/>

plan for eider – inside the boundary, and outside the boundary (control sites) of the property, and should focus on interactions between eider (and other bird species of high conservation value) with aquaculture sites. The aquaculture industry should be fully involved and opportunities should be explored for partnership funding, for example through the National Fund for Aquaculture. Monitoring the impact of changing recreational and commercial (large and small-scale) fisheries within the World Heritage property should also be considered, regardless as to whether the aquaculture developments go ahead.

Recommendation 7: The State Party should explore whether changes need to be made to the property Management Plan in order to allow it to address more actively the issues related to sustainable development. This should also explore what measures might be encouraged to strengthen the economy of local communities, how high-value organic produce associated with the World Heritage property might be developed; and whether and how aquaculture might contribute to sustaining the OUV of the property.

Recommendation 8: The State Party should continue to explore with relevant Municipality authorities, extension of the World Heritage property or its buffer zone to include adjacent islands and marine areas beyond the Vega Municipality and encourage opportunities to explore inter-municipal planning for aquaculture to reduce pressure on development within the existing property boundaries.

3.2 HELGELAND COASTAL PLAN

This supplementary assessment works on two levels: i) a strategic environmental assessment of the Vega municipal area of the Helgeland Coastal Plan (section 3.2), and ii) a more detailed impact assessment of the two proposals for aquaculture facilities at Rørskjæran and Hysvær (section 3.3) (it should be noted that the two locations for these individual aquaculture proposals are included within the Helgeland Coastal Plan). They are discussed below as the basis on which to then identify and predict potential positive and negative impacts on 'Vegaøyane – The Vega Archipelago' (section 4).

3.2.1 Coastal planning in a Norwegian context

The Planning and Building Act which gives municipalities responsibility for land-use planning and the development of local services (section 2.6.1), also gives them the right to establish plans for sea areas out one nautical mile from the coastal baseline.²⁶⁶ Coastal planning is an adapted form of land-use planning and land protection approaches, with the sea divided into identified zones for different categories of use. Municipalities are encouraged to work together to create intermunicipal coastal plans in recognition of the fact that many issues relating to the sea go beyond administrative boundaries and therefore need coordinated approaches. By mapping existing uses of the sea area in a single plan, which come under the responsibility of various national or local government institutions, the intention is to provide greater clarity and coordination among actors.

The Planning and Building Act states that municipal planning of the sea must consider traffic, shipping lanes, fishing, aquaculture, drinking water, nature and outdoor recreation areas.²⁶⁷ As noted in the previous section, current approaches to coastal planning place emphasis on facilitating the expansion of the aquaculture industry as outlined in national policy (section 3.1.2). It has long been noted that there is a risk that the very active participation of the aquaculture and fishing industries in coastal planning overwhelm other interests, such as the environment and recreation.²⁶⁸

In municipalities where coastal planning has not been adopted, conflicts over the use of sea areas can arise and have to be resolved through ad hoc planning dispensations. These are reactive to planning proposals and frequently inconsistent with earlier dispensations and those given by other local authorities. For this reason, strategic coastal planning is needed to provide municipalities with a proactive and consistent approach to how Norwegian sea areas will be used.

3.2.2 The Helgeland Coastal Plan

The Helgeland Coastal Plan, developed by the 11 neighbouring municipalities of Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy and Rødøy sets out strategic coastal planning for

²⁶⁶ Planning & Building Act: Lov om planlegging og byggesaksbehandling (plan- og bygningsloven): section 1-2. Available from: <https://lovdata.no/dokument/NL/lov/2008-06-27-71>

²⁶⁷ Planning & Building Act: Lov om planlegging og byggesaksbehandling (plan- og bygningsloven): section 11-7, 6. Available from: <https://lovdata.no/dokument/NL/lov/2008-06-27-71>

²⁶⁸ Stokke, K.B., Hanssen, M. & Hovik, S. (2006) *Kommunal kystzone planlegging. Et redskap for en balansert utvikling av havbruk og fiske. NIBR-rapport 2006:17*. NIBR: 9.

their respective sea areas (Figure 3.5).²⁶⁹ The Coastal Plan sets out to address other municipal planning processes, not just aquaculture, as stated in its intention to ‘set goals for the physical, environmental, economic, social and cultural development in municipalities and regions, clarify societal needs and tasks, and state how the tasks can be solved.’²⁷⁰ However, having identified that ‘the most important business activities in the sea areas for Helgeland are fishing, aquaculture and tourism,’²⁷¹ the focus thereafter is clearly placed on aquaculture (Figure 3.6). One example of this is that the plan ‘sets out a direction for which clarifications are considered central for coastal zone planning in the region to contribute to Helgeland being able to further develop the production of farmed salmon in a sustainable manner.’²⁷² It also notes that ‘the aquaculture industry experiences a shortage of space for further development and the fishing industry experiences that other industries’ space requirements may be in conflict with their activity,’²⁷³ and repeats the need ‘to contribute to Helgeland being able to further develop the production of farmed salmon in a sustainable manner.’²⁷⁴

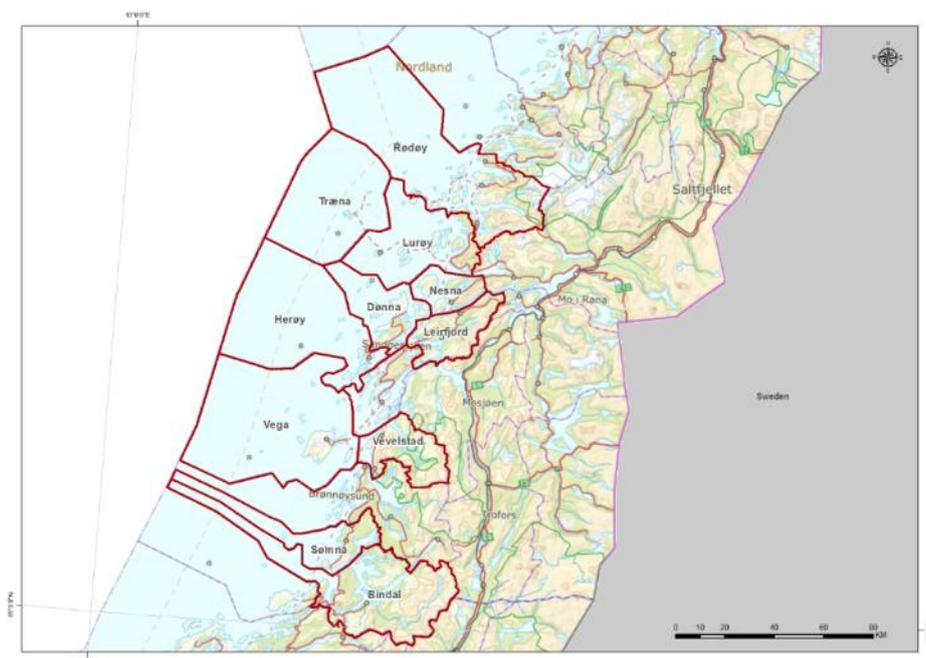


FIGURE 3.5. The Helgeland Coastal Plan covers the sea areas of 11 neighbouring municipalities on the Helgeland coast, each of which is responsible for planning on land and in the sea area out one nautical mile beyond the coastal baseline. Source: *Helgeland Coastal Plan*²⁷⁵

²⁶⁹ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy.*

²⁷⁰ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 12.*

²⁷¹ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 4.*

²⁷² Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 12.*

²⁷³ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 4.*

²⁷⁴ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 12.*

²⁷⁵ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019).*

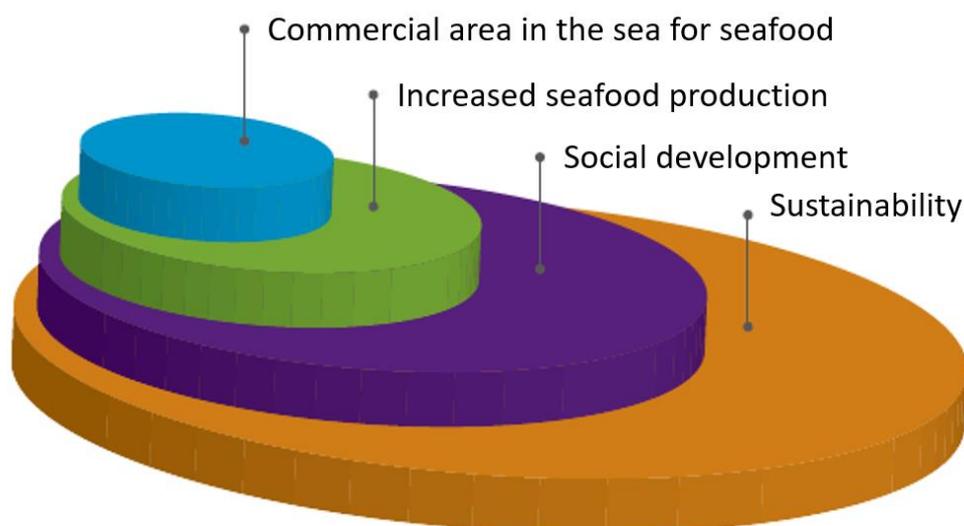


FIGURE 3.6. This diagram from the Helgeland Coastal Plan shows the centrality of aquaculture to the planning process, as it is considered the primary way to encourage social development. *Source: Based on Helgeland Coastal Plan*²⁷⁶

A collaborative planning process between the municipalities and other stakeholders began in 2014.²⁷⁷ Each municipal section of the plan was organized by the individual municipalities, while the South Helgeland Regional Council acted as secretariat. Nordland County Council assisted in its capacity as regional planning authority and the County Governor of Nordland provided an input regarding national legislation. The draft coastal plan was revised following public posting and reviewed by the statutory bodies (section 3.2.7). The sections of the coastal plan for a specific municipality were then adopted as part of the relevant municipal plan, with the exception of Vega Municipality, so that there is a single approach to planning for the land and sea areas of each municipality.²⁷⁸

The result of the process described is a zoning plan for the municipal sea areas along the Helgeland coast. The overall approach departs from the premise that the sea is a multi-use area where a range of compatible activities can take place – and where aquaculture could potentially be located - unless there is a specific existing use that precludes that.²⁷⁹ These existing uses of the sea were mapped for the whole planning area and classified as specific zones, leaving the rest of the sea area classified as ‘multi-purpose’ and therefore open to aquaculture.

²⁷⁶ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 6.*

²⁷⁷ Nordland County Council, Directorate of Fisheries, the County Governor of Nordland, the Norwegian Coastal Administration, the Norwegian Mapping Authority, the aquaculture industry, local fishing associations, Nordland County Fisheries Association and the Norwegian Seafood Federation. See Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 9.*

²⁷⁸ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 9.*

²⁷⁹ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 16-17.*

3.2.3 The 2016 impact assessment of the Helgeland Coastal Plan

Following the requirements of the Planning and Building Act, the intermunicipal coastal planning process included the preparation of an impact assessment to consider potential environmental and social effects.²⁸⁰ This first impact assessment looked at the overall Helgeland Coastal Plan (section 3.2.2), as well as the individual aquaculture proposals (section 3.3.4). The objective of the Coastal Plan, according to this impact assessment report, was expressed in even clearer terms: 'The Helgeland Coastal Plan wants to facilitate business development (fishing and aquaculture) while taking into account the "non-commercial" interests such as biodiversity, outdoor life, cultural monuments, cultural environment, landscape experiences and clean sea.'²⁸¹ Indeed, this first impact assessment did evaluate the potential impacts on the environment, and in particular priority habitats and biodiversity,²⁸² however, it was considered that: 'There is a danger that the consideration of narrow environmental interests will limit business development.'²⁸³

The impact assessment identified overall positive socio-economic benefits for local communities from a Coastal Plan that facilitates the growth of the aquaculture industry along the Helgeland coast. These would include increased food production, business development, and population growth.²⁸⁴

Regarding overall potential negative impacts, the coastal area was found to be suitable for aquaculture because there are sufficient currents to provide regular water change. This provides better conditions for the farmed fish and distributes pollution, such that there should be no significant build up under aquaculture facilities or risk of eutrophication (excessive levels of nutrients in the water leading to an overabundance of plants or algae, and other damaging effects on the ecosystem).²⁸⁵ Due to the fact that aquaculture would not be permitted in areas shallower than 20m, due to the fact that these are the areas that house key habitats and greater biodiversity, it was considered that there would be no direct impact. It was also evaluated that there would be no significant visual impacts within the seascape and that floating facilities are reversible and therefore do not pose a risk.²⁸⁶ While negative impacts could potentially occur on the environment, it argued that implementing national regulations and good operational policy would mitigate many of these.²⁸⁷

²⁸⁰ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak.*

²⁸¹ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 6.*

²⁸² Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 24.*

²⁸³ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 9.*

²⁸⁴ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 239.*

²⁸⁵ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 17.*

²⁸⁶ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 26, 30.*

²⁸⁷ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 239.*

In consideration of the overall Helgeland Coastal Plan, this first impact assessment concluded that ‘The total impact on biodiversity is considered to be acceptable for the entire planning area as a whole.’²⁸⁸ However, it was noted that ‘it is not possible to conclude with certainty about the total burden on biodiversity’ from the cumulative impact of multiple aquaculture locations within the planning area, particularly given the ongoing national policy to promote growth in the industry.²⁸⁹ Furthermore, lack of knowledge around changes caused by the climate crisis means that many calculations in the impact assessment have an even greater degree of uncertainty.²⁹⁰

With regard to World Heritage, the impact assessment did evaluate the potential impacts of the aquaculture proposals on eider ducks, as representative of the World Heritage property and the attribute of Outstanding Universal Value that might be potentially affected. In addition, it stated that UNESCO has communicated its approval of aquaculture as a reversible measure to the Norwegian authorities.²⁹¹

3.2.4 Information gaps in the Helgeland Coastal Plan

Notwithstanding the Helgeland Coastal Plan and its impact assessment gathered much relevant data, they also acknowledged a ‘deficient’ knowledge base on which to base planning decisions regarding the suitability of new aquaculture locations.²⁹² In particular, it was noted that:

- There is no available knowledge about bottom topography, bottom sediments, currents and hydrographic conditions and sedimentation areas in the sea²⁹³
- The mapping of marine habitats is deficient²⁹⁴
- There is a need for more and better mapping of risk factors, e.g., storm surges, landslides.²⁹⁵

They concluded that this ‘lack of knowledge makes it very difficult / impossible to identify sustainable aquaculture sites for the future’²⁹⁶ and that ‘the knowledge base is not considered good enough for the municipal planning level’ – and yet surprisingly this ‘is not considered to be an obstacle to making decisions

²⁸⁸ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 235.

²⁸⁹ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 235.

²⁹⁰ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 237.

²⁹¹ ‘I 2012 godkjente UNESCO (via MD, i dag KLIF) oppdrett i verdensarvområdet med begrunnelse i at tiltaket er reversibelt og ikke var noen trussel mot Outstanding Universal Value som er ærfugldrifft’: Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 30.

²⁹² Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 22.

²⁹³ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 16.

²⁹⁴ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 234.

²⁹⁵ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 238.

²⁹⁶ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 16.

at the municipal planning level.²⁹⁷ While the Helgeland Coastal Plan itself can be considered a starting point for gathering the necessary data, a robust knowledge base on which to make strategic decisions is not yet available.

3.2.5 The Vega section of the Helgeland Coastal Plan

Unlike the other Helgeland municipalities that have approved their own revised sections of the Coastal Plan, which are now legally binding planning tools, the Vega section has not been adopted (Figure 3.7). This is due to concerns raised during the review phase regarding the compatibility of aquaculture with the protection of the World Heritage property's Outstanding Universal Value (section 3.5).

The Vega section of the Coastal Plan, like the other sections, departed from the premise that the most flexible approach to planning is based on the sea as a multi-purpose area. These multi-purpose areas are interpreted as open to a range of uses, including potential new aquaculture facilities, unless there is a pre-existing use that is not compatible with other activities. In some cases, specific combinations of uses were determined as compatible in a particular zone (e.g., traffic, fishing, and outdoor recreation).²⁹⁸ The following existing uses of the sea were therefore identified and mapped so that they could be appropriately zoned, for example:

- *Use and protection of sea and water*: this is the general category for multi-purpose areas. Areas shallower than 20m have the richest biodiversity and therefore aquaculture cannot be located there, whereas areas deeper than 20m are considered potentially suitable for an aquaculture facility
- *Traffic and fairways*: these are the existing navigational routes that are defined by Norwegian Coastal Administration
- *Fishing*: this includes all areas where fishing and harvesting of other marine resources (e.g., shrimp) takes place, spawning grounds, locking areas used by fishers, etc.
- *Aquaculture*: these are the existing facilities of all types of aquaculture
- *Nature*: important habitat types (e.g., kelp forests, eelgrass meadows and soft bottom areas), as well as the protected areas listed in section 2.6.2
- *Outdoor recreation*: areas which are state-owned outdoor recreation areas

²⁹⁷ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 25.

²⁹⁸ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 45.

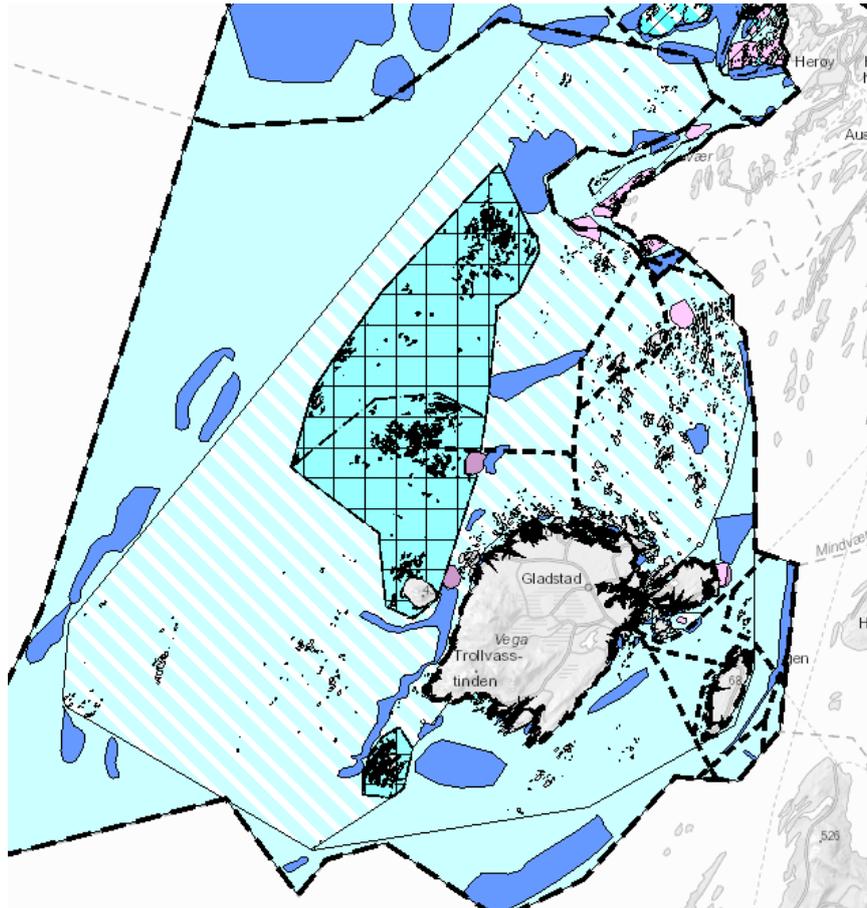


FIGURE 3.7. The Vega section of the Helgeland Coastal Plan showing the proposed zoning. Pink: existing aquaculture; purple: proposed aquaculture; darker blue: fishing grounds; lighter blue hatching: protected areas.

Source: *Helgeland Coastal Plan*²⁹⁹

3.2.6 Proposed aquaculture locations within Vega Municipality

Following the mapping of existing uses of the sea, additional proposals were invited for consideration within the plan – these were all for new aquaculture locations.³⁰⁰ The Helgeland Coastal Plan once approved would establish the suitability of these locations for aquaculture in principle, whereas specific applications to establish an aquaculture facility would then need to proceed through the standard administrative routes. From the outset, the Helgeland Coastal Plan process, identified new areas for aquaculture based on the following criteria:

- *Conflict of interests*: the facility would not conflict with other uses of the area (such as spawning grounds, fairways, etc; although aquaculture is considered compatible with nature protection and outdoor recreation, such as at Hysvær)³⁰¹

²⁹⁹ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 32.

³⁰⁰ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 11.

³⁰¹ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 22.

- *Sea depth*: aquaculture should be in areas deeper than 20m; shallower areas have greater biodiversity and are therefore protected³⁰²
- *Distance from other aquaculture facilities*: the Norwegian Food Safety Authority sets requirements for distances between aquaculture facilities and other sensitive areas to avoid the spread of diseases³⁰³
- *Water currents*: modelling of water exchange and currents were used to both confirm that there is enough water change to facilitate better environmental conditions, as well as to indicate the potential connectivity between aquaculture facilities and therefore the risk of disease transmission³⁰⁴

The first draft of the Coastal Plan included five proposed sites suitable for aquaculture in Vega Municipality– and within the World Heritage property – each of which were assessed within the original impact assessment as follows.³⁰⁵

- *Kilvær*: the Norwegian Coastal Administration considered this an unsuitable location, and it was removed from the plan³⁰⁶
- *Sørvær*: located on the border between Vega Municipal and neighbouring Herøy, this proposal was shifted into the Herøy section of the coastal plan (Figure 3.8)³⁰⁷
- *Sandvær*: located on the border with Herøy, this proposed aquaculture location was assessed as suitable for inclusion in the Coastal Plan during the original impact assessment, however, no application has been made to use this site³⁰⁸
- *Søla/Måsskjæret*: this proposed aquaculture location was assessed as suitable for inclusion in the Coastal Plan during the original impact assessment and an application has been made to use this site by Mowi ASA (Figure 3.9; section 3.3.2)³⁰⁹
- *Hysværet*: this proposed aquaculture location lies within the Hysvær/Søla landscape conservation area; it was assessed as suitable for inclusion in the Coastal Plan during the original impact assessment and an application has been made to use this site by Vega Sjøfarm AS with Nova Sea AS and Vegalaks AS (Figure 3.9; section 3.3.3).³¹⁰

³⁰² Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 17.

³⁰³ Mattilsynet (2020) *Akvakultur* [online]. Available from: https://www.mattilsynet.no/fisk_og_akvakultur/akvakultur/

³⁰⁴ For the Strømmodell Nordland, see: Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 22 and Gilstad, M. (2011) *Havstrømmodell for Nordland –et nytt verktøy i kystberedskap?* [online]. Available from: <https://docplayer.me/37288099-Havstrommodell-for-nordland-et-nytt-verktoy-i-kystberedskap.html>

³⁰⁵ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*.

³⁰⁶ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 128-133.

³⁰⁷ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 134-138. See also <https://sikker.fiskeridir.no/akvakulturregisteret/web/sites/36017>

³⁰⁸ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 139-143.

³⁰⁹ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 119-123.

³¹⁰ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 123-127.

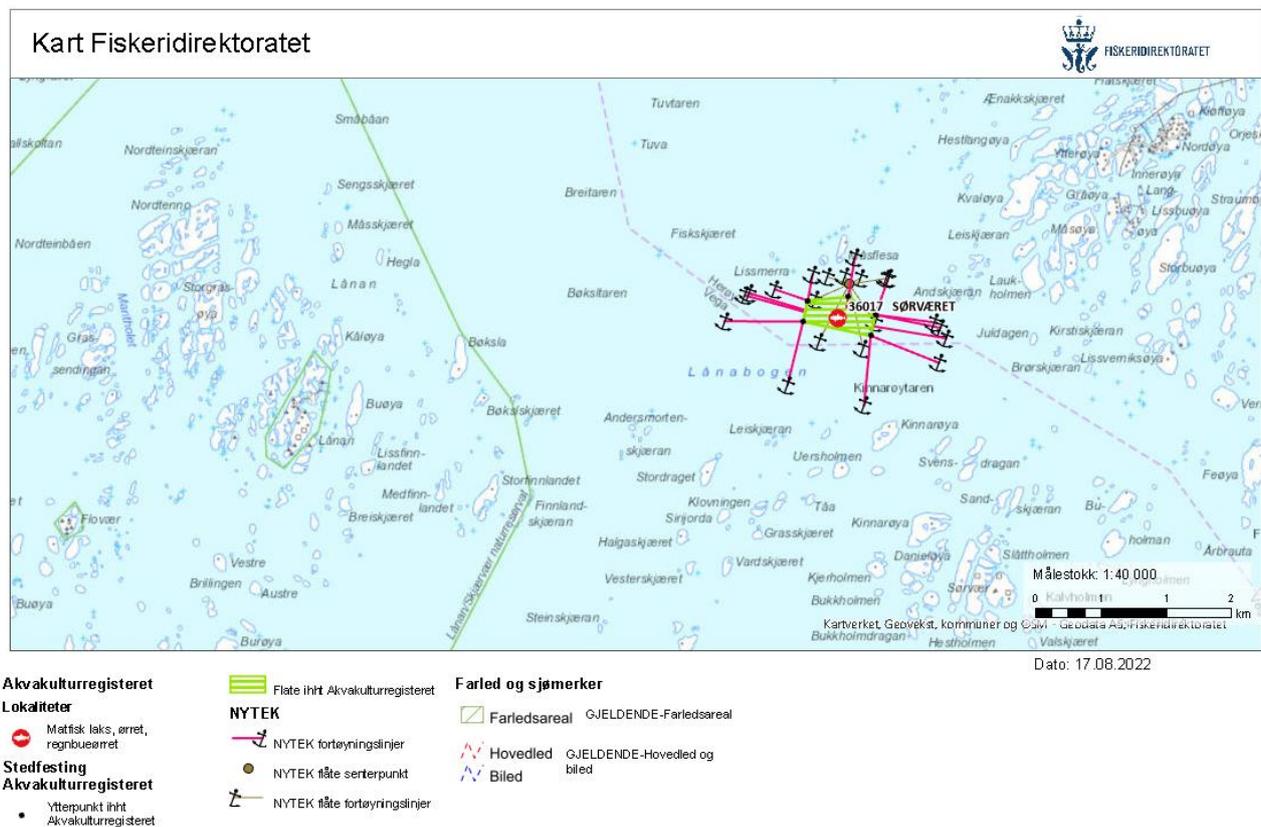


FIGURE 3.8. Above: the aquaculture facility proposed for Sørvær was slightly adjusted so that it is no longer within Vega Municipality but is located in the neighbouring municipality. Below: however, the mooring system does cross into the Vega area. Source: *Instead Heritage / Fiskeridirektoratet*.

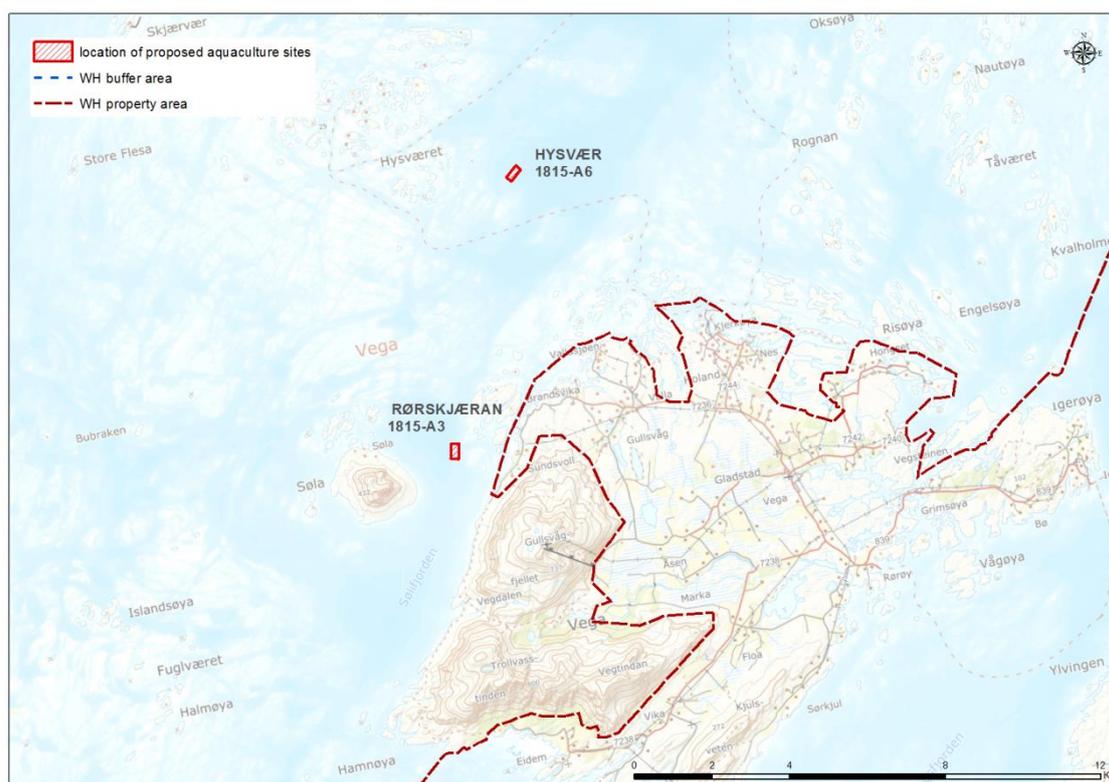


FIGURE 3.9. The two proposed aquaculture locations at Søla/Måsskjæret and Hysvaeret (purple) that are included within the Vega section of the Helgeland Coastal Plan. *Source: Instead Heritage*³¹¹

3.2.7 Statutory review of the Vega section of the Helgeland Coastal Plan

The Vega section of the Coastal Plan has been drafted three times (2016, 2017, 2019) and each revision has been made publicly available on the municipal website and reviewed by the statutory authorities. Minor issues and corrections were typically addressed immediately, while more complex questions required greater discussion (see section 3.5 and Table 3.5).

Objections were raised to the designation of most of the sea area as multi-purpose in the first draft, because this would leave around 83% of the area potentially open to aquaculture proposals. This approach is underpinned by a default position that aquaculture is appropriate unless a specific regulation of an area prevents it, which places the onus on the specific municipality to research each case before making a decision. A preference was stated for selecting appropriate locations for aquaculture in advance, with the assumption that aquaculture would not be considered suitable in or near areas of significant biodiversity or outdoor recreation unless the proponent can demonstrate the opposite.³¹² This was taken on board by the third draft in 2019, by which time aquaculture had been taken out of multipurpose areas within the World Heritage property, and the existing aquaculture facilities and the two new proposed locations had been defined as specific aquaculture areas. The 2019 draft, however, maintained the buffer zone and the wider setting of the World Heritage property as ‘multi-purpose’ areas open to aquaculture. While statutory requirements, for example, in terms of water depth, distances from existing facilities, etc., exclude new aquaculture being

³¹¹ Vega kommune (2020) *Program for supplementary assessments to Helgeland Intermunicipal Master Plan for Vega: 7.*

³¹² Fylkesmannen i Nordland (2016) *Samordnet uttalelse med innsigelse – Kystzoneplan – Kystplan Helgeland – Vega* [correspondence 31/08/2016].

introduced in the buffer zone in the immediate future, in the long term this provision could lead to the expansion of existing facilities or new facilities being established.

The second significant cause for concern was that aquaculture was proposed for locations in or near the World Heritage property without clarification of the potential consequences on its Outstanding Universal Value, nor on individual protected areas. While the boundaries of the property, its buffer zone and the protected areas are included in the Helgeland Coastal Plan, there were no associated regulations to control activities within them. The result being that regulated use would essentially be the same within the World Heritage property as the remaining area of the Vega section of the Helgeland Coastal Plan. This includes the two proposed facilities at Sjøla/Måsskjæret (also referred to as Rørskjæran) and Hysværet (also referred to as Hysvær) which remain in the 2019 draft plan as dedicated aquaculture areas.

Despite mediation, no consensus has been achieved around this issue. Notably, while the Directorate of Fisheries considers aquaculture a continuity of ‘Vegaøyane – The Vega Archipelago’'s Outstanding Universal Value,³¹³ the County Governor of Nordland and, later, the Directorate for Cultural Heritage maintain an objection to the plan on the basis that the potential impacts on Outstanding Universal Value have not been properly considered (section 3.5).³¹⁴ It is this unresolved issue which led to this present supplementary assessment being commissioned.

³¹³ Fylkesmannen i Nordland (2017) *Samordnet uttalelse med innsigelse – Kystzoneplan – Kystplan Helgeland – Vega* [correspondence 11/05/2017].

³¹⁴ Riksantikvaren (2019) *Forslag til kystzoneplan, Kystplan Helgeland, Vega kommune. Tredje gangs høring – Riksantikvaren opprettholder innsigelse* [correspondence 21/05/2019].

3.3 PROPOSED AQUACULTURE FACILITIES

The following section looks at the two proposals for new aquaculture facilities for the Vega municipal area and which would be located within the World Heritage property of 'Vegaøyane – The Vega Archipelago' (Figure 3.10; Table 3.2). The process of drafting the Helgeland Coastal Plan was launched in 2014 and involved welcoming proposals for new aquaculture locations. In a parallel process, in 2015 two aquaculture companies started the application process for permits to operate facilities in two specific sites in the Vega Archipelago. These two areas were incorporated in the Vega section of the draft Coastal Plan (section 3.2.6).

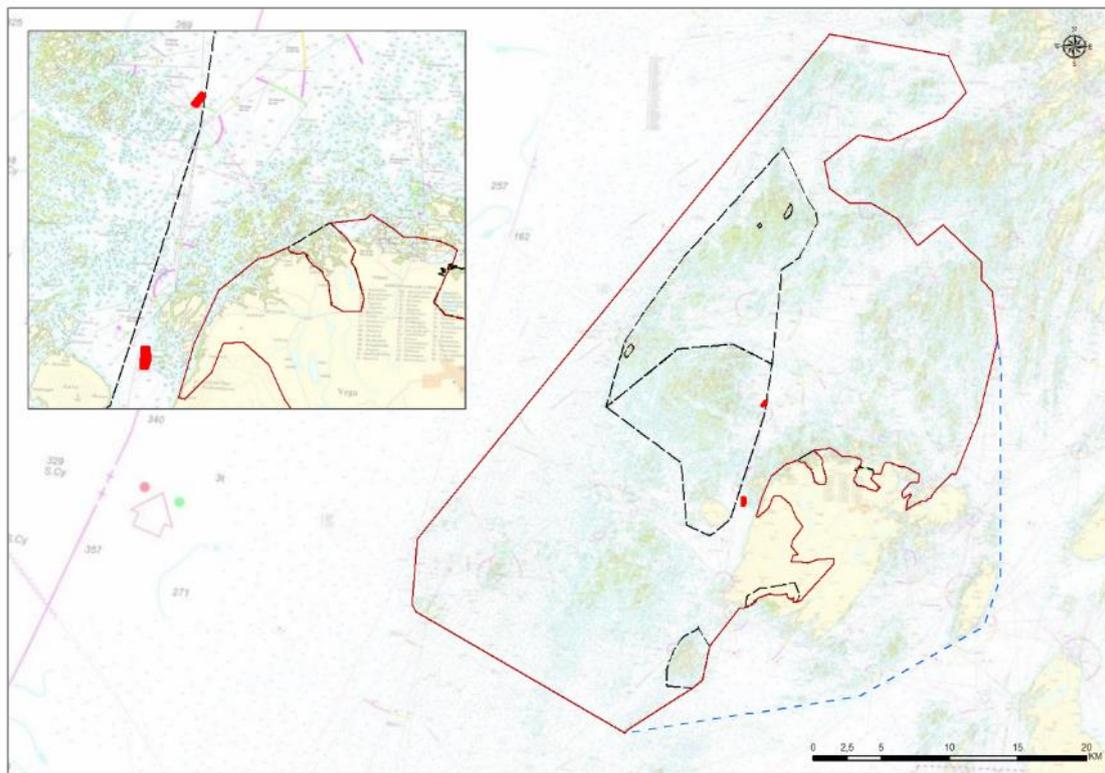


FIGURE 3.10. Location of the two proposed aquaculture facilities (red) within the World Heritage property of Vega Archipelago (red boundary). Source: *Instead Heritage*³¹⁵

³¹⁵ Based on Suul, J. & Sønstebo, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

TABLE 3.2: summary of the two new aquaculture facilities in the Vega Archipelago for which permits have been requested.

	RØRSKJÆRAN	HYSVÆR
Location name in the Helgeland Coastal Plan	Søla / Måsskjæret	Hysværet
World Heritage	Within the property	Within the property
Location	Between the main island of Vega and Søla, 300m east of the Hysvær/Søla landscape conservation area	Near the Hysværet group of islands, on the east boundary of the Hysvær/Søla landscape conservation area
Water depth	40-135 m	80-170 m
Company	Mowi ASA (previously Marine Harvest Norway AS)	Vega Sjøfarm AS / Nova Sea AS / Vegalaks AS
Species	Food fish: Salmon, trout, and rainbow trout	Food fish: Salmon, trout, and rainbow trout
Biomass	3120 tonnes (roughly 800,000 fish)	3120 tonnes (roughly 800,000 fish)

In general, the aquaculture industry is looking for new locations that are suitable for new facilities as they expand their operations. Factors that are taken into consideration when choosing a new site include:

- *Coastal location*: the site cannot be in the open ocean but needs the relatively protected coastal waters
- *Sea depth*: shallower sea areas tend to have more protected habitats and higher biodiversity which may need to be avoided, deeper seas have the advantage of greater water change and the dispersal of pollution
- *Distance from other facilities*: there are minimum distances recommended between facilities to avoid the risk of infections spreading in the case of an outbreak
- *Water currents*: water change is needed to ensure fish health and to reduce the build-up of pollution (faecal matter and waste food) under the net pens. Ideally a facility would not be located in a current that leads directly to another one
- *Environmental conditions*: surveys conducted before a permit is granted must demonstrate good environmental conditions which are robust enough to support the effects of aquaculture and can recover after fallow periods.³¹⁶

For aquaculture companies looking to expand operations – and for Vega Municipality seeking to gain the advantages brought by aquaculture in terms of job creation and municipal income – the Vega Archipelago offers suitable conditions in terms of protected coastal waters within the strandflat and good sea currents. However, once other factors such as water depth and the distance from existing facilities are taken into consideration there are few new locations for aquaculture to be established. Indeed, the two locations proposed at Vega are next to the two deepest areas within the archipelago and are considered the only new

³¹⁶ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak.*

locations that are suitable for new facilities. For this reason, this supplementary assessment will not consider alternative locations within the Vega area.³¹⁷

3.3.1 Overview of typical aquaculture facilities at grow-out sites

The following paragraphs are intended to be a very general overview of the standard features of aquaculture facilities at grow-out sites. These are sea cages where young salmon, after early phases in freshwater tanks on land, are kept as they grow to maturity before being slaughtered. Both companies who have applied to establish facilities in the Vega Archipelago have fairly typical grow-out facilities, equipment, and operating procedures which they would adapt to the particular conditions at the new location (e.g., mooring that is designed for the particular seafloor topography and currents) and they provided this information for this supplementary assessment.³¹⁸ Given the length of time since the original applications for aquaculture at Vega were submitted (2015) and regular innovations within the industry, the finer details of the facility would not be clarified until installation is confirmed. For this reason, the general description only attempts to outline the various components of a facility and its operation.

Mooring systems connect the aquaculture facility, which includes net pens and a feed barge, to the seafloor. It includes some form of anchorage (e.g., anchors, blocks, helical moorings), connecting elements (e.g., ropes, chains), buoys and connecting plates or rings. These are designed specifically for the type of seabed, depth, the water currents, tidal range, wind dynamics and potential storms, and the size and layout of the facility. The mooring system designed for Rørskjæran would include 24 mooring lines with 25 anchorage points on the seabed, of these 17 would be anchors and 8 bolts (Figure 3.11). There would be 16 buoys.³¹⁹ The exact location of the facility at Hysvær has not yet been determined and awaits further investigation into current and wave conditions. For this reason, the mooring system has not yet been designed. As a general reference point, it can be considered similar to the existing facility at Skogsholmen, which has a relatively similar bottom topography (Figure 3.31).³²⁰

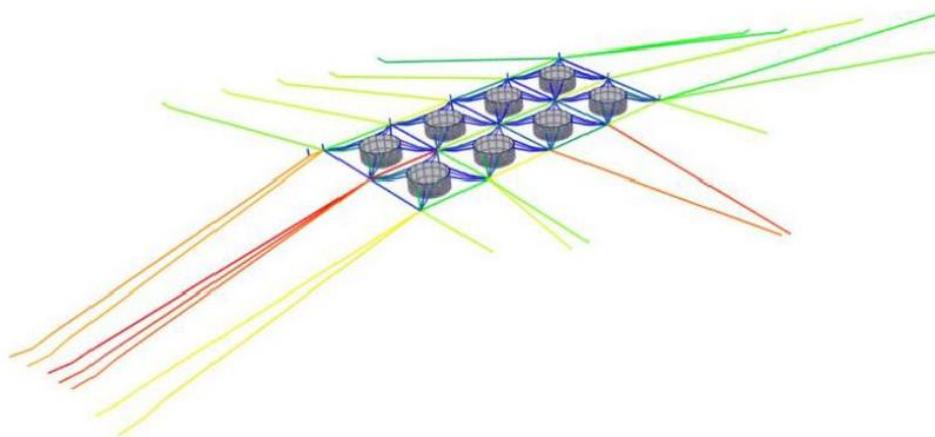


FIGURE 3.11. Modelling of the mooring system for the net pens that would make up the proposed facility at Rørskjæran. Source: Mowi³²¹

³¹⁷ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019)*: 21.

³¹⁸ Nova Sea (2022) *Svar fra Nova Sea, verdensarv feedback* [unpublished communication]; Mowi AS (2022) *Utkast tilsvar Instead (UNESCO Vega)* [unpublished communication].

³¹⁹ DNV GL Business Assurance Norway AS (2019) *Anlegg Lokalitet Rørskjæran: Fortøyningsanalyse* [unpublished report].

³²⁰ Nova Sea (2022) *Svar fra Nova Sea, verdensarv feedback* [unpublished communication].

³²¹ DNV GL Business Assurance (2019) *Anlegg Lokalitet Rørskjæran. Fortøyningsanalyse* [unpublished report]: 18.

Aquaculture facilities are made up of several large circular net pens (Figure 3.12). Those used by Nova Sea, for example, are 50m across, with a circumference of 160m. There might be 8-10 of these net pens at an average facility (Figure 3.13). It is foreseen that 10 rings would be installed at Hysvær (moored in a 90 x 90 m frame), which provide the structure for the net pens.³²² The nets themselves are largely under the surface of the water but netting does extend upwards by several metres.

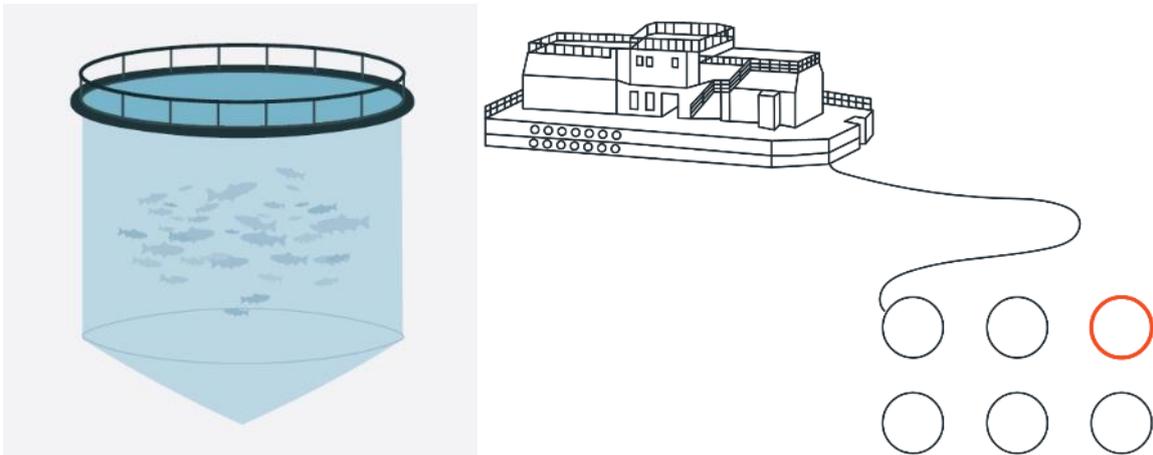


FIGURE 3.12. An aquaculture facility is usually made up of multiple net pens (left), which are connected to a feed barge (right). These are permanently moored at the site. *Source: Mowi / Nova Sea*³²³

A permanent feature of an aquaculture facility is a feed barge, which is connected to each of the net pens, for automatic feeding of the fish (Figure 3.14). At Hysvær, there would be a vessel that is permanently moored while the facility is in use, containing spaces for the staff to use while on site (e.g., break room, kitchen, shower/WC, changing rooms, etc.) and an automatic feeding centre. This would possibly be connected to an electricity cable that supplies energy from land.

³²² Nova Sea (2022) *Svar fra Nova Sea, verdensarv feedback* [unpublished communication].

³²³ Mowi (2020) *Integrated Annual Report 2020* [online]: 52. Available from: <https://mowi.com/blog/annual-report-2020/>; Nova Sea (2022) *Our 26 facilities are located in perfect surroundings along the Helgeland coast* [online]. Available from: <https://novasea.no/en/vare-anlegg/#Seafarm>



FIGURE 3.13. One of the ten net pens seen from above at the facility at Igerøy Ø which is operated by Nova Sea within the buffer zone of the World Heritage property. *Source: Nova Sea*³²⁴



FIGURE 3.14. An example of a feed barge next to one of multiple net pens at an aquaculture facility at Sørværet, which is located on the border with Vega. *Source: Instead Heritage*

In compliance with the Norwegian Coastal Administration regulations, all facilities must be clearly visible with navigational aids, including lights that must be visible in daylight up to two nautical miles.³²⁵

Additional vessels are required throughout the lifecycle of a facility for a variety of tasks (Figure 3.15). This includes the ships that initially moor the facility to the seabed and then set up the net pens (up to three

³²⁴ Nova Sea (2022) *Igerøy Ø* [online]. Available from: <https://novasea.no/en/igeroy-o/>

³²⁵ Kystverket (2022) *Overgang til IALA-standard* [online]. Available from: <https://www.kystverket.no/sjovegen/overgang-til-iala-standard/>

weeks for installation). Similarly, a facility that is no longer in use would be removed the same way. A well boat (which incorporates a well or tank for storing live fish), transports the fish to the facility at the beginning of a growth cycle and then takes them away again for slaughter. Smaller service vessels bring in personnel and specialists during inspections, cleaning and maintenance of the facility and equipment, as well as monitoring of the fish themselves, including removal of dead fish, provision of any necessary lice treatments, etc.



FIGURE 3.15. Examples of ships that might visit the facility. Left: the Nova Master which is used for mooring new facilities. Right: the Færøysund, a well boat used to transport fish. Source: Nova Sea / Marius Vassnes³²⁶

One regular maintenance activity is that of cleaning the nets from biofouling (an accumulation of unwanted microorganisms, plants, algae or small animals) in order to protect the health of the farmed fish. In order to reduce the amount of biofouling that accumulates on the nets, they are coated in antifoulants. These antifoulants act as a biocide, and the most prevalent type is copper-based, sometimes with the addition of copper pyrithione, zinc pyrithione or tralopyril. These antifoulants disperse into the sea over time, but dispersal can be speeded up when the nets are cleaned: it has been estimated that about 30% of the coatings are removed from nets the first time they are cleaned with pressure-washing.³²⁷

Another regular activity is checking for lice on the fish. Current industry practise is to avoid chemical treatments as much as possible, using other preventive methods wherever possible and manual removal. However, large outbreaks of lice on the salmon may require chemical treatment and this is the most common source of chemical dispersal into the sea. The chemical treatments, such as hydrogen peroxide, azamethiphos, cypermethrin and deltamethrin, can be added to the net pens and so are then released directly into the sea. Alternatively, the fish can be taken into a well boat for treatment and the chemicals are later released when the boat is in motion, although purification systems are now available to stop this. Oral treatments include diflubenzuron, teflubenzuron and emamectin, which may disperse into the sea through feed and excrement.³²⁸ Mowi estimates that a third of its lice treatments are chemical.³²⁹

³²⁶ Nova Sea (2022) *Our 25 facilities are located in perfect surroundings along the Helgeland coast* [online]. Available from: <https://novasea.no/en/om-oss/> and Wikimedia Commons (2021) *Færøysund* [online]. Available from: https://commons.wikimedia.org/wiki/File:5252942_F%C3%A6r%C3%B8ysund_2021.png

³²⁷ Bloecher, N. & Floerl, O. (2021) Towards cost-effective biofouling management in salmon aquaculture: a strategic outlook. *Reviews in Aquaculture* 13: 786.

³²⁸ Mowi (2021) *Salmon Farming Industry Handbook*. Mowi: 32.

³²⁹ Mowi (2021) *Salmon Farming Industry Handbook*. Mowi: 33.

When working at maximum capacity, a typical facility would house approximately 800,000 salmon during their period of ‘out growth’. However, there are fallow periods when no fish are present at the grow-out site. These occur between annual cycles, but longer fallow periods might also be necessary if environmental monitoring indicates that the conditions at the site are worsening significantly or in the case of a disease outbreak.

3.3.2 The application to establish aquaculture facilities at Rørskjæran

Marine Harvest Norway AS, now operating as Mowi ASA, applied for a permit to establish an aquaculture facility to farm fish at Rørskjæran in 2015. Rørskjæran lies between the main island of Vega and the island of Sjøla to its west and is within the World Heritage property (Figure 3.16-3.17). It corresponds to the area referred to in the Helgeland Coastal Plan as Sjøla/Måsskjæret (section 3.2.6).

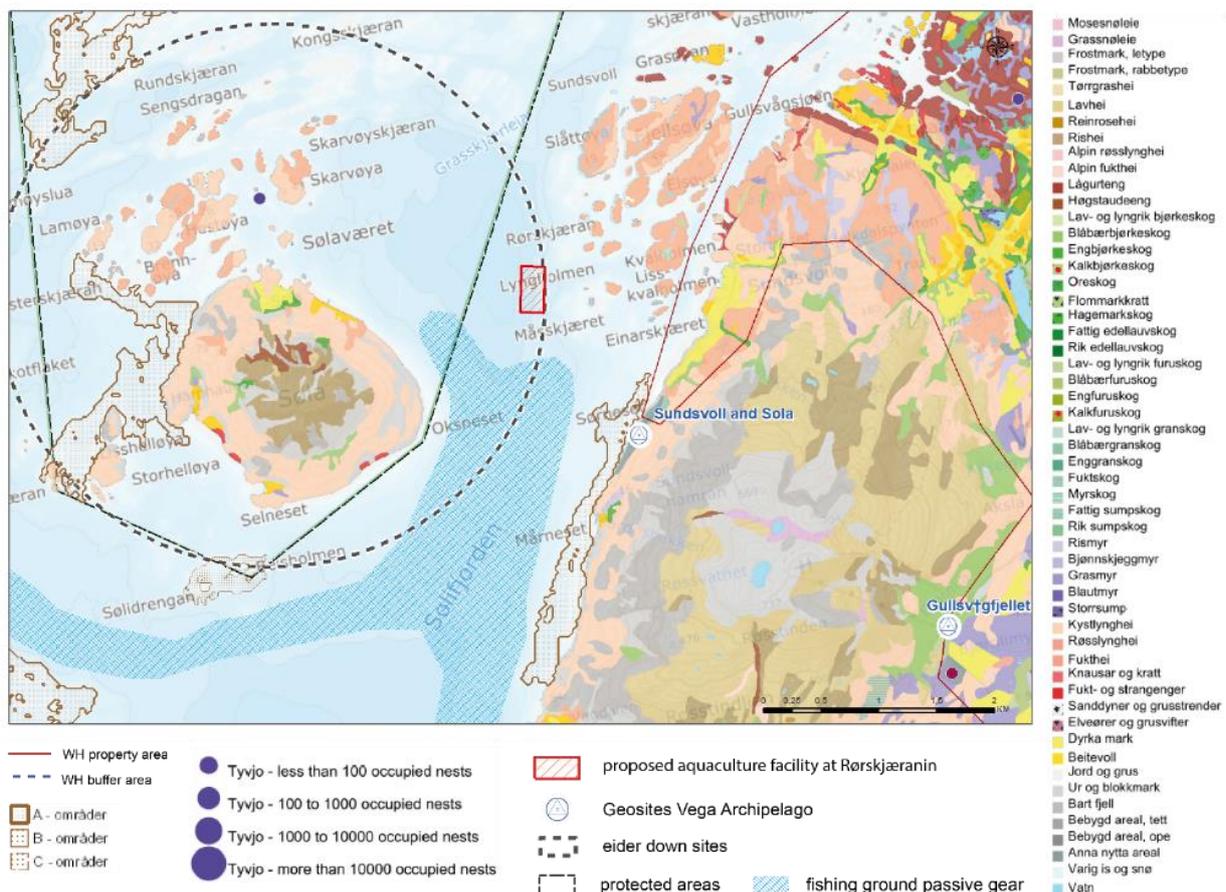


FIGURE 3.16. This image shows the proposed location of the aquaculture facility at Rørskjæran in relation to the various attributes of the heritage place. *Source: Instead Heritage*

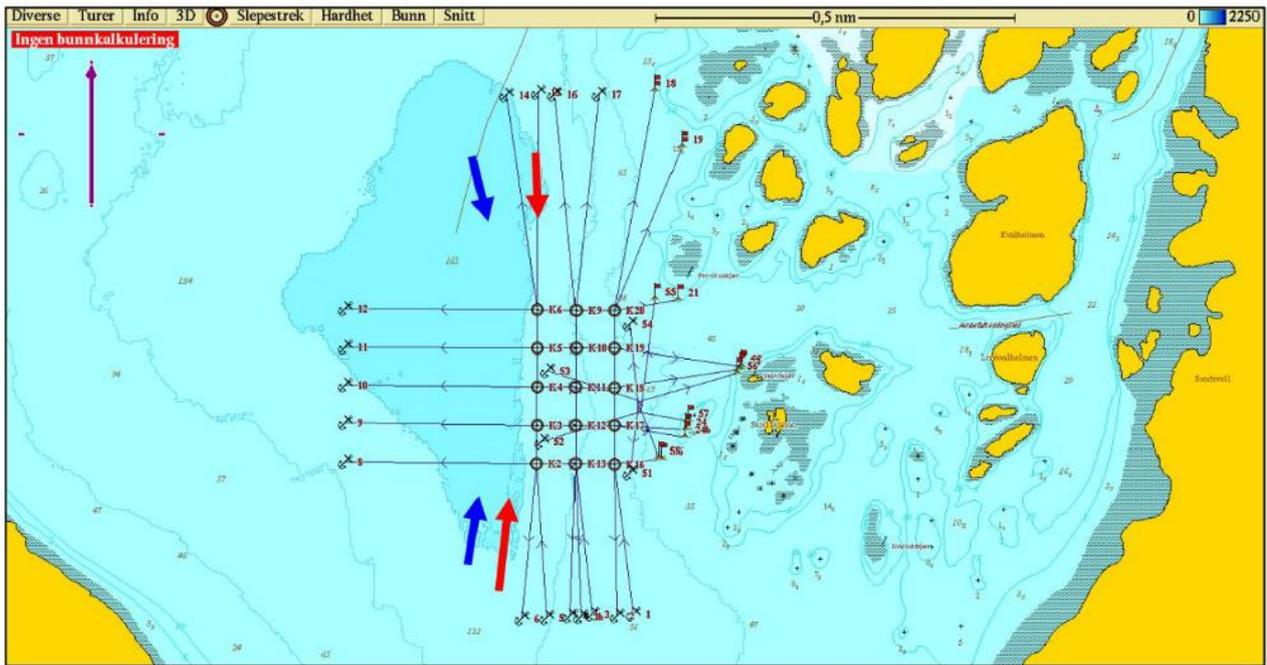


FIGURE 3.17. This plan shows the details of the proposed location of the aquaculture facility at Rørskjæran and the position of its moorings. Source: Mowj³³⁰

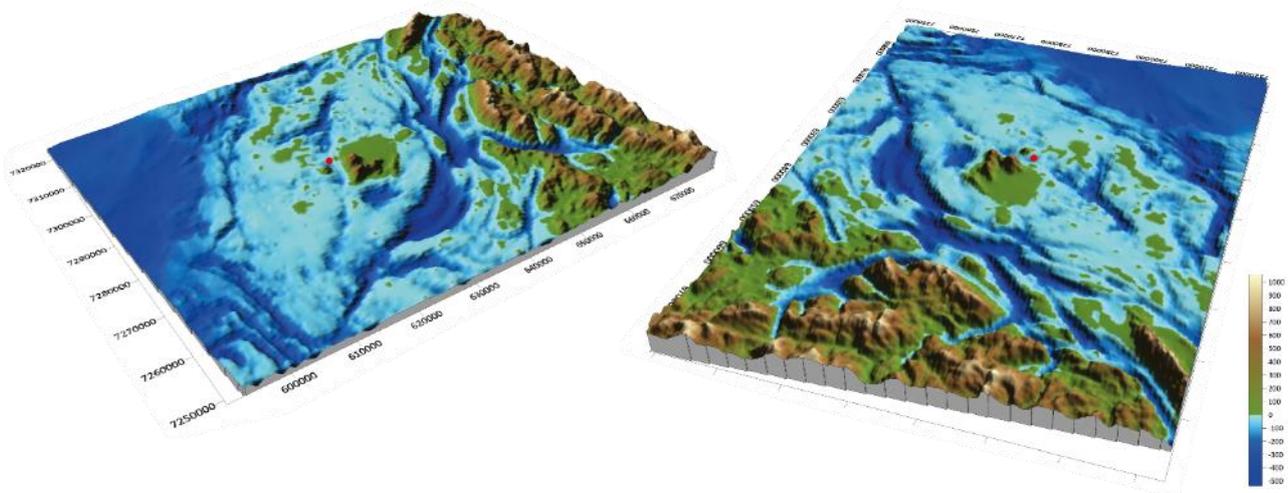


FIGURE 3.18. This image shows the proposed location of the aquaculture facility at Rørskjæran (red dot) in relation to the seabed topography. Source: *Instead Heritage*

The site is located above a sloping seabed consisting of coarse-grained bottom sediment with a lot of hard bottom (Figure 3.17).³³¹ It is near to an isolated deep trench that goes down 165 m. Maerl beds have been observed to the west, east and south of the Rørskjæran area. Rørskjæran is in an area that has previously been affected by sea urchin grazing of the kelp forest and where both kelp species can be found.³³² There are

³³⁰ DNV GL Business Assurance (2019) *Anlegg Lokalitet Rørskjæran. Fortøyningsanalyse* [unpublished report]: 3.

³³¹ Aqua Kompetanse AS (2015) *MOM B-undersøkelse lokalitet Rørskjæran* [unpublished report].

³³² Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA.

large scallop areas just to the north-west of the site and a large spawning and fishing ground to the south (Figure 3.19).³³³

The land and coastal waters in the near part of Vega and the whole of Sjøla are designated for outdoor recreation (Figure 3.20). This means that the location is available for a range of outdoor activities: kayaking and canoeing in the sea, bathing on the sandy beaches, climbing the Vegatrappa (a scenic stairway up to a view point) or hiking up the mountain peaks which give direct views to the proposed aquaculture location (Figure 3.21).³³⁴

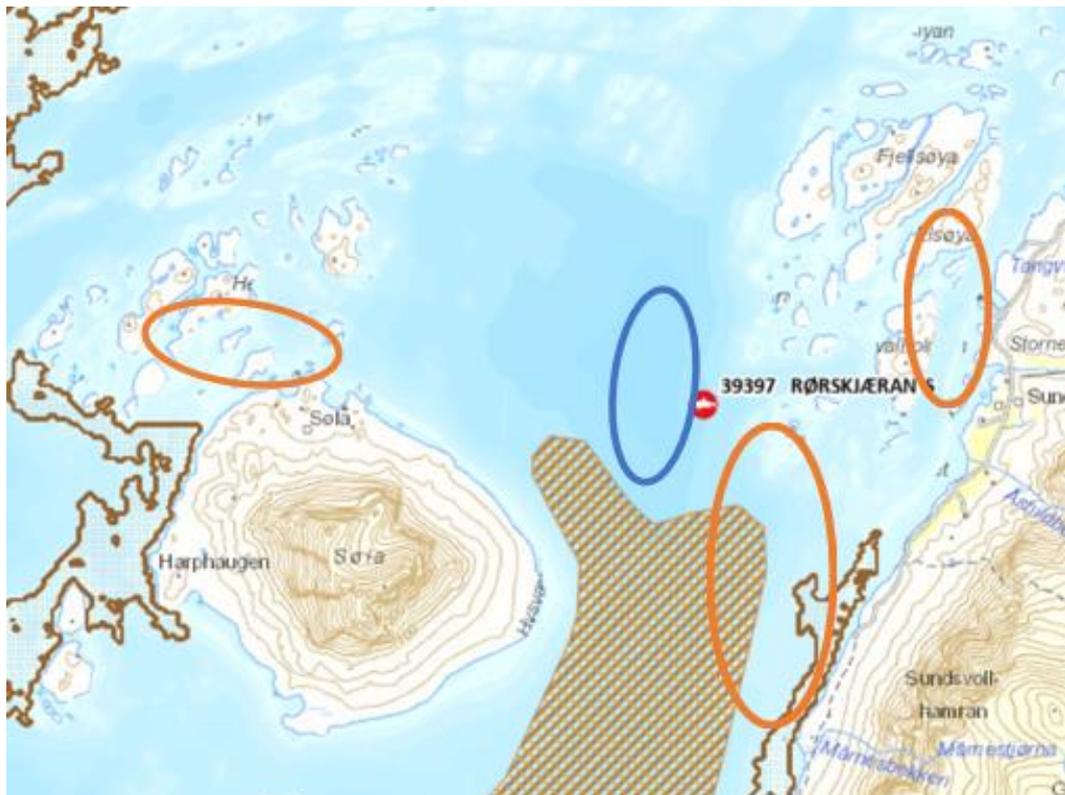


FIGURE 3.19. The location of the proposed facility at Rørskjæran compared to marine habits. Brown outlined areas: tangle kelp; orange ovals: maerl beds; blue oval: deep trench; brown hatched area: spawning and fishing ground.

Source: *Instead Heritage*

³³³ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 120.

³³⁴ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 120.

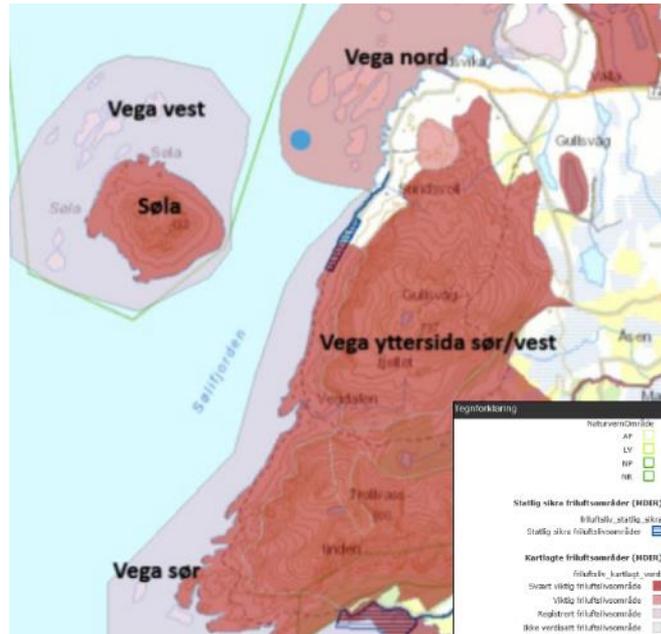


FIGURE 3.20. Location of the proposed facility for Rørskjæran (blue) in relation to the outdoor recreation areas around the islands of Vega and Sjøla. Source: *Direktoratet for naturforvaltning*³³⁵



FIGURE 3.21. View from the Vegatrappa towards Sjøla showing the proposed location of the Rørskjæran aquaculture facility. The site area has already been laid out in the sea with buoys which are here circled in white. Source: *Instead Heritage*

³³⁵ Suul, J. & Sønstebo, G. (eds) (2003) *Vegaøyane – The Vega Archipelago. Norwegian Nomination 2003, UNESCO World Heritage List*. Direktoratet for naturforvaltning.

The obligatory environmental surveys, both B- and C-surveys, were carried out in 2015 to check the environmental conditions in advance of the application for an aquaculture permit. The surveys identified strong and steady currents at various depths which it was considered would ensure that organic waste produced by a potential aquaculture facility would be dispersed.³³⁶ The impact assessment carried out as part of the Helgeland coastal planning process used modelling of the sea currents to demonstrate there is no direct connection to other aquaculture facilities, which means that there is a lower risk of spreading infections from site to site.³³⁷

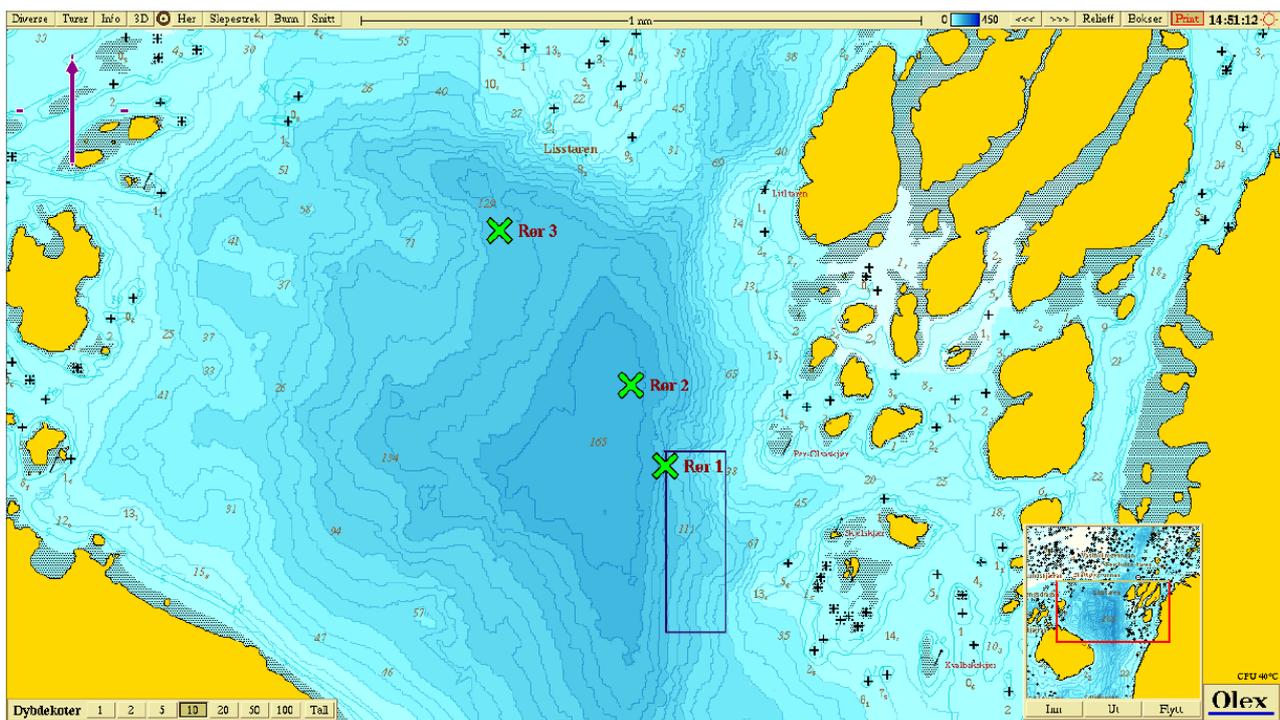


FIGURE 3.22. The proposed Rørskjæran site is indicated with the black rectangle and the sampling stations used for the C-survey are shown with green crosses. Source: Aqua Kompetanse AS³³⁸

The B-survey indicated high oxygen levels in the entire water column.³³⁹ However, contrasting results were found during the C-survey when poor water quality was seen in the highly elevated levels of organic carbon, which due to organic content in the water leading to an increase in micro-organisms, contributes to the depletion of oxygen supplies.³⁴⁰ For the rest, the C-survey identified good conditions generally around the site in terms of water conditions (hydrography) and seabed samples (sediment, bottom fauna, and chemistry) (Figure 3.22). The B-survey indicated overall conditions to be '1: very good' on the basis of rich benthic fauna showing good seabed conditions.³⁴¹ However, the presence of high numbers of species is not necessarily an

³³⁶ Hagen, L. (2015) *Måling av sprednings- og bunnstrøm ved Rørskjæran (mars – april 2015)* [unpublished report]. Aqua Kompetanse A/S: 2.

³³⁷ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsonesplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 121.

³³⁸ Aqua Kompetanse AS (2015) *MOM C-undersøkelse ved oppdrettslokalitet Rørskjæran i Vega kommune, Nordland, juli 2015* [unpublished report].

³³⁹ Aqua Kompetanse AS (2015) *MOM B-undersøkelse lokalitet Rørskjæran* [unpublished report].

³⁴⁰ Aqua Kompetanse AS (2015) *MOM C-undersøkelse ved oppdrettslokalitet Rørskjæran i Vega kommune, Nordland, juli 2015* [unpublished report]; and in particular, its appendix: Akvaplan-niva AS (2015) *C undersøkelse på oppdrettslokaliteten Rørskjæran, 2015* [unpublished report]: 6.

³⁴¹ Aqua Kompetanse AS (2015) *MOM B-undersøkelse lokalitet Rørskjæran* [unpublished report].

indicator of optimum conditions and indeed analysis of the species showed that many were known to be tolerant of poorer environmental conditions. There were also a significant number of opportunist species at the most distant sample site, which are often markers of changes in marine ecosystems.³⁴² Together these results might indicate that the seabed community in this location is already characterized by high organic loads and the benthic community is already affected.³⁴³

3.3.3 The application to establish aquaculture facilities at Hysvær

Vega Sjøfarm AS, together with Nova Sea AS and Vegalaks AS, applied for a permit to establish an aquaculture facility to farm fish at Hysvær in 2015 (the application was adjusted in 2016 but only the moorings were slightly moved; Figure 2.23-2.24). Hysvær is an area of sea, approximately four km north-west of the main island of Vega. It is close to the Hysværet group of islands and lies within the World Heritage property (Figure 3.25). A significant portion also lies within the Hysvær/Søla landscape conservation area (section 2.6.2). It corresponds to the location referred to in the Helgeland Coastal Plan as Hysværet (section 3.2.6).

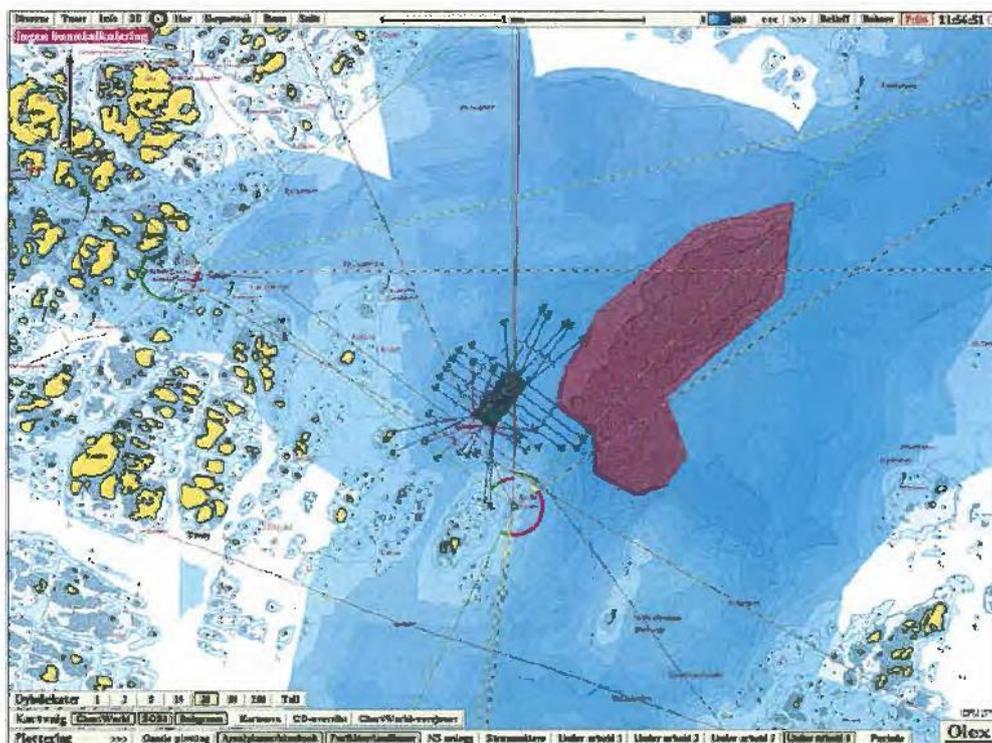


FIGURE 3.23. Plan showing the proposed moorings of the facility at Hysvær in relation to the adjacent shrimp field (red), which lies over the deeper area of the site. Source: Nova Sea³⁴⁴

³⁴² Bakun, A. (2014) Active opportunist species as potential diagnostic markers for comparative tracking of complex marine ecosystem responses to global trends, *ICES Journal of Marine Science* 71.8: 2281–2292.

³⁴³ Aqua Kompetanse AS (2015) *MOM C-undersøkelse ved oppdrettslokalitet Rørskjæran i Vega kommune, Nordland, juli 2015* [unpublished report]: 10.

³⁴⁴ Nova Sea (2016) *Aealendring på omsøkt lokalitet Hysvær, Vega kommune* [unpublished communication].



FIGURE 3.24. The existing facility at Skogsholmen managed by Nova Sea has a similar seabed to the proposed site at Hysvær and so the proposed facility would be moored in a similar way. *Image: Instead Heritage*

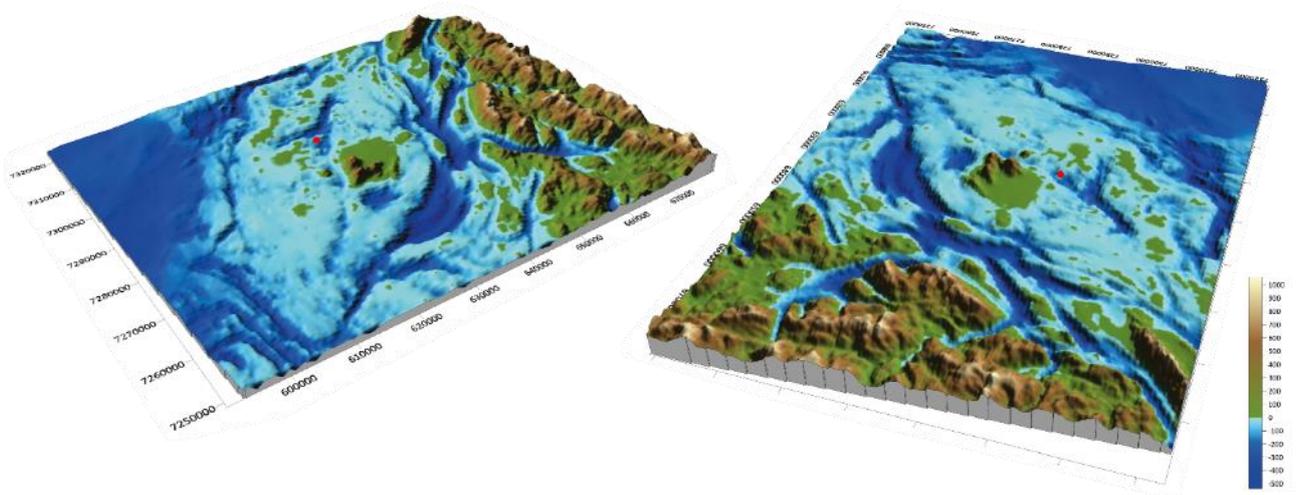


FIGURE 3.25. This image shows the proposed location of the aquaculture facility at Hysvær (red dot) in relation to the seabed topography and its vicinity to a deep trench. *Source: Instead Heritage*

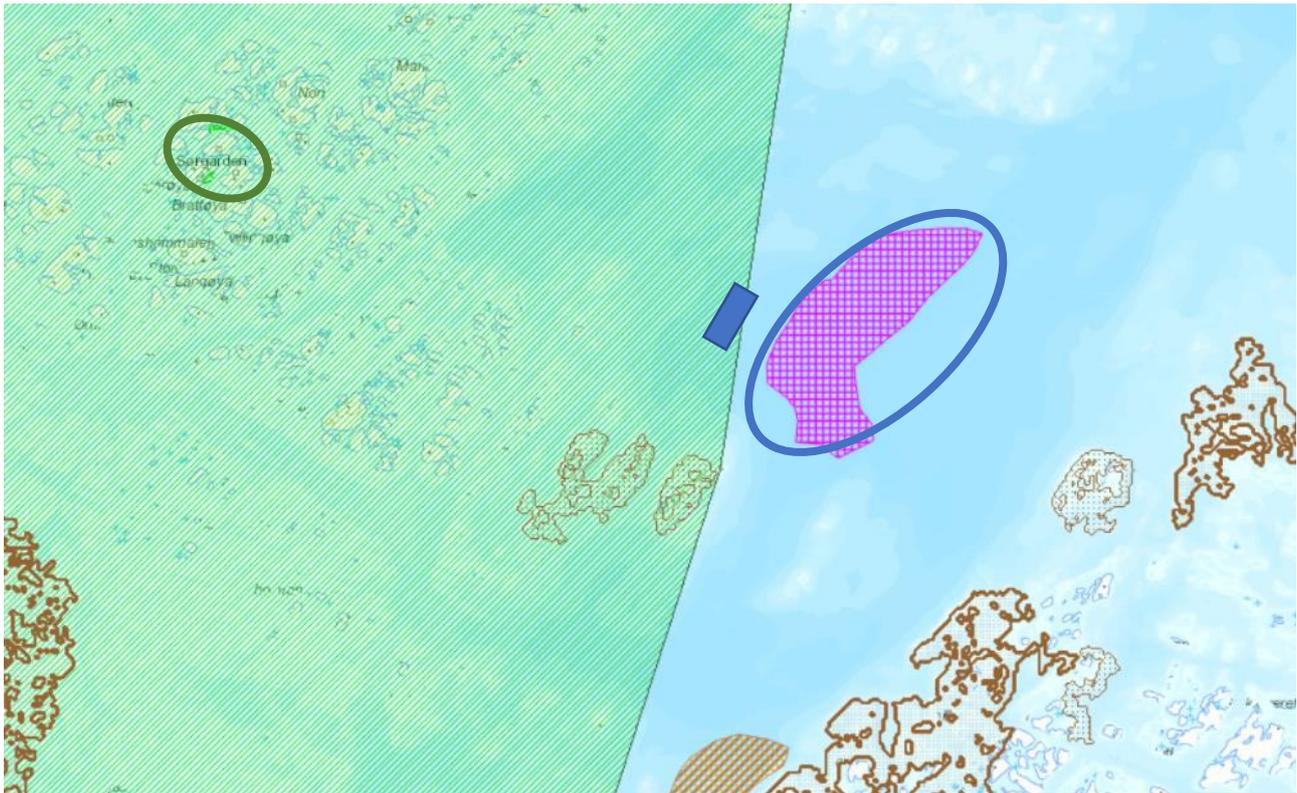


FIGURE 3.26. The location of the proposed facility (blue rectangle) at Hysvær compared to marine habits. Green area: Hysvær/Søla landscape conservation area; blue oval: deep trench; pink area: shrimp ground; green oval: eelgrass; brown outlined areas: kelp forest. Source: *Instead Heritage*

The Hysvær site is located near to an isolated deep trench that goes down 220 m and which corresponds to a shrimp field, as they can live in deeper waters. The site lies within an area which has previously been affected by overgrazing of the kelp forest by sea urchins, this seems to be recovering³⁴⁵ and areas of both kelp species have been mapped around the locality.³⁴⁶ Eelgrass has also been observed around the Hysværet island group (Figure 3.26).³⁴⁷

The proposed aquaculture facility would be located within the Hysvær/Søla landscape conservation area (section 2.6.2). The site lies two km away from breeding areas for eider ducks and other sea birds.³⁴⁸ Being further away from the main Vega island, it is visited less frequently for outdoor recreation activities than Rørskjæren.

³⁴⁵ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA.

³⁴⁶ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA.

³⁴⁷ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 124. See also Hillersøy, G. (2021) *Opplevelseriverdensarvsstrandsone. Marine ressurser som grunnlag for kunnskapsbaserte opplevelser* [unpublished report]. Vega Verdensarvsenter/Stiftelsen Vegaøyan Verdensarv.

³⁴⁸ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 124.

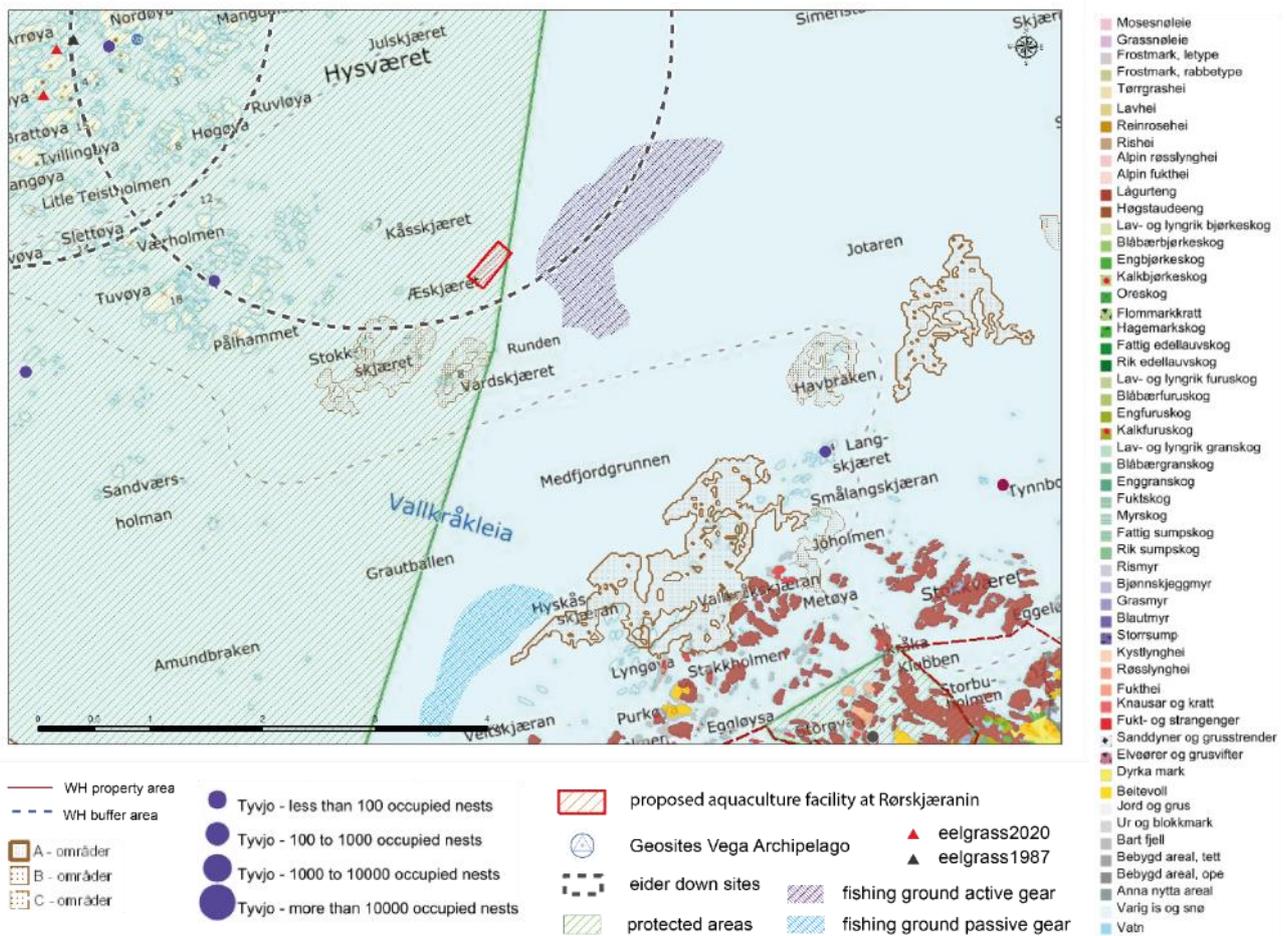


FIGURE 3.27. This image shows the proposed location of the aquaculture facility at Hyvaer in relation to the attributes of the heritage place. *Source: Instead Heritage*

A B-survey was carried out in 2015 to check the environmental conditions and concluded that there were generally ‘1: very good’ conditions. The fauna assessment indicated a normal ecosystem without a high organic load and with very good sediment conditions.³⁴⁹ The first impact assessment within the Helgeland Coastal Plan used modelling of the sea currents to demonstrate there is no direct connection to other facilities, which lowers risk of spreading infections.³⁵⁰

3.3.4 The impact assessment of the aquaculture proposals within the Helgeland Coastal Plan

The general indications and standard operating models described above formed the basis for the original 2016 impact assessment of the two proposed aquaculture locations included in the Helgeland Coastal Plan (section 3.2.3).³⁵¹

³⁴⁹ Helgeland Havbruksstasjon AS (2015) *MOM-B undersøkelse. Hysvær, Vega kommune, Mars 2015* [unpublished report].

³⁵⁰ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 121.*

³⁵¹ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 122, 127.*

That impact assessment noted that there would be potential positive impacts on:

- business and employment
- population development
- municipal economy

It also noted that potential negative impacts might occur on:

- biodiversity and marine habitats
- pollution and water quality
- cultural environment
- aquaculture, spread of infection (uncertain)
- sea trout / arctic char (uncertain)
- outdoor life and recreation (only for the Rørskjæran location, not Hysvær)
- transport needs (in terms of energy consumption)
- emergency preparedness and risk of accidents
- aesthetic conditions.

However, the 2016 impact assessment concluded that with standard mitigation measures, the potential negative impacts were not of such great concern that they outweighed the positive benefits; therefore, it was concluded that both aquaculture locations could be used.

3.4 EXISTING AQUACULTURE IN VEGA MUNICIPALITY

There are existing aquaculture facilities within the coastal waters of the Vega Municipality and its neighbouring municipalities, as along the entire coast of Norway (Figure 3.28). This was the case when the Vega Archipelago was nominated for World Heritage and it was a cause of concern to both ICOMOS and IUCN as Advisory Bodies reviewing the nomination file in 2003-4. Subsequently, in 2004 when the Vega Archipelago was inscribed, the World Heritage Committee immediately requested the State Party to address ‘the interface between conservation and sustainable development in respect of aquaculture’.³⁵² These facilities are briefly described in this section of the report so that they can be taken into consideration when looking at the cumulative impacts on the proposed new facilities (section 4.2).

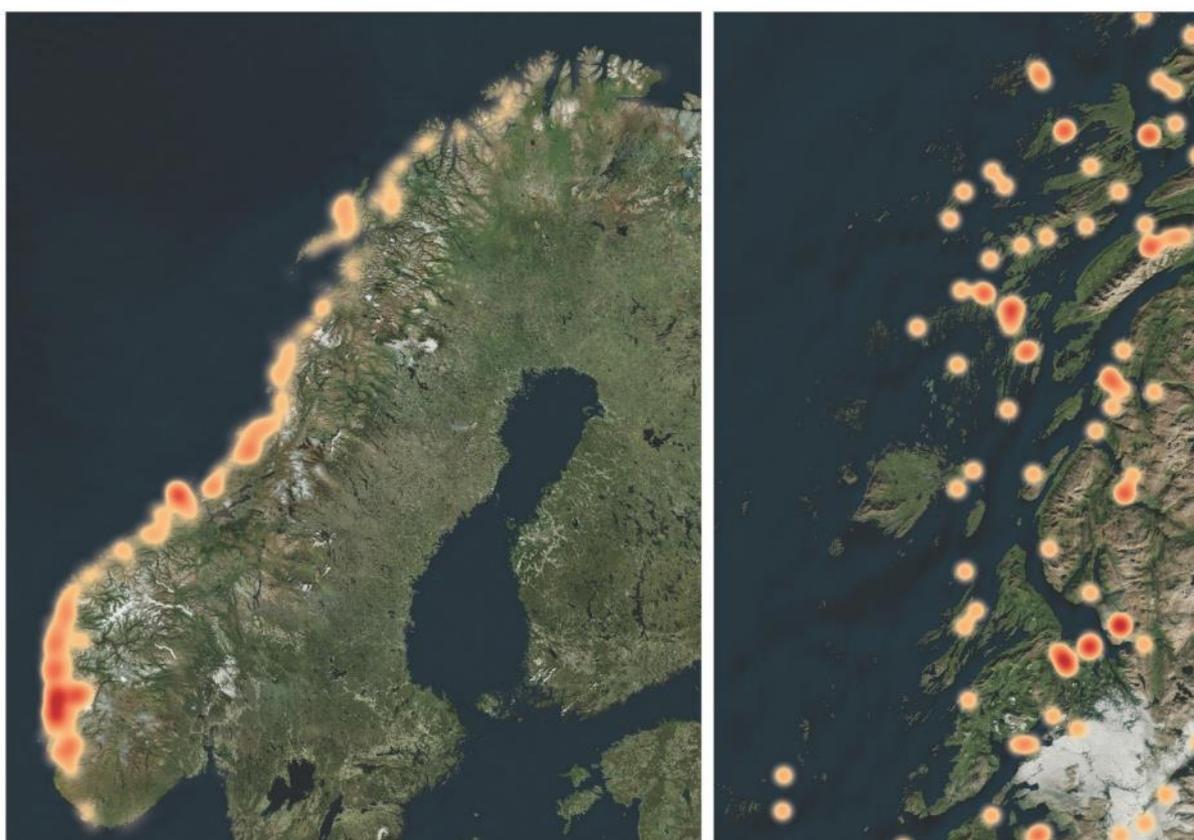


FIGURE 3.28. The distribution of aquaculture sites along the Norwegian coast (left) and along the Helgeland coast near to the Vega Archipelago (right). *Source: Instead Heritage*

Currently there are three aquaculture facilities operating within Vega Municipality, two for farmed fish and one for algae (Table 3.3; Figures 3.29-3.32). The original 2016 impact assessment for the Helgeland Coastal Plan did not address these as there was no requirement for retrospective assessment of facilities already approved.³⁵³

³⁵² UNESCO World Heritage Centre (2022) *Decision 28 COM 14B.45: nominations of cultural properties to the World Heritage List (Vegøyan – The Vega Archipelago)* [online]. Available from: <https://whc.unesco.org/en/decisions/128>

³⁵³ Sør-Helgeland Regionråd (2016) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 5.*

TABLE 3.3. Summary of the aquaculture facilities currently operating within Vega Municipality

	IGERØYØ (18936)³⁵⁴	SKOGSHOLMEN (33157)³⁵⁵	BØBUKTA (40138)³⁵⁶
Location	Buffer zone	Within World Heritage property	Buffer zone
Zoning	Area AK6 of Vega municipal plan	Included in the Vega section of the Helgeland Coastal Plan	Area AKF1of Vega municipal plan
Species permitted	Salmon, rainbow trout, trout	Salmon, rainbow trout, trout	Algae (winged kelp, oarweed, sea lettuce, tangle kelp, sugar kelp, dulse)
Capacity	4,500 TN (10 net pens)	3,120-4,680 TN (12 net pens)	0.05 hectares
Company	Nova Sea AS, Vega Sjøfarm AS, Vegalaks AS	Nova Sea AS, Vega Sjøfarm AS, Vegalaks AS	Vega Sjøfarm AS
Site clearance	2003	2012	2019

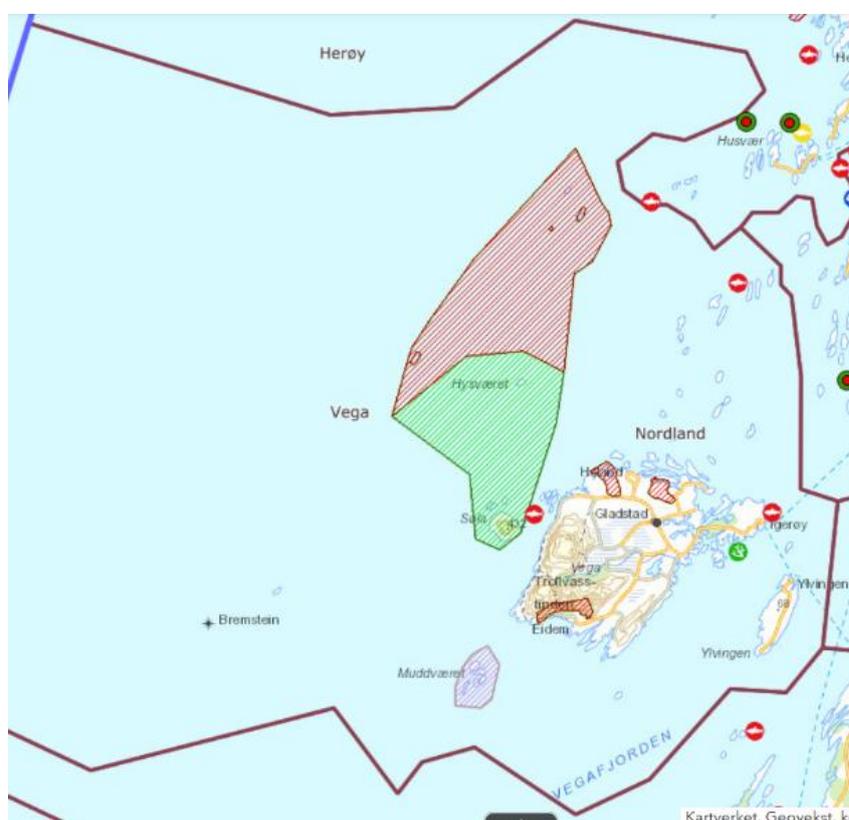


FIGURE 3.29. The location of existing aquaculture facilities within the Vega municipal area. The red circle indicates facilities for farming salmon or trout; the green circle is for algae facilities. Source: Directorate of Fisheries³⁵⁷

³⁵⁴ Fiskeridirektoratet (2020) *Akvakulturregisteret: 18936 Igerøy Ø* [online]. Available from: <https://sikker.fiskeridir.no/akvakulturregisteret/web/sites/18936>

³⁵⁵ Fiskeridirektoratet (2020) *Akvakulturregisteret: 33157 Skogsholmen* [online]. Available from: <https://sikker.fiskeridir.no/akvakulturregisteret/web/sites/33157>

³⁵⁶ Fiskeridirektoratet (2019) *Akvakulturregisteret: 40138 Bøbukta alge* [online]. Available from: <https://sikker.fiskeridir.no/akvakulturregisteret/web/sites/40138>

³⁵⁷ Fiskeridirektoratet (no date) *Akvakultur* [online]. Available from: <https://portal.fiskeridir.no/portal/apps/webappviewer/index.html?id=87d862c458774397a8466b148e3dd147>



FIGURE 3.30. The aquaculture facility at Skogsholmen, within the World Heritage property, showing one of the net pens and the feed barge. *Source: Instead Heritage*



FIGURE 3.31. The facility at Skogsholmen with its eight pen nets and feed barge. *Source: Google*

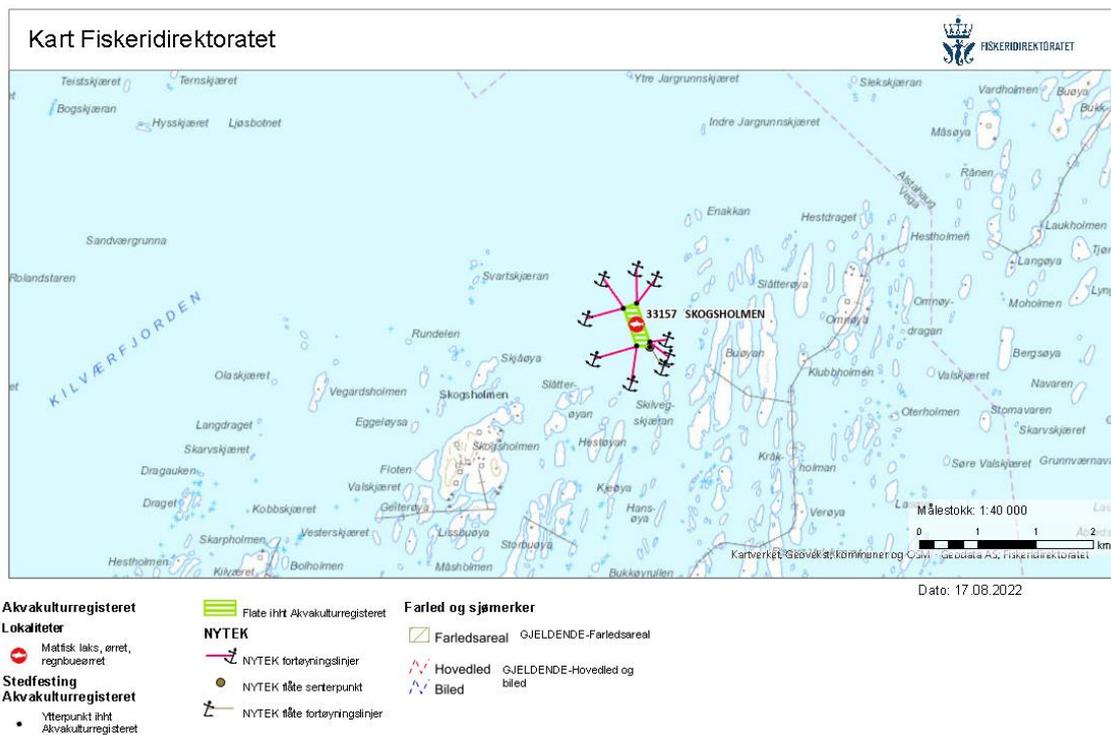


FIGURE 3.32. The layout of the facility at Skogsholmen showing its mooring system. *Source: Fiskeridirektoratet*

In line with the regulations outlined in section 3.1.4, the two operational aquaculture facilities in the Vega Archipelago report weekly to the Norwegian Food Safety Authority on salmon lice, and also report suspected outbreaks of infectious viral diseases. The two facilities must also carry out surveys periodically, as part of monitoring of environmental conditions across the seabed in accordance with relevant national standards. The results of this monitoring are summarized in Table 3.4.

TABLE 3.4. Conditions at the existing aquaculture facilities farming fish in the Vega municipal area

	IGERØY Ø (18936)	SKOGSHOLMEN (33157)
Salmon lice	Lice counts above the limit 26 times since 2012, most recently twice in 2021 ³⁵⁸	Lice counts above the limit 13 times since 2012, most recently three times in 2021 ³⁵⁹
Lice treatments	Lice treatments given 52 times since 2012, most recently in 2021. Medication has not been used since 2016 ³⁶⁰	Lice treatments given 41 times since 2012, most recently in 2021. Medication (Emamectin 154enzoate) was given four times in 2020 ³⁶¹
Fish disease	No disease reported	Infectious salmon anaemia outbreak in June 2021 and the facility was emptied in July 2021; the case is considered closed although the area is under observation ³⁶²
Recent B-survey results	2021: overall the conditions of the seabed under the pens were '1: very good'. Signs of deterioration since the previous survey, with one sampling station registering '4: very poor' ³⁶³	2021: most sampling stations were in '1: very good' or '2: good' conditions, while three stations were '3: poor' ³⁶⁴ 2022: the seabed under the pens was seen to be recovering after the emptying of the facility; the conditions at all sampling stations were considered to be '1: very good' ³⁶⁵
Recent C-survey results	2021: overall poor conditions were found; the sampling stations closest to the facility were poor in fauna, with low biodiversity ³⁶⁶	2018: the overall conditions were considered to be '3: moderate'. The benthic community was disturbed ('3: moderate' to '4: poor') at two stations. Elevated levels of organic carbon were found at all sample stations ('3: moderate' to '5: very poor') ³⁶⁷

Due to an outbreak of infectious salmon anaemia at the Skogsholmen facility in 2021, the farmed fish were slaughtered, the facility disinfected and quarantined for three months. Following this, an area of the Vega, Herøy and Alstahaug municipalities is being monitored by the Norwegian Food Safety Authority for a period of two years (Figure 3.33).³⁶⁸

³⁵⁸ Barents Watch (2022) *Salmon lice: Igerøy Ø* [online]. Available from:

<https://www.barentswatch.no/nedlasting/fishhealth/lice?locality=18936>

³⁵⁹ Barents Watch (2022) *Salmon lice: Skogsholmen* [online]. Available from:

<https://www.barentswatch.no/nedlasting/fishhealth/lice?locality=33157>

³⁶⁰ Barents Watch (2022) *Lice treatments: Igerøy Ø* [online]. Available from:

<https://www.barentswatch.no/nedlasting/fishhealth/treatments?locality=18936>

³⁶¹ Barents Watch (2022) *Lice treatments: Skogsholmen* [online]. Available from:

<https://www.barentswatch.no/nedlasting/fishhealth/treatments?locality=33157>

³⁶² Barents Watch (2022) *Fish disease: Skogsholmen* [online]. Available from:

<https://www.barentswatch.no/nedlasting/fishhealth/disease?locality=33157>

³⁶³ Aqua Kompetanse AS (2021) *B-undersøkelse ved Igerøy Ø i Vega kommune, oktober 2021* [online]. Available from:

<https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR456084465/attachments/69960>

³⁶⁴ Aqua kompetanse AS (2021) *ASC-undersøkelse ved Skogsholmen i Vega kommune, juli 2021*

[online]. Available from: <https://novasea.no/wp-content/uploads/ASC-Skogsholmen-2021.pdf>

³⁶⁵ Aqua kompetanse AS (2022) *B-undersøkelse ved Skogsholmen i Vega kommune, mars 2022* [online]. Available from:

<https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR483130178/attachments/71907>

³⁶⁶ Åkerblå AS (2021) *C-undersøkelse med ASC-vurdering for Igerøy Ø (18936)* [online]. Available from:

<https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR476597569/attachments/71442>

³⁶⁷ Aqua kompetanse AS (2018) *C-undersøkelse ved Skogsholmen i Vega kommune, juli 2018* [online]. Available from:

<https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR298212428/attachments/41353>

³⁶⁸ The original regulations from July 2021: <https://lovdata.no/dokument/LF/forskrift/2021-07-13-2391>, these were amended in January 2022: <https://lovdata.no/dokument/LTI/forskrift/2022-01-18-78>.

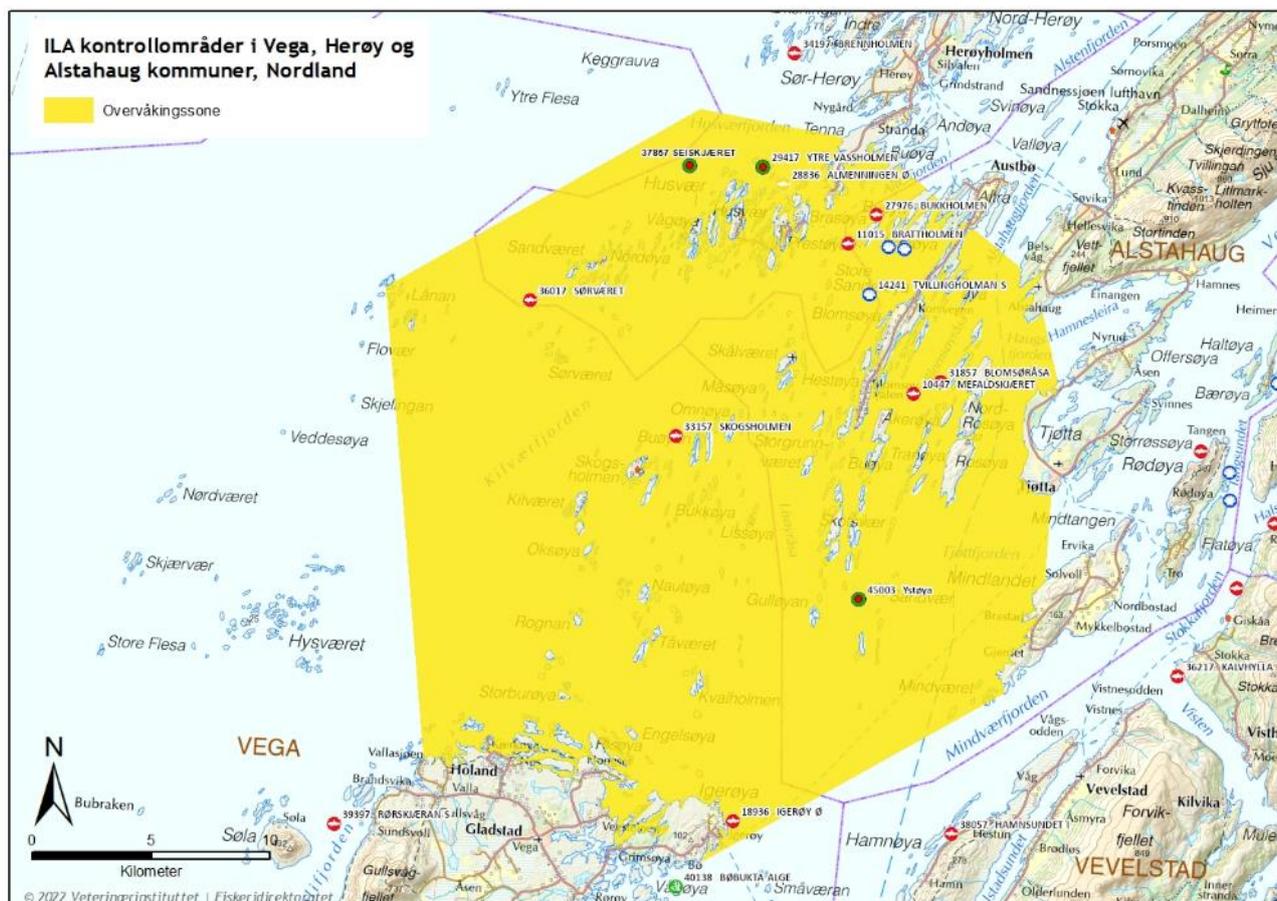


FIGURE 3.33. Following an outbreak of infectious salmon anaemia at the Skogsholmen aquaculture facility in 2021, an area of the Vega, Herøy and Alstahaug municipalities is being monitored by the Norwegian Food Safety Authority.

Source: Lovdata³⁶⁹

In addition, high densities of brittle stars close have been observed near to the aquaculture facility at Igerøy.³⁷⁰ Although a direct relationship to the facility has not been demonstrated, this species is known to increase in numbers in areas with increased organic matter, such as found near to aquaculture.³⁷¹

As well as the three existing aquaculture facilities in Vega Municipality, the 2007-2020 municipal masterplan includes four other potential areas for aquaculture, also located within the World Heritage property:

- Hilholman (10901 / AK-16): there has been no active facility since 2006, although the municipal plan lists it as being designated for future aquaculture activity
- Lyngøya N (13103 / AK-8) and Vallsjøen V (10595 / AK-14): these have not been active since 2009, although the municipal plan lists them as existing aquaculture facilities
- Kråkskjerslua (AK – 17): this is designated as a future aquaculture area in the municipal plan.

³⁶⁹ Forskrift om endring i forskrift om kontrollområde for å forebygge, begrense og bekjempe infeksjøs lakseanemi (ILA) hos akvakulturdyr, Vega, Herøy og Alstahaug kommuner, Nordland. Available from: <https://lovdata.no/dokument/LTI/forskrift/2022-01-18-78>

³⁷⁰ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 5.

³⁷¹ Keeley, N., Valdemarsen, T., Strohmeier, T. et al. (2020) Mixed-habitat assimilation of organic waste in coastal environments. *Science of the Total Environment* 699.

3.5 ONGOING ADMINISTRATIVE AND LEGAL ISSUES

The draft section of the Helgeland Coastal Plan for Vega Municipality has been through a long political and administrative planning processes. Due to the uncertainty about the implications of the World Heritage status of ‘Vegaøyane – The Vega Archipelago’ and its compatibility with aquaculture, the plan has not yet been approved. It is important to understand something of this background since it is the context in which this supplementary assessment will be reviewed by the State Party.

In addition, it is noted that the two separate application processes for permissions to operate at Rørskjæran and Hysvær have had complex administrative and legal processes. At the time of writing this report, the application by Vega Sjøfarm AS and Nova Sea AS for a facility at Hysvær has been rejected. The application by Mowi ASA for Rørskjæran has been suspended until the outcome of this supplementary assessment has informed decision-making.

The issues are summarized below in Table 3.5.

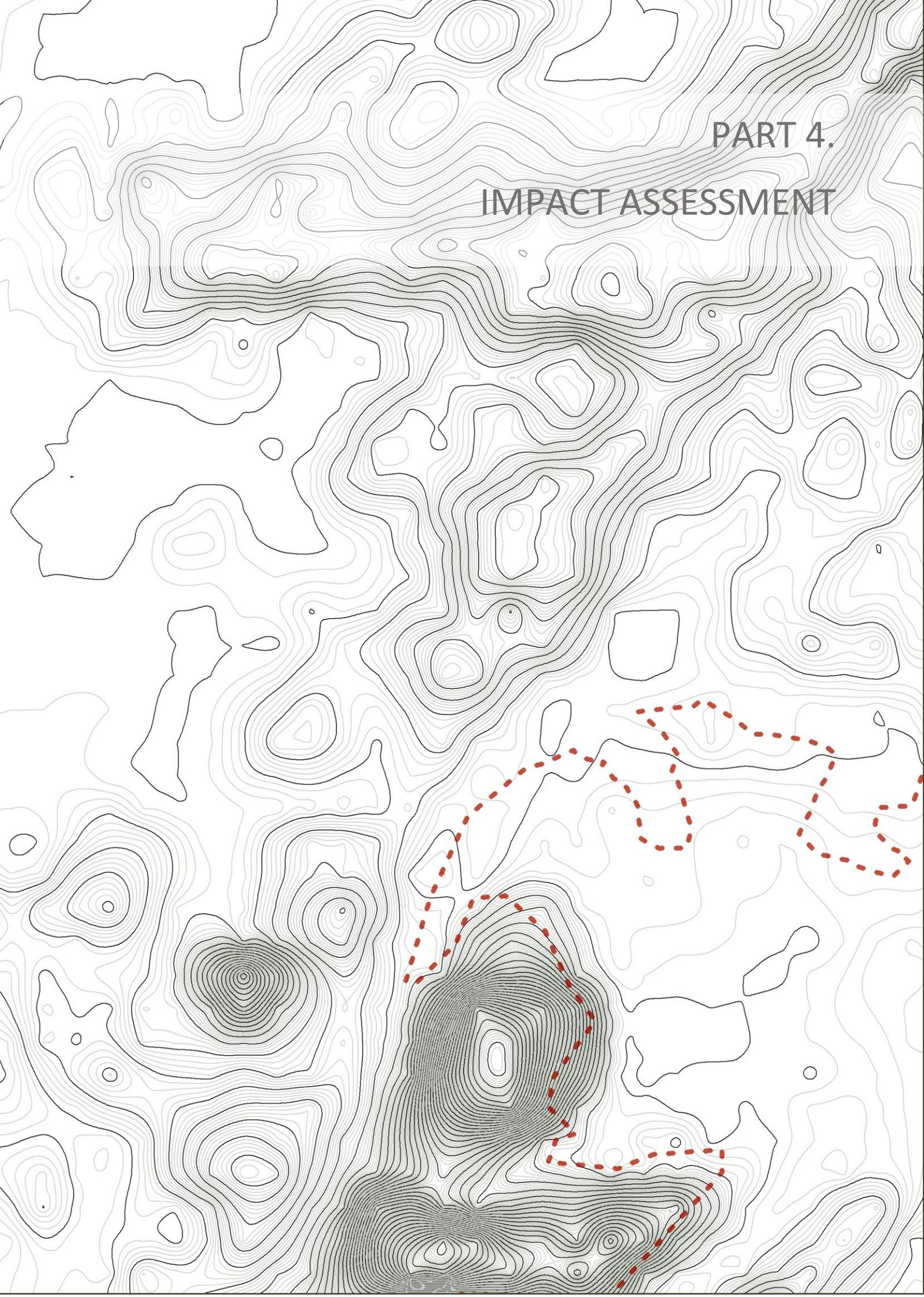
TABLE 3.5. Summary of the administrative and legal issues related to new aquaculture in the Vega Archipelago up to the launch of this supplementary assessment.

	VEGA SECTION OF THE HELGELAND COASTAL PLAN	MOWI RØRSKJÆRAN	VEGA SJØFARM / NOVA SEA HYSVÆR
2014	February: Helgeland Coastal Plan starts		
2015		April: application submitted by Marine Harvest May: Nordland County Council forwards application to Vega Municipality for processing	June: application submitted by Vega Sjøfarm July: Vega Protected Areas Board gives Vega Sjøfarm dispensation, against Protected Areas Manager recommendation
2016	June: first consultation on the Vega section of the Helgeland Coastal Plan, which includes proposed aquaculture facilities at Hysvær and Rørskjæran August - November: objections received	April: discharge permit issued by the County Governor of Nordland May: County Governor of Nordland requests that the application is suspended until further information is available	May: Nordland County Council asks institutions to suspend the process until further information is available May: County Governor of Nordland recommends rejecting application
2017	March: Nordland County Council withdraws objection, legal responsibility in the planning process was transferred to the Directorate of Cultural Heritage March: second consultation on Helgeland Coastal Plan	July: Nordland County Council suspends application process until report is prepared on potential impacts on eider ducks	May: County Governor of Nordland rejects the request for a discharge permit and Nordland County Council rejects the application for a licence June: Vega Sjøfarm appeals

	VEGA SECTION OF THE HELGELAND COASTAL PLAN	MOWI RØRSKJÆRAN	VEGA SJØFARM / NOVA SEA HYSVÆR
	May: Directorate of Cultural Heritage and County Governor of Nordland raise objection		August: Norwegian Environment Agency upholds County Governor of Nordland's decision to reject application
2018	February: mediation meeting mediation meeting between Vega Municipality, the County Governor of Nordland and the Directorate of Cultural Heritage held without reaching agreement	July: Nordland County Council issues 5-year licence July: Directorate of Cultural Heritage (and other stakeholders) issues a complaint about the licence	September: County Governor of Nordland confirms their decision to reject the application
2019	April: third consultation on the Vega section of the Helgeland Coastal Plan May: Directorate of Cultural Heritage and County Governor of Nordland maintain their objections June: Vega Municipality cannot approve Helgeland Coastal Plan, decides to commission supplementary assessment September: County Governor of Nordland informs the Ministry of Local Government and Regional Development that knowledge about World Heritage is insufficient to take decisions about aquaculture	February: Nordland County Council confirms they are granting the licence April: Norwegian Environment Agency informs Mowi that they are recalling the discharge permit issued in 2016 April: Mowi appeals against the withdrawal of the discharge permit	August: Norwegian Environment Agency recommends that no permit is granted and upholds decision of County Governor September: Nordland County Council informs Vega Sjøfarm that their appeal is closed, and the licence will not be granted
2020	July: Vega Municipality issues tender for supplementary assessment	April: Ministry of Climate and the Environment overrules the Norwegian Environment Agency and confirms that the original discharge permit is valid May: Directorate of Cultural Heritage asks the Directorate of Fisheries to suspend the licence until the situation is resolved	



Lånan with the islands of Hysvær and then the peaks of Vega and Sjøla in the distance. Source: Inge Ove Tysnes | Vega Archipelago World Heritage Foundation

The background of the page is a topographic map with intricate contour lines. A prominent red dashed line is drawn across the map, starting from the bottom center, curving upwards and to the right, then looping back to the left and then down again. The text is positioned in the upper right quadrant of the page.

PART 4.

IMPACT ASSESSMENT

4.1 ASSESSING IMPACTS

Having explored the Vega Archipelago as a heritage place (section 2) and the proposals to be assessed (section 3), this chapter of the report focuses on identifying and predicting the potential positive and negative impacts that would occur if the Vega section of the Helgeland Coastal Plan were adopted in its current form and/or permission given for the two proposed aquaculture facilities for Rørskjæran and Hysvær.

4.1.1 Attributes as the focus of heritage conservation and management

Following guidance for impact assessments in a World Heritage context,³⁷² impacts are considered to be the result of interactions between the proposed action that is being evaluated – in this case different components of the Vega section of the Helgeland Coastal Plan and the two proposed aquaculture facilities (section 3) – and the attributes that convey the Outstanding Universal Value of ‘Vegaøyane – The Vega Archipelago.’

Attributes are understood as the elements of the World Heritage property that convey its Outstanding Universal Value and other heritage values. The attributes that emerged from the analysis of the Outstanding Universal Value in section 2.5.3 (Table 2.2) were grouped thematically so that they could be used more effectively in this assessment (Table 4.1). These thematic groups of attributes - geology and landscape features, habitats, species, human settlement, fishing traditions, farming, eider tending - are now used for the analysis that follows (sections 4.3 and 4.4).

TABLE 4.1. Attributes that convey the Outstanding Universal Value of ‘Vegaøyane – The Vega Archipelago’

<p>Geology and landscape features</p> <p>Laurentian geology</p> <p>Ordovician granite</p> <p>Strandflat topography (including islands, islets and skerries, neighbouring coastline and intervening areas of sea)</p> <p>Coastal mountains with strandlines</p> <p>Beach areas</p> <p>Shallow, clear marine waters</p> <p>Gulf Stream ocean currents</p> <p>Habitats</p> <p>Coastal heathland</p> <p>Boreal heathland</p> <p>Hay meadows</p> <p>Semi-natural pastures</p> <p>Semi-natural wetlands</p> <p>Semi-natural beach / mesic meadow</p> <p>Calcareous shallow soils</p>	<p>Species</p> <p>Bird species</p> <p>Eider and other species</p> <p>Terrestrial plant species</p> <p>Marine plant species, including kelp forest and other seaweed systems (50+ algae species)</p> <p>Fungi</p> <p>Fish</p> <p>Other animal species</p> <p>Human settlement</p> <p>Archaeological sites</p> <p>Natural harbours and anchorages</p> <p>Historic buildings</p> <p>Historic eider houses</p> <p>Settlements and dwellings on 56 islands across the archipelago</p> <p>Re-used materials in structures</p>	<p>Fishing infrastructure: fishing villages, breakwaters, quays, houses, outhouses, boathouses, warehouses, lighthouses and beacons, harbours and anchorages, slipways, etc.</p> <p>Fairways and routes, including traditional knowledge of navigational landmarks to ensure safe sea travel</p> <p>Fish processing equipment and traditional processes</p> <p>Harbours and fishing-industry buildings</p> <p>Farming</p> <p>Farmlands including cultivated, mown and grazing areas</p> <p>Farmlands and field patterns</p>
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³⁷² UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

Calcareous and rich ponds Dams and lakes Calcareous helophyte swamps Kelp forests Maerl beds Eelgrass	Trading posts Trade routes and transport connections to landowners on mainland Fishing traditions Fishing grounds Traditional knowledge Spawning grounds and nursery areas Fishers and their equipment	Farmers and traditional knowledge Farm animals Farm buildings Traditional agricultural activities and land management practices Eider tending Nesting areas Eider tenders and traditional knowledge
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Concerns have been noted about the state of conservation of various attributes of the World Heritage property (Table 2.3). The range of conservation issues mean that the social-ecological system is vulnerable and the impacts of certain forms of continuity and change, in particular new developments, can be amplified. The ‘Vegaøyan – The Vega Archipelago’ World Heritage property is a continuing cultural landscape³⁷³ and this requires an approach to assessment and long-term management of continuity and change that constantly checks back to the Outstanding Universal Value effectively. Methodologically, for World Heritage purposes, it is not acceptable to allow the state of conservation of the attributes of Outstanding Universal Value to worsen; instead, the attributes of ‘Vegaøyan – The Vega Archipelago’ should be enhanced from their fragile state at the time of nomination.³⁷⁴ The strengths and weaknesses of the management system in place for the World Heritage property and its setting can enhance or compromise both the capacity to direct continuity and change so they are compatible with Outstanding Universal Value but also responses to factors and potential impacts of specific changes, be it seizing opportunities or managing negative impacts.

For this reason, the baseline state of conservation of the World Heritage property offered in Table 2.3 and the overview of its management system Table 2.6 are taken into consideration in the evaluation of potential impacts of the adoption of the Helgeland Coastal Plan for Vega and the implementation of the two proposed aquaculture facilities, including identification of mitigation measures relative to those impacts. It is noted that, taken holistically, the property’s state of conservation is not robust and that therefore, the overall baseline for this impact assessment is delicate and is less able to resist impacts.

³⁷³ UNESCO World Heritage Centre (2022) *Cultural landscapes* [online]. Available from: <https://whc.unesco.org/en/culturallandscape/>

³⁷⁴ ‘Protection and management of World Heritage properties should ensure that their Outstanding Universal Value, including the conditions of integrity and/or authenticity at the time of inscription, are sustained or enhanced over time,’ (paragraph 96) and ‘Protection of cultural landscapes can contribute to current techniques of sustainable land use and can maintain or enhance natural values in the landscape,’ (paragraph 47). See UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]: paragraph 96. Available from: <https://whc.unesco.org/en/guidelines/>

4.1.2 Identification of impacts

Impacts are understood to be the consequences of interactions between the attributes of a World Heritage property which convey its Outstanding Universal Value and elements of a proposed action, as illustrated in Figure 4.1.



FIGURE 4.1. These diagrams illustrate the concept of an ‘impact’ for assessments in a World Heritage context. Impacts are understood to be the interaction between an attribute of Outstanding Universal Value with an element of the proposed project. Source: *World Heritage Leadership*³⁷⁵

The Vega section of the Helgeland Coastal Plan proposes forms of continuity and change at the scale of a zoning plan but also, given the limited locations suitable for new aquaculture, in the form of two specific aquaculture facilities, Rørskjæran and Hysvær.

The interactions between these proposals and the attributes of the ‘Vegaøyen – The Vega Archipelago’ World Heritage property are assessed when they might have a direct effect, i.e., potential direct impacts, but also where an attribute might be affected through a chain effect, i.e., indirect impacts. This is of particular relevance within social-ecological systems where impacts on one species can affect others. For example, within a cultural landscape, humans are dependent on particular species for harvesting as natural resources, these species are in turn dependent on others which form their habitat or are part of their food web. The interdependencies of the Vega Archipelago, as outlined in section 2, are many and complex, making it essential to consider all impacts, direct or indirect, that might affect the Outstanding Universal Value of the World Heritage property.

The potential impacts that would arise if the Helgeland Coastal Plan was adopted by Vega Municipality are assessed in section 4.3 without the two proposed aquaculture facilities, but including Vega’s existing aquaculture facilities. This decision to assess the Helgeland Coastal Plan for Vega *without any new aquaculture proposals* means that the elements assessed, for the most part, respect and maintain a current status quo and the degree of change is limited.

Instead, the two proposed aquaculture facilities assessed in section 4.4 constitute more significant change to the current status quo. In order to ensure comprehensive identification of types of potential impact, specific impact assessment guidance for marine aquaculture was used, in particular *Environmental Impact Assessment: Practical Guidelines Toolkit for Marine Fish Farming* commissioned by the Scottish

³⁷⁵ UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

government.³⁷⁶ This was integrated with information from the publication *Aquaculture and the Environment* by the former Programme Director of the Aquaculture Development Programme of the UN's Food and Agriculture Organization.³⁷⁷ Subsequently the identified potential impacts were included within the online survey conducted with local stakeholders in the context of this supplementary assessment, so that they had the opportunity to express any other additional concerns that were specific to the situation in the Vega Archipelago (Appendix 4). The final list of potential impacts that were assessed were:

Potential impacts during the installation/deinstallation of an aquaculture facility

- Installation/deinstallation activities
- Mooring system

Potential impacts during the operation of an aquaculture facility

- Presence of the facility within the seascape
- Increased marine traffic serving the facility
- Noise
- Light
- Discharge of organic waste
- Discharge of chemicals
- Release of heavy metals into water from antifoulants
- Production of non-fish waste
- Interactions with predators
- Interactions of farmed fish with wild salmonids
- On-land traffic and processing facilities

Potential impacts on the socio-economic context

- Presence in the socio-economic context
- Use of marine resources
- Funding for the municipality

Potential impacts of the proposed aquaculture facilities were also assessed within the broader context of other trends occurring in the Vega Archipelago. These factors are all issues that place additional pressure on 'Vegaøyen – The Vega Archipelago' and potentially make its attributes vulnerable to the negative impacts of additional aquaculture. These factors are explored as potential cumulative impacts in more detail in section 4.2. In addition, the current state of conservation (Table 2.3) means that several attributes are already potentially vulnerable to negative impacts and this is taken into consideration within the assessment (sections 4.3 and 4.4).

However, it should be noted that this assessment does not consider global positive and negative impacts of the entire aquaculture production chain (for example, the impact of farmed salmon feed on wild fisheries or the carbon footprint of supplies and delivery). Nor does it consider the impacts on fish welfare of caging, handling, transport and slaughter of migratory predators. These issues were considered to be beyond the

³⁷⁶ RPS Group (2007) *Environmental Impact Assessment: Practical Guidelines Toolkit for Marine Fish Farming*. Scottish Aquaculture Research Forum/The Highland Council/The Scottish Executive.

³⁷⁷ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing.

focus on World Heritage considerations but are a source of discussion in other contexts about improving practices in fish farming.³⁷⁸

4.1.3 Alternatives

In line with impact assessment practice, including recommendations in the *Guidance and Toolkit for Impact Assessment in a World Heritage Context*,³⁷⁹ a limited number of alternatives will be included within this report for consideration.

As mentioned above, the main significant changes that this supplementary assessment assesses are the proposed aquaculture facilities at Rørskjæran and Hysvær since, for the most part, the adoption of the rest of the Helgeland Coastal Plan for Vega would constitute maintaining the current status quo. By assessing the two proposed aquaculture facilities separately from the Vega section of the Helgeland Coastal Plan, several scenarios can be considered:

- the adoption of the Vega section of the Helgeland Coastal Plan in its current form with the two proposed aquaculture included
- the adoption of the Vega section of the Helgeland Coastal Plan without new aquaculture in the World Heritage property or its buffer zone
- proceeding with the two proposed aquaculture facilities for Rørskjæran and Hysvær without adopting the Vega section of the Helgeland Coastal Plan

With regard to alternative locations, the planning process of the Vega section of the Helgeland Coastal Plan included consideration of multiple potential locations for new aquaculture facilities but concluded that only two new locations were suitable for inclusion within Vega Municipality. These were Sjøla/Måsskjæret (corresponding to the application by Mowi ASA for Rørskjæran) and Hysværet (corresponding to the application by Vega Sjøfarm AS with Novasea AS and Vegalaks AS for Hysvær) (section 3.2.6). For this reason, this report will look at only these two new locations and considers there to be no suitable alternative locations that need inclusion in this assessment. This report will assess both locations and consider the options available to the State Party for giving permission for both aquaculture facilities or only one of them. In addition, this report will include the 'no project' alternative. This is a comparison between the predicted future situation with the proposed aquaculture facilities and the predicted future situation without them.

4.1.4 Mitigation

In the case of potential negative impacts being identified from the adoption of the Helgeland Coastal Plan for Vega and/or implementation of the two new aquaculture approvals, the systematic analysis in sections 4.3 and 4.4 also consider mitigation. Given that the coastal plan for the most part constitutes maintaining the current status quo, the real focus of potential mitigation are the two new aquaculture proposals.

³⁷⁸ E.g., Winther, U., Skontorp Hognes, E., Jafarzadeh, S. & Ziegler, F. (2020) *Greenhouse gas emissions of Norwegian seafood products in 2017*. SINTEF Ocean AS. Available from:

https://www.sintef.no/contentassets/25338e561f1a4270a59ce25bcbc926a2/report-carbon-footprint-norwegian-seafood-products-2017_final_040620.pdf/ Sommerset, I., Walde, C.S., Jensen, B.B. et al. (eds) (2022) *Fiskehelse rapporten 2021* [online].

Veterinærinstituttets årlige oversikt over fiskehelsen i Norge. Available from: <https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2022/fiskehelse-rapporten-2021>.

³⁷⁹ UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre: 35. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

As already mentioned, the aquaculture industry is constantly developing in terms of technology and practice. As a result, the sector already implements some mitigative measures in an attempt to reduce the impact of aquaculture on the environment. This assessment notes current practices, including existing mitigation, described by the aquaculture companies and takes them into consideration when assessing specific impacts. It should be noted that the conclusions of this report are only valid if these mitigation standards are implemented.

This assessment follows World Heritage impact assessment guidance on the subject of mitigation, where some types of mitigative action are not acceptable, for example, offsetting. Instead, it is recognized that ‘the best outcome for World Heritage is to avoid negative impacts entirely. In some cases, it may not be possible to entirely avoid all negative impacts but they should be minimized to acceptable levels that cause no concern for World Heritage by significantly reducing their magnitude, duration, extent, etc.’³⁸⁰

The assessment will note where there are residual impacts on the Outstanding Universal Value of the World Heritage property that would remain after mitigation is carried out.

³⁸⁰ UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre: 41. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

4.2 CUMULATIVE IMPACTS FROM FACTORS AFFECTING THE PROPERTY

This section will summarize cumulative impacts which will be taken into consideration during the overall assessment of impacts (sections 4.3 and 4.4). This approach is in line with the Nature Biodiversity Act's Chapter 2, Section 10, which requires the pressures placed on an ecosystem by cumulative environmental effects to be used to make decisions about sustainable use.³⁸¹ It is also advocated by the *Guidance and Toolkit for Impact Assessment in a World Heritage Context*.³⁸²

Before entering into the precise details of the potential impacts of adoption of the Helgeland Coastal Plan for Vega and/or approval of the two aquaculture facilities, it is useful to consider the wider context at Vega and existing or foreseeable trends. This is because some factors which affect the World Heritage property can potentially add to or magnify the impacts of new aquaculture facilities: these are known as cumulative impacts. Assessing new strategic frameworks or individual proposed projects in isolation has the risk of underestimating the potential impacts on the attributes of the 'Vegaøyane – The Vega Archipelago' World Heritage property from multiple projects of the same type and/or a combination of different factors over time.

When cumulative impacts occur, attributes of the World Heritage property are more vulnerable to the addition of further impacts. This is because a social-ecological system, such as the continuing cultural landscape found in the Vega Archipelago, is dynamic but tendentially stays within a 'regime,' as represented in ball-and-cup diagrams (Figure 4.2). The archipelago has essentially been a vast self-regulating system for millennia. In some respects, impact assessment can be thought of as assessing whether a proposed change in strategic direction or a specific project would cause a 'shock' to the system to such an extent that it would cause a regime change ('a' in Figure 4.2). When there are other factors affecting the system, they can create a situation where a regime shift is much more likely to occur should the change in strategic direction or proposed project take place ('b' in Figure 4.2).

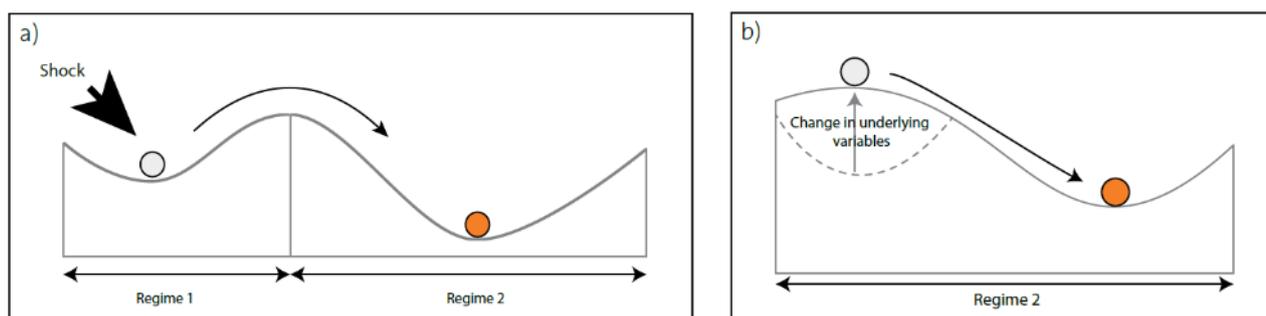


FIGURE 4.2. A social-ecological system is often represented by a ball-and-cup diagram. The ball can move within its cup, showing the dynamism of a system, but it tendentially stays within a functioning 'regime'. a) shows that when a shock occurs to the social-ecological system, it can be shifted into a new regime. b) shows that when there are other changes affecting a system, a regime shift is much more likely when a shock occurs. *Source: Stockholm Resilience Centre*³⁸³

³⁸¹ Lov om forvaltning av naturens mangfold (naturmangfoldloven). Available from: <https://lovdata.no/dokument/NL/lov/2009-06-19-100>

³⁸² UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

³⁸³ Stockholm Resilience Centre (2016) *Insight 2: Regime Changes* [online]. Available from: <https://www.stockholmresilience.org/research/insights/2016-11-16-insight-2-regime-shifts.html>

For this reason, factors with the potential to affect the Vega Archipelago as cumulative impacts have been identified. This has been based on the list of factors used by the UNESCO World Heritage Centre for its Periodic reporting.³⁸⁴ Table 4.2 shows those which have the potential to add to or interact with the potential impacts of aquaculture in some way.

TABLE 4.2. Factors affecting the ‘Vegaøyen – The Vega Archipelago’ World Heritage property. *Factors from: UNESCO World Heritage Centre*³⁸⁵

PRIMARY FACTORS AFFECTING WORLD HERITAGE	SECONDARY FACTORS	HOW FACTORS AFFECT THE VEGA ARCHIPELAGO
Pollution:	Pollution of marine waters Agricultural runoff	Chemical analyses show poor conditions of seawater ³⁸⁶ Agriculture in region increases nutrients and particle runoff during surface erosion ³⁸⁷ Increased light attenuation affecting organisms dependent on photosynthesis (e.g., kelp, seagrass) and visual predators (e.g., fish) ³⁸⁸
Biological resource use/modification:	Fishing/collecting aquatic resources Aquaculture	Only 22% of fish stocks in the Norwegian Sea are harvested within sustainable levels ³⁸⁹ Aquaculture facilities already exist within the World Heritage property and along entire Helgeland coast (section 3.4) and potentially could increase in the future. Combined, they are the largest anthropogenic nutrient discharge along the coast with potential risk of increased light attenuation and eutrophication ³⁹⁰
Social/cultural uses of heritage:	Changes in traditional ways of life and knowledge systems	Reduction in traditional land management practises and abandoned/altered use of land, leading to deterioration of semi-natural habitats through vegetation change, bushfires, establishment of alien species, etc. ³⁹¹

³⁸⁴ UNESCO World Heritage Centre (2022) *List of factors affecting the properties* [online]. Available from: <https://whc.unesco.org/en/factors/>

³⁸⁵ UNESCO World Heritage Centre (2022) *List of factors affecting the properties* [online]. Available from: <https://whc.unesco.org/en/factors/>

³⁸⁶ Kartverket (no date) *NVE Temakart* [online]. Available from: https://temakart.nve.no/link/?link=tilstand_biologiske_kvalitetselement

³⁸⁷ Direktoratgruppen vanddirektivet (2018) *Klassifisering av miljøtilstand i vann* [online]. Available from: <https://www.vannportalen.no/veiledere/klassifiseringsveiledere/>

³⁸⁸ Frigstad, H., Harvey, T., Deininger, A. & Poste A. (2020) *Increased Light Attenuation in Norwegian Coastal Waters – a literature review*. NIVA Report 7551. NIVA. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2711599>

³⁸⁹ ICES (2020) Norwegian Sea ecoregion – Fisheries overview. In: *Report of the ICES Advisory Committee, 2020. ICES Advice 2020, section 12.2: 13*. Available from: <https://doi.org/10.17895/ices.advice.7603>.

³⁹⁰ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 8.

³⁹¹ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 13.

	<p>Identity, social cohesion, changes in local population and community</p> <p>Impacts of tourism / visitor / recreation</p> <p>Transport and energy infrastructure</p>	<p>Changes in land use to less labour intense techniques, e.g., conversion of hay-meadows to semi-natural pastures, results in less species-rich habitats³⁹²</p> <p>Almost no fisher-farmer or eider tenders (section 2.4.4)</p> <p>Decreased number of small-scale local fishers in coastal waters (section 2.4.4)</p> <p>End of the inshore fishery of coastal Atlantic cod (following loss of kelp forests)³⁹³</p> <p>Decreasing population and depopulation of smaller islands (section 2.4.4)</p> <p>Conversion of some houses and other traditional buildings to serve tourists and the construction of new-build cabins (fig. 4.5)</p> <p>Recreational fishing³⁹⁴</p> <p>Potential introduction of windfarms to meet pressure for energy autonomy</p> <p>Potential pressure to expand coastal infrastructure to increase capacity cruise ship tourism</p>
<p>Climate change and severe weather events:</p>	<p>Storms</p> <p>Changes to oceanic waters</p> <p>Temperature change</p> <p>Other climate change impacts</p>	<p>Islands at risk from removal of thin topsoil by droughts, flooding, wind leading to erosion³⁹⁵</p> <p>Semi-natural beach meadows most at risk of permanent flooding as sea levels rise, altering zonation and extent³⁹⁶</p> <p>Climate changes alter species distributions with consequent effects on ecosystem services and therefore also on human wellbeing³⁹⁷</p>

³⁹² Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 17.

³⁹³ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 5.

³⁹⁴ Norway has the largest marine recreational fishery in Europe; there have been studies linking recreational fishing as the largest cause of fish mortality of coastal cod. Hyder, K., Weltersbach, M. S., Armstrong, M., *et al.* (2018) Recreational sea fishing in Europe in a global context—participation rates, fishing effort, expenditure, and implications for monitoring and assessment. *Fish and Fisheries* 19: 225–243. Kleiven, A.R., Fernandez-Chacon, A., Nordahl, J.-H., *et al.* (2016) Harvest Pressure on Coastal Atlantic Cod (*Gadus morhua*) from Recreational Fishing Relative to Commercial Fishing Assessed from Tag-Recovery Data. *PLoS ONE* 11.3: e0149595.

³⁹⁵ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 15.

³⁹⁶ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 15.

³⁹⁷ Pecl, G. T., Araújo, M. B., Bell, J. D., Blanchard, J., Bonebrake, T. C., Chen, I.-C., Clark, T. D., Colwell, R. K., Danielsen, F. & Evengård, B. (2017) Biodiversity redistribution under climate change: Impacts on ecosystems and human well-being. *Science* 355 (6332).

		<p>Increased temperatures threaten already vulnerable species that are habitat specialists with limited geographical range, for example, altering the alpine species which are characteristic of Vega's coastal heathlands³⁹⁸</p> <p>Altered precipitation patterns could change the composition of habitats into wetter variants, while increased droughts could damage or kill vegetation e.g., heath³⁹⁹</p> <p>Increased temperatures and variation in precipitation could negatively affect species with narrow temperature ranges and drought events could cause death</p> <p>Increased temperatures increase risk of large, uncontrolled fires⁴⁰⁰</p> <p>More extreme weather events can damage social-ecological systems, e.g., from kelp forests to buildings</p> <p>Changes to seawater currents; weakening of Gulf Stream</p> <p>Changes to seawater flow and circulation patterns, changes to seawater PH and temperature</p> <p>More acidic sea water, due to climate change, may have consequences for marine organisms that have calcium-based shells or skeletons⁴⁰¹</p>
Invasive/alien species or hyper-abundant species:	Hyper-abundant species Modified genetic material	<p>An estimated 3 billion sea urchin overgrazed 180km² of kelp forests in the Vega Archipelago since the 1970s, leaving underwater deserts and affecting ecosystem services (from primary production to reduced fisheries)⁴⁰²</p> <p>Rapid increase in edible crab population due to increasing sea temperatures facilitating its movement north⁴⁰³</p> <p>Farmed fish genetically mixing with wild salmon stocks⁴⁰⁴</p>

³⁹⁸ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 15, 16.

³⁹⁹ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 17, 18.

⁴⁰⁰ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 16.

⁴⁰¹ Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene — Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]: 33-34. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-20-20192020/id2699370>

⁴⁰² Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 4

⁴⁰³ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 6.

⁴⁰⁴ Thorstad, E.B., Forseth, T. & Fiske, P. (eds) (2021) *Vitenskapelig råd for lakseforvaltning 2021. Status for norske laksebestander i 2021. Rapport fra Vitenskapelig råd for lakseforvaltning 16* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2830680> or the English summary:

		<p>Water vole population periodically peaks and causes damage to various terrestrial habitats, including facilitating establishment of invasive plant species. Population peaks are occurring more frequently and lasting longer⁴⁰⁵ and appear to be connected to abandoned land use⁴⁰⁶</p> <p>Mink is an alien species which is causing harm to bird life, including eider ducks⁴⁰⁷</p> <p>Sitka spruce is invasive and spreading on islands and altering habitats such as coastal heathland⁴⁰⁸</p> <p>A few species, e.g., juniper, crowberry, meadowsweet, etc., outcompete other species when landscape is left unused⁴⁰⁹</p>
Management and institutional factors ⁴¹⁰ :	<p>Management system/management plan</p> <p>Legal framework</p> <p>Governance</p> <p>Management activities</p> <p>Financial resources</p> <p>Human resources</p>	<p>Gaps in legal frameworks hinder the ability of responsible authorities to meet the obligations of the World Heritage</p> <p>The strongly decentralized governance model offers strengths (decision making close to the problems) but is also fragmentary and vulnerable at the local level to conflict of interests</p> <p>Gaps in systematic monitoring at the scale of the entire World Heritage property since inscription make it difficult to establish the state of conservation, especially of marine environments, and map upward or downward trends</p> <p>Funding models tend to focus on sustaining efforts in relation to only some attributes upholding Outstanding Universal Value</p> <p>Those holding the primary responsibility for management of the cultural landscape do not always have access to the tools and expertise to shoulder it</p>

This list of factors demonstrates the range of pressures currently affecting the World Heritage property or which are foreseen in the near future. It is particularly important to note that these interact with each other, reinforcing and magnifying effects on the attributes of the World Heritage property. Figure 4.3 shows how a marine ecosystem which is subject to pressure from both overfishing and eutrophication (increased organic matter resulting from various human activities, including aquaculture): the cumulative impact is significantly greater than individual impacts and can cause changes in the structure of the food web.

<https://www.vitenskapsradet.no/Portals/vitenskapsradet/Status%20of%20wild%20Atlantic%20salmon%20in%20Norway%202021.pdf>

⁴⁰⁵ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 14.

⁴⁰⁶ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 17.

⁴⁰⁷ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 14.

⁴⁰⁸ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 16, 17-18.

⁴⁰⁹ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 16.

⁴¹⁰ See full analysis in Table 2.6

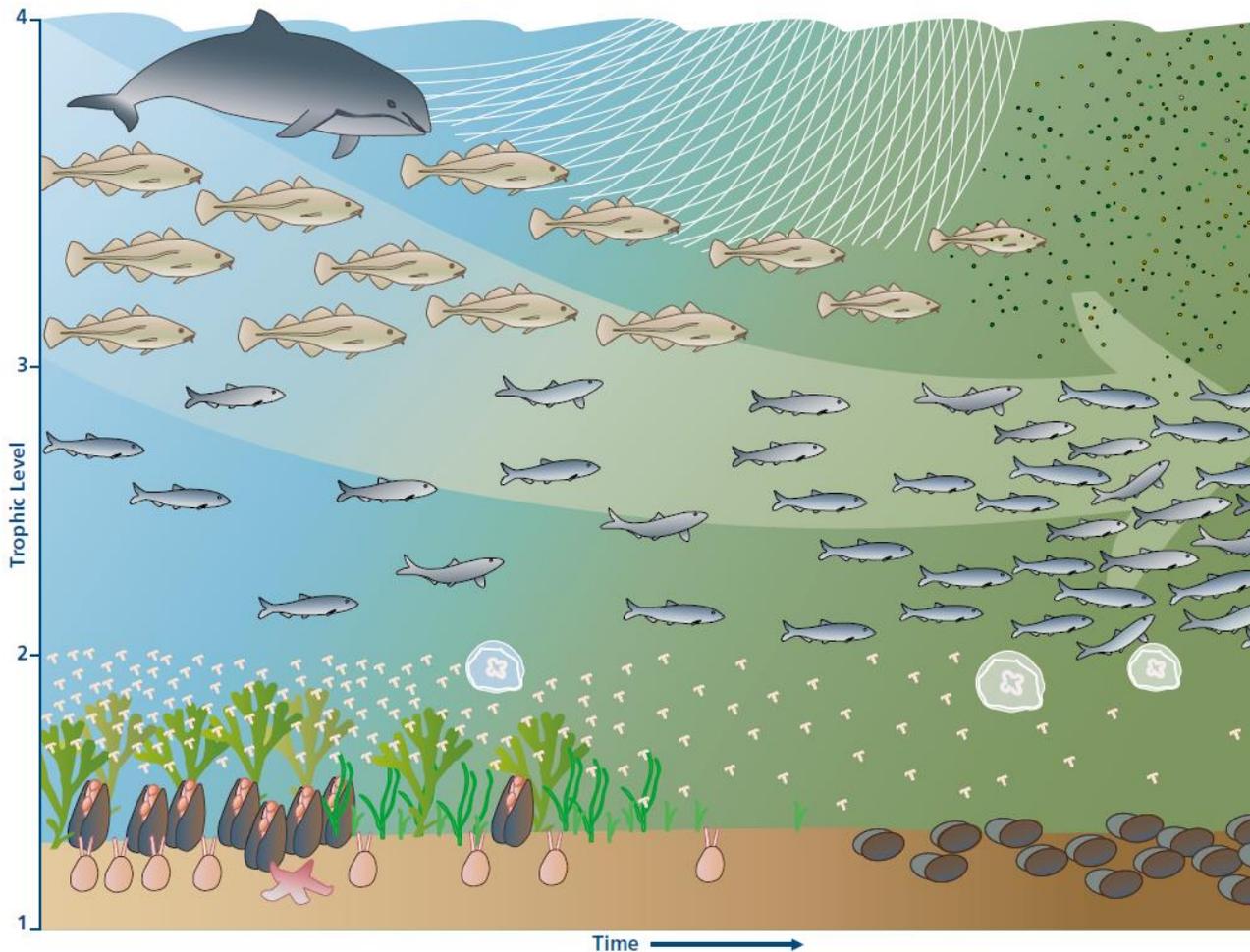


FIGURE 4.3. This diagram shows how overfishing and eutrophication can cause significant changes in the food-web structure within a marine ecosystem. Source: HELCOM⁴¹¹

It is also particularly important to note the role climate change plays in exacerbating and magnifying other impacts. The many, complex and inter-related effects on climate change are being demonstrated to make ecosystems ever more vulnerable, with consequent reduction of services they provide and thereby reduction of human wellbeing.⁴¹² The aquaculture industry has noted that it needs to respond to the climate crisis, with 45 climate change impacts identified as specific challenges for the sector.⁴¹³

Specific examples of the effects of climate change on the Vega Archipelago were provided in Table 4.2 but this summary does not provide an exhaustive list.⁴¹⁴ This is an area of continuing research and specific

⁴¹¹ HELCOM (2010) Ecosystem Health of the Baltic Sea 2003–2007: HELCOM Initial Holistic Assessment. *Baltic Sea Environmental Proceedings* 122.

⁴¹² Follestad, A., Evju, M. & Ødegaard, F. (2011) *Effekter av klimaendringer for havstrand*. NINA Rapport 667 [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2595525>

⁴¹³ Falconer, L., Telfer, T.C., Garrett, A. *Et al.* (2022) Insight into real-world complexities is required to enable effective response from the aquaculture sector to climate change. *PLOS Climate* 1.3: e0000017. Available from: <https://doi.org/10.1371/journal.pclm.0000017>

⁴¹⁴ For a specific review of the affects of climate changes on terrestrial habitats, biodiversity and ecosystem services in Norway see: Rusch, G., & Schartau, A. K. (2015). *Naturtyper i klimatilpassningsarbeid. Effekter av klimaendringer og klimatilpassningsarbeid på naturmangfold og økosystemtjenester* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/292962> and Forsgren, E., Aarrestad P.A, Gundersen, H., Christie, H., Friberg, N., Jonsson, B., Kaste, Ø., Lindholm, M., Nilsen, E.B., Systad, G., Veiberg, V., Ødegaard, F. (2015) *Klimaendringenes påvirkning på naturmangfoldet i Norge – NINA Rapport* 1210.

initiatives are taking place in the Vega Archipelago to explore the issue more fully.⁴¹⁵ Figure 4.4 provides an indication of the range of potential and overlapping pressures on the Vega Archipelago's marine and terrestrial habitats.

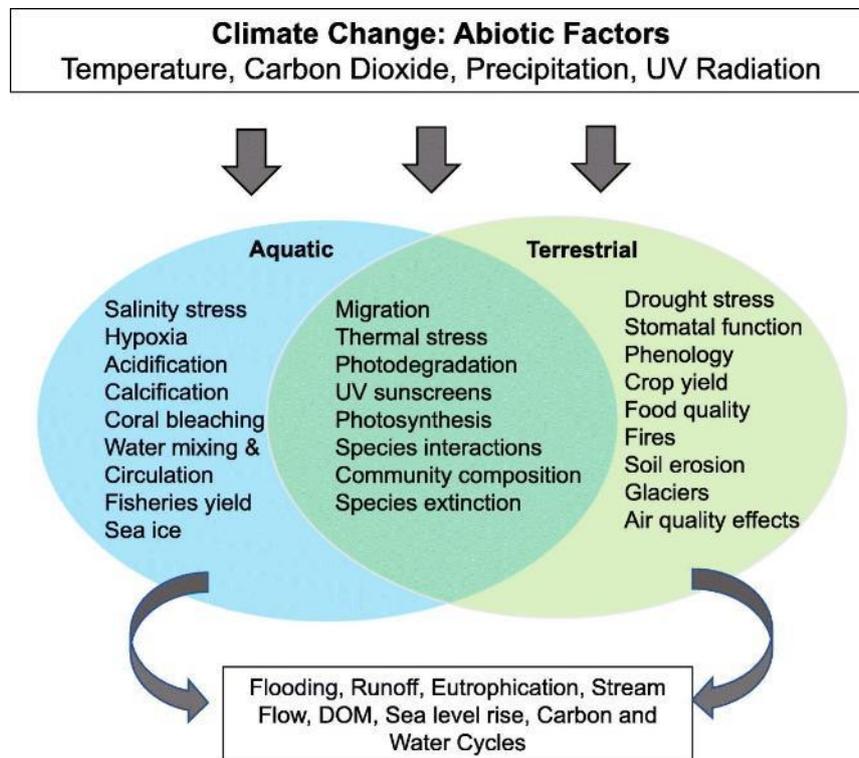


FIGURE 4.4. This diagram shows the range of affects on aquatic and terrestrial ecosystems due to climate change, which can be considered as cumulative impacts. As elsewhere, these effects at the Vega Archipelago mean that the ecosystem is already under pressure before considering any potential new impacts from proposed projects. *Source: Häder & Barnes 2019⁴¹⁶*

In the case of human impact on a cultural landscape, small changes can come together and, over a relatively short period of time, create a significant cumulative impact on the sense of place. This realization is what has prompted the development of planning tools focussing on landscape characterisation. Figure 4.5 highlights continuity and change of the land- and seascape on the west coast of Vega island, in the twenty-first century. The total impact of the changes highlighted (aquaculture, camping areas, cabins and the Vegatrappa staircase) is greater than the sum of their individual impacts. For example, the visual presence the cabins and campsite, including noise and artificial light, impact negatively on the sense of place of this previously undeveloped part of the archipelago. The additional presence of industrial aquaculture facilities, including more noise and light, would consolidate these negative impacts. How this landscape/seascape copes with these and other types of potential change typical of coastal areas (for example, wind turbines) should be actively understood in advance.

⁴¹⁵ Risksantikvaren (2022) *Internasjonale klimaforskere kartlegger fremtidens klima på Vega* [online]. Available from: <https://www.riksantikvaren.no/internasjonale-klimaforskere-kartlegger-fremtidens-klima-pa-vega/>

⁴¹⁶ Häder, D-P. & Barnes, P.W. (2019) Comparing the impacts of climate change on the responses and linkages between terrestrial and aquatic ecosystems. *Science of the Total Environment* 682: 239-246.

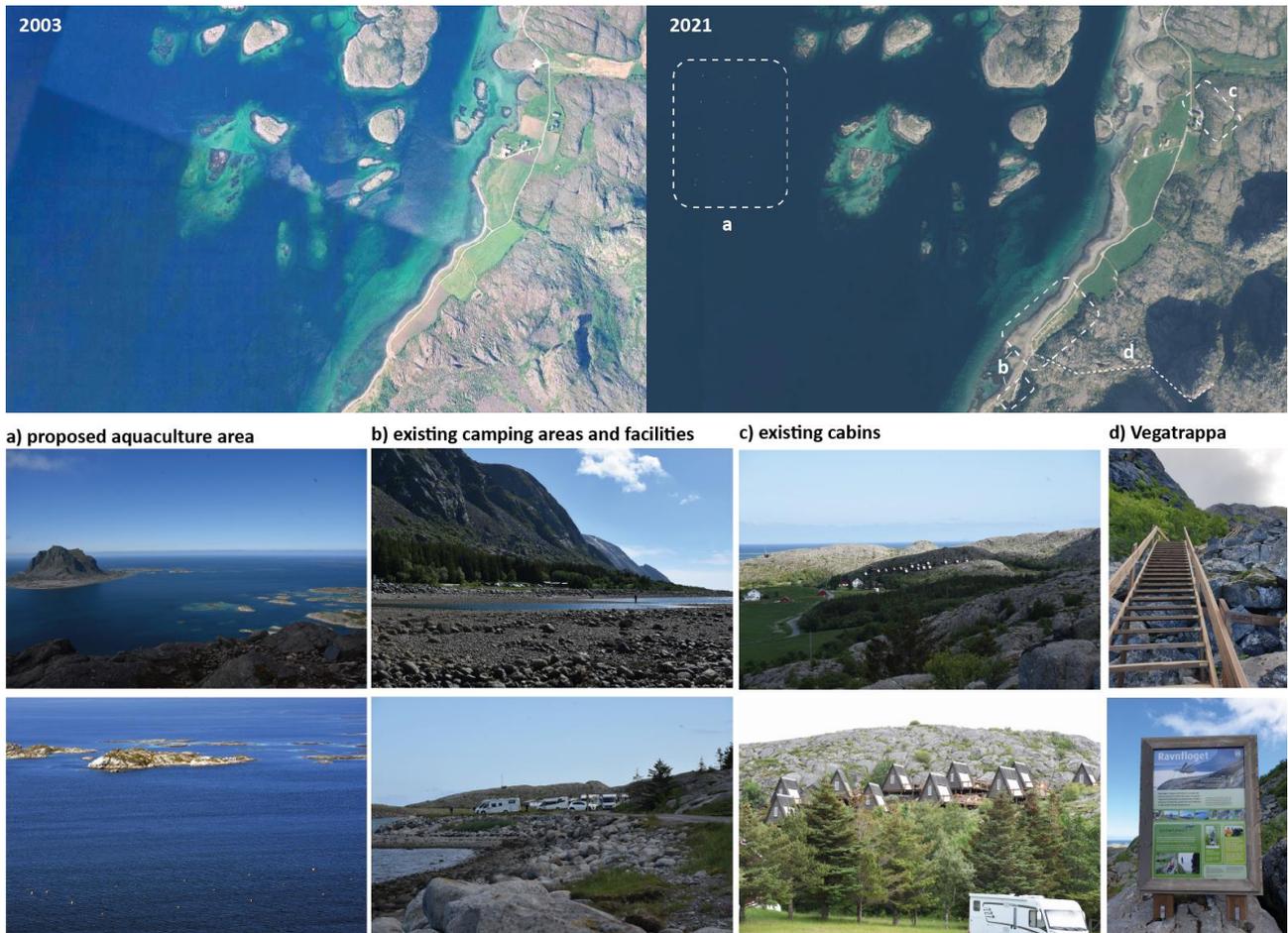


FIGURE 4.5. Examples of continuity and change on the west coast of Vega island, which faces nearby Sjøla island, that need consideration in decision-making and planning for the future. *Source: Instead Heritage*

Cumulative impacts will be taken into consideration during the following assessment of impact in sections 4.3 and 4.4, where it will be noted for each potential impact caused by a proposed aquaculture project where there are additional existing or future pressures on attributes of the World Heritage property that could magnify that potential impact.

4.3 PREDICTION OF IMPACTS OF THE HELGELAND COASTAL PLAN FOR VEGA ON THE WORLD HERITAGE PROPERTY

This section of the report identifies the positive and negative impacts which could potentially occur if the Vega section of the Helgeland Coastal Plan is approved. The following pages contain tables that summarize the uses of the coastal area that have been identified within the Helgeland Coastal Plan and highlight how they would interact with the attributes of the 'Vegaøyane – The Vega Archipelago' World Heritage property. Summaries are given of the various uses of the coastal areas which largely involves the mapping of existing uses and activities. In contrast, the section that follows (section 4.4) will provide more detailed summaries for the proposed aquaculture facilities, as these require greater understanding of the potential impacts. All these observations will be brought together in an evaluation of the potential impacts in section 4.5.

TABLE 4.3.1 Potential impacts on the World Heritage property of marine traffic and fairways in the Vega section of the Helgeland Coastal Plan

Element of the proposed coastal plan:	MARINE TRAFFIC AND FAIRWAYS
<p>The Helgeland Coastal Plan has mapped out the maritime transport routes (including shipping lanes, ferries and passenger boat routes, etc.) and navigational aids.</p> <p>Under the Ports and Fairways Act, Vega Municipality can regulate sea traffic within one nautical mile from the coastal baseline, including, for example, temporary restrictions on boats approaching sensitive nesting areas. The Norwegian Coastal Administration is responsible, on behalf of the State, for the main fairways and navigational aids.</p> <p>These are included in the Helgeland Coastal Plan so that other infrastructure or activities do not create conflicts regarding access or safety.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	SPECIES
<p>Maritime traffic can disturb wild species, in particular, sea birds. However, regulating traffic with identified fairways and restricting the approach of boats to sensitive nesting and moulting sites in key seasons, helps to reduce those impacts.</p>	
Attributes of the heritage place:	HUMAN SETTLEMENT
<p>The regular transport connections from the mainland to Vega island are of the greatest importance to the community and ensure that it is a viable place of residency for many individuals and families.</p>	
Attributes of the heritage place:	EIDER TENDING
<p>Traffic restrictions near to nesting areas provides support to eider tending processes.</p>	
Cumulative impact(s):	
<p>The use patterns of the fairways are vulnerable to seasonal surges of users from different sectors magnifying negative impacts (e.g., recreational fishers overlapping with traffic for existing aquaculture and island tourism trips).</p>	
Potential mitigation/enhancement measure(s):	
<p>The identification of fairways is already a form of mitigation that encourages marine traffic to remain within identified routes and reduce traffic in other areas.</p> <p>Traffic should be monitored and thresholds set where and when necessary.</p>	

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- The area as a whole is representative of settlements on the strandflat
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The cultural landscape of the Vega Archipelago continues to be managed in a traditional manner, using time-honoured management techniques
- a distinctive way of life centred around the sustainable use of natural resources, including fishing, farming and eider down harvesting...
- The rich maritime resources of the Vega Archipelago... benefited local peoples

Other heritage values:

- Participation of Vega's fishers to the cod trade was central contribution to household economics
- The diversity of ecosystems and ecosystem services, through natural resource use, have given the area cultural and social importance, political influence and a resilient socio-economic model based on multiple income sources

TABLE 4.3.2 Potential impacts on the World Heritage property of fishing in the Vega section of the Helgeland Coastal Plan

Element of the proposed coastal plan:	FISHING
<p>The fishing areas mapped for the Helgeland Coastal Plan include areas for harvesting fish, shrimp, crab and other natural resources; spawning and nursery grounds; areas for temporary live holdings; etc.</p> <p>It includes areas where both active gear (i.e., trawl nets or seines that approach the fish to make a catch; these are not allowed for use by recreational fishers) and passive gear (i.e., fish must approach the nets or lines to be caught) can be used.</p> <p>Fishing is regulated by specific fisheries legislation and does not come under the Planning and Building Act. The Directorate of Fisheries has responsibility for mapping fisheries resources and new data was gained from local fishers for the Helgeland Coastal Plan. The Helgeland Coastal Plan cannot regulate the areas that are dedicated to fishing but can only indicate them and ensure that no other purposes are included for those areas which might be detrimental to fishing.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	WATER QUALITY
<p>Pollution generated by fishing activity, in particular, non-organic waste, such as plastic, nets and other fishing equipment, is a significant problem.⁴¹⁷</p>	
Attributes of the heritage place:	MARINE HABITATS
<p>Trawling can leave trawl marks on the seabed, damage vegetation and reduce the numbers of marine megafauna.⁴¹⁸</p>	
Attributes of the heritage place:	SPECIES
<p>The fish stocks along the Norwegian coast are not robust and some fish populations could be negatively impacted by unsustainable practices.</p>	
Attributes of the heritage place:	HUMAN SETTLEMENT
<p>This measure supports the continued activity of 37 full-time and 36 part-time fishers in Vega Municipality.</p>	

⁴¹⁷ Buhl-Mortensen, P. & Buhl-Mortensen, L. (2018) Impacts of Bottom Trawling and Litter on the Seabed in Norwegian Waters. *Frontiers in Marine Science* 5. Available from: <https://www.frontiersin.org/articles/10.3389/fmars.2018.00042>

⁴¹⁸ Buhl-Mortensen, P. & Buhl-Mortensen, L. (2018) Impacts of Bottom Trawling and Litter on the Seabed in Norwegian Waters. *Frontiers in Marine Science* 5. Available from: <https://www.frontiersin.org/articles/10.3389/fmars.2018.00042>

Attributes of the heritage place:	FISHING TRADITIONS
<p>The definition of fishing areas permits the historic tradition of fishing in the Vega Archipelago and its contribution to the local economy.</p>	
<p>Cumulative impact(s):</p>	
<p>These potential negative impacts may magnify the effects of other factors that are causing the sharp decline in coastal fish and seabird populations.</p> <p>Higher sea water temperatures due to climate change is likely to affect the composition and abundance of species in coastal waters.</p>	
<p>Potential mitigation/enhancement measure(s):</p>	
<p>Local fishers working at a non-industrial scale of fishing should be encouraged in the Vega area.</p> <p>Fishing techniques that are least damaging to the environment should be promoted.</p>	
<p>Heritage values associated with the impacted attributes:</p>	
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature • The cultural landscape of the Vega Archipelago continues to be managed in a traditional manner, using time-honoured management techniques • a distinctive way of life centred around the sustainable use of natural resources, including fishing ... • The rich maritime resources of the Vega Archipelago... benefited local peoples <p>Other heritage values:</p> <ul style="list-style-type: none"> • Participation of Vega's fishers to the cod trade was central contribution to household economics 	

TABLE 4.3.3 Potential impacts on the World Heritage property of existing aquaculture in the Vega section of the Helgeland Coastal Plan

Element of the proposed coastal plan for Vega:	EXISTING AQUACULTURE FACILITIES
<p>Existing aquaculture facilities were mapped and included within the Helgeland Coastal Plan, which in Vega Municipality are the salmon farms at Igerøy Ø and Skogsholmen, and algae at Bøbukta (section 3.4). There are aquaculture facilities in the other municipalities along the Helgeland Coast, including that at Sorvær, which is immediately adjacent to the World Heritage property (Figure 3.8).</p> <p>The impacts of the existing facilities at Igerøy Ø and Skogsholmen are explored below but are, like Sorvær, considered to be comparable to those that are described for the proposed new facilities, therefore, for more details, please see section 4.4.</p> <p>The impacts of the proposed aquaculture facilities are discussed in section 4.4.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	GEOLOGY AND LANDSCAPE FEATURES
<p><i>Mooring system:</i> Each facility will have deadweight anchors (i.e., a concrete block), drag-embedment anchors (similar to the anchors used for boats, where the anchor embeds into a soft seabed, typically these will weigh from 700-3000 kg), or helical anchors (which screw into the soft bottom). Bolts are used to connect to hard bottoms and are drilled into the rock forming the sea floor. According to the specific bolt used, these have a diameter of 3.2-5.0 cm and are inserted into the rock to a depth of 40-70 cm. Elements of these mooring systems may be left in place after the removal of the rest of the facility, e.g., the concrete blocks, bolts, etc.</p> <p><i>Presence of aquaculture facilities within the seascape:</i> It has been recognized that scale and distance are particularly difficult to judge in seascapes due to the extensive open areas and few features to judge scale against.⁴¹⁹ Indeed the visual impact was assessed specifically by SWECO and it was concluded that the modest size of the facilities within the open landscape was not a significant problem. However, this is not the key feature when assessing sensitivity to change and it is considered of greater relevance to characterize the seascape so that this can then inform decisions on continuity and change in that defined seascape. From this perspective, aquaculture facilities would affect visual amenity and the experience of being within the World Heritage property. This is due to the industrial character of aquaculture facilities, with their geometric shapes and necessarily high visibility, which contrasts with the overall characterisation of the archipelago (Part 2) with a small-scale human presence.⁴²⁰</p>	

⁴¹⁹ Hill, M., Briggs, J., Minto, P. et al. (2001) *Guide to Best Practice in Seascape Assessment*. The Marine Institute.

⁴²⁰ SWECO (2016) *Vegaøyen Verdensarv – visuell karakter* [unpublished report]. Available from: <https://www.fylkesmannen.no/contentassets/1fbc385a200d4891b07e0cf75bbac9ff/vegaoyan-verdensarv--visuell-karakter--SWECO-rapport-2016.pdf>

Attributes of the heritage place:	WATER QUALITY
<p><i>Mooring system:</i> The mooring lines connecting the aquaculture facility to the anchors/bolts are slack, allowing some movement. This movement of mooring elements has been shown to cause increased sediment when chains rub across the sea floor.⁴²¹</p> <p><i>Discharge of organic waste:</i> Organic waste is produced by aquaculture facilities in terms of excess feed, fish excretion and fish excrement. Research commissioned, in part by Marine Harvest, has shown that organic waste can be found up to 100 m away from aquaculture net pens, even in areas with strong currents.⁴²²</p> <p>The discharge of large quantities of waste from the fish can lead to eutrophication. This is where high levels of organic nutrients and minerals in the water encourages rapid growth of micro-organisms and algae with a resultant lack of oxygen in the water.</p> <p>Suspended particles can increase the turbidity of the water column. Any algae blooms or similar phenomena caused by the high levels of organic nutrients and minerals in the water also results in a reduction of light (light attenuation). Fish faeces cause increases in ammonium, nitrogen and phosphate, this can lead to phosphate concentrations doubling or quadrupling within water column. Decomposition of organic matter can lead to increased levels of hydrogen sulphide.⁴²³</p> <p><i>Discharge of chemicals:</i> Lice treatments are the most common type of chemicals used at aquaculture facilities. At Skogsholmen lice treatments given 41 times since 2012, most recently in 2021; medication (Emamectinbenzoat) was given four times in 2020.⁴²⁴ At Igerøy Ø lice treatments given 52 times since 2012, most recently in 2021. Medication has not been used since 2016.⁴²⁵</p> <p>Detergents and disinfectants are used to maintain hygiene standards at aquaculture facilities and lower the risk of disease outbreaks. They are toxic to the environment, although they enter the marine environment in diluted forms. For example, at Skogsholmen, EnduroSuper and ADDI Aqua are currently in use, although there are plans to shift to LifeClean.⁴²⁶</p> <p>Other chemicals may enter the sea from the facility through discharge of greywater from the barge from, for example, showers and handwashing.⁴²⁷</p> <p>Although there will be an increased presence of chemicals in water directly under and around the aquaculture facilities, there has been no research to understand if normal use of such chemicals would have an effect on water quality. Any such research would need to be specific to the individual products being used, their level of dilution, persistence and solubility in water and the marine currents.</p> <p><i>Production of non-fish waste:</i> On the basis of monitoring of macroplastics from aquaculture, it is likely that some elements are lost into the sea, although this is reduced thanks to the waste disposal policies of each aquaculture company.</p>	

⁴²¹ Luff, A.L., Sheehan, E.V., Parry, M. *et al.* (2019) A simple mooring modification reduces impacts on seagrass meadows. *Scientific Reports* 9: 20062.

⁴²² Haskoning UK Ltd (2006) Investigation into the impact of marine fish farm deposition on maerl beds. Scottish Natural Heritage Commissioned Report 213. Available: <http://pearl.plymouth.ac.uk/bitstream/handle/10026.1/1425/Hall-Spencer%20%26%20White%202007.pdf?sequence=2&isAllowed=y>

⁴²³ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 10.

⁴²⁴ Barents Watch (2022) *Lice treatments: Skogsholmen* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/treatments?locality=33157>

⁴²⁵ Barents Watch (2022) *Lice treatments: Igerøy Ø* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/treatments?locality=189366>

⁴²⁶ Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 13.

⁴²⁷ Nova Sea (2022) *Svar fra Nova Sea, verdensarv feedback* [unpublished communication].

Estimates for microplastic emissions from aquaculture vary: the discharge of microplastics from feed pipes in Norwegian salmon aquaculture is between 10-100 tonnes annually.⁴²⁸ The individual contribution of each aquaculture facility would be a proportion of this.

Attributes of the heritage place:	MARINE HABITATS
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Mooring system: The mooring lines connecting the aquaculture facilities to the anchors/bolts are slack, allowing some movement. This movement of mooring elements has been shown to affect vegetation, creating bare patches around mooring points⁴²⁹ and where it may take years to recover.⁴³⁰ Decreasing vegetation density can then negatively influence the associated fauna.⁴³¹

There are difficulties associated with removing deadweight anchors when a facility is decommissioned, due to the need for a suitable crane to lift them from the seabed. They are often therefore left in place within the marine environment.

The mooring lines on the aquaculture facilities can be used as stepping stones for new invasive species moving north along the Norwegian coast.⁴³²

Presence of aquaculture facilities within the seascape: Aquaculture facilities can provide suitable places for non-indigenous species to settle, acting as stepping stones for their range expansion.⁴³³ Aquaculture operations, such as net cleaning, can then facilitate their spread into the surrounding natural environment.⁴³⁴

Noise: Sound can affect a range of species (see below), even causing animals to avoid noisy areas and move to less disturbed locations. This can impact on the quality of the habitat as a whole as the community changes.⁴³⁵

Light: Current standards allow the use lighting systems in net pens. Light conditions are one of the dynamic features of habitats and disruptions to natural light regimes can significantly affect the composition of communities within an ecosystem. Artificial lighting can eliminate variations in light conditions and natural light patterns. Some studies show that light pollution can have an effect on aquatic habitats.⁴³⁶

⁴²⁸ Bay-Larsen, I.A., Vangelsten, B.V., Nogueira, L.A. et al. (2019) *Sluttrapport HAVPLAST – Marin plast fra norsk sjømatnæring – kartlegging, kvantifisering og handling* [online]: 22. Available from: <https://www.nordlandsforskning.no/nb/publikasjoner/report/sluttrapport-havplast-marin-plast-fra-norsk-sjomatnaering-kartlegging>

⁴²⁹ Luff, A.L., Sheehan, E.V., Parry, M. et al. (2019) A simple mooring modification reduces impacts on seagrass meadows. *Scientific Reports* 9: 20062.

⁴³⁰ Collins, K.J., Suonpää, A.M., & Mallisonson, J.J. (2010) The impacts of anchoring and mooring in seagrass, Studland Bay, Dorset, UK. *Underwater Technology* 29.3: 117-123.

⁴³¹ McCloskey, R. M. & Unsworth, R. K. F. (2015) Decreasing seagrass density negatively influences associated fauna. *PeerJ: Life and Environment* 3: e1053.

⁴³² Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 10.

⁴³³ Carl, C., Guenther, J. & Sunde, LM (2011) Larval release and attachment modes of the hydroid *Ectopleura larynx* on aquaculture nets in Norway. *Aquaculture Research* 42: 1056–1060. Mineur F, Cook EJ, Minchin D, Bohn K, MacLeod A, Maggs CA. (2012) Changing coasts: marine aliens and artificial structures. In: Gibson R.N., Atkinson RJA, Gordon JDM, Hughes R.N. (eds) *Oceanography and Marine Biology: an Annual Review* 50: 189–234.

⁴³⁴ Bloecher, N. & Floerl, O. (2020) Towards cost-effective biofouling management in salmon aquaculture: a strategic outlook. *Reviews in Aquaculture* 13.2: 783-795.

⁴³⁵ Olesiuk, P.F., Lawson, J.W. & Trippel, E.A. (2010) Pathways of effects of noise associated with aquaculture on natural marine ecosystems in Canada. *Canadian Science Advisory Secretariat Research Document 2010/025* [online]. Available from: <https://waves.vagues.dfo-mpo.gc.ca/Library/345630.pdf> Peng, C., Zhao, X. & Liu, G. (2015) Noise in the Sea and Its Impacts on Marine Organisms. *International Journal Environmental Research and Public Health* 12.10: 12304-23

⁴³⁶ Follestad, A. (2014) *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie*. NINA Rapport 1081: 54. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

Discharge of organic waste: The discharge of large quantities of waste from the fish can lead to eutrophication. This is where high levels of organic nutrients and minerals in the water encourages rapid growth of micro-organisms and algae. The resultant lack of oxygen in the water causes animals and other organisms dependent on oxygen to leave the area. It also results in a reduction of light (light attenuation), which affects plants and other organisms that dependent on photosynthesis, potentially causing them to die off.

Organic waste accumulates under or near to aquaculture facilities, although the depth and extent depends on the currents within the water column. This can bury areas of the sea floor, with a potential fragmentation of habitats. All of this can lead to significant changes in the benthic communities living on the sea floor within a marine habitat, reducing biodiversity.⁴³⁷

At Igerøy Ø the 2021 B-survey showed that while overall the conditions of the seabed under the pens were '1: very good'. Signs of deterioration since the previous survey, with one sampling station registering '4: very poor'.⁴³⁸ The same year the C-survey found overall poor conditions were found; the sampling stations closest to the facility were poor in fauna, with low biodiversity.⁴³⁹ In addition, high densities of brittle stars close have been observed near to the aquaculture facility at Igerøy.⁴⁴⁰ Although a direct relationship to the facility has not been demonstrated, this species is known to increase in numbers in areas with increased organic matter, such as found near to aquaculture.⁴⁴¹ At Skogsholmen, the 2021 B-survey most sampling stations were in '1: very good' or '2: good' conditions, while three stations were '3: poor',⁴⁴² while in 2022 the seabed under the pens was seen to be recovering after the emptying of the facility; the conditions at all sampling stations were considered to be '1: very good'.⁴⁴³ The more detailed C-survey, which last took place in 2018 found that the overall conditions were '3: moderate'. The benthic community was disturbed ('3: moderate' to '4: poor') at two stations. Elevated levels of organic carbon were found at all sample stations ('3: moderate' to '5: very poor').⁴⁴⁴

Discharge of chemicals: Residues of lice treatments have been found to be more widely distributed in the benthic (seafloor) environment than previously thought and remain longer than expected after cessation of use. They can affect the abundance, diversity and community structure of benthic ecology.⁴⁴⁵

Specifically, sea lice chemicals are known to be a considerable risk to maerl and the subsequent recovery time for maerl beds can be long.⁴⁴⁶

Attributes of the heritage place:

SPECIES

Presence of aquaculture facilities within the seascape: The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It is presumed this is due to the supply

⁴³⁷ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 17.

⁴³⁸ Aqua Kompetanse AS (2021) *B-undersøkelse ved Igerøy Ø i Vega kommune, oktober 2021* [online]. Available from: <https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR456084465/attachments/69960>

⁴³⁹ Åkerblå AS (2021) *C-undersøkelse med ASC-vurdering for Igerøy Ø (18936)* [online]. Available from:

<https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR476597569/attachments/71442>

⁴⁴⁰ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 5.

⁴⁴¹ Keeley, N., Valdemarsen, T., Strohmeier, T. et al. (2020) Mixed-habitat assimilation of organic waste in coastal environments. *Science of the Total Environment* 699.

⁴⁴² Aqua kompetanse AS (2021) *ASC-undersøkelse ved Skogsholmen i Vega kommune, juli 2021*

[online]. Available from: <https://novasea.no/wp-content/uploads/ASC-Skogsholmen-2021.pdf>

⁴⁴³ Aqua kompetanse AS (2022) *B-undersøkelse ved Skogsholmen i Vega kommune, mars 2022* [online]. Available from:

<https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR483130178/attachments/71907>

⁴⁴⁴ Aqua kompetanse AS (2018) *C-undersøkelse ved Skogsholmen i Vega kommune, juli 2018* [online]. Available from:

<https://api.fiskeridir.no/aqua-env-reports-ws/api/v1/env-reports/AR298212428/attachments/41353>

⁴⁴⁵ E.g., Bloodworth, J.W., Baptie, M.C., Preedy, K.F. & Best, J. (2019) Negative effects of the sea lice therapeutant emamectin benzoate at low concentrations on benthic communities around Scottish fish farms. *Science of the Total Environment* 669: 91-102.

⁴⁴⁶ E.g., Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 8; Legrand, E., Parsons, A.E., Escobar-Lux, R.H. et al. (2022) Effect of sea lice chemotherapeutant hydrogen peroxide on the photosynthetic characteristics and bleaching of the coralline alga *Lithothamnion soriferum*. *Aquatic Toxicology* 247.

of waste feed that falls from the net pens. The aggregation of wild fish may in turn attract fish-eating species, e.g., cormorants and other seabirds, seals, etc., who can find food under or near the facility.⁴⁴⁷ However, this can lead to conflict situations with predators and potential damage to net pens, increasing the risk of escaping farmed fish.

Increased marine traffic: Boating activity can cause disturbance and consequently stress for ducks, waders and other sea birds, including the eider.⁴⁴⁸ For example, eider ducks are disturbed by boats at a distance of approximately 330 m and it can take them 16 minutes to recover from the disturbance.⁴⁴⁹ Other duck species are even less tolerant. Traffic disturbance can range from relatively insignificant behavioural changes to serious effects on birds' survival. Disturbance can have a negative effect because the bird has to leave foraging activities and use increased energy to distance themselves. This can affect the ability to build up reserves in order to survive the winter or to have the strength to migrate. There are seasons when sea birds are more vulnerable to disturbance. For example, eiders, like some other bird species, cannot fly for 3-4 weeks during moulting and each time they are disturbed they have to use their limited energy reserves to relocate by swimming, instead of focusing on feeding.⁴⁵⁰ There are areas within the Vega Archipelago which are used by the large greylag goose for moulting.⁴⁵¹ Another example, is that disturbances can cause a mother bird to temporarily leave the nest, which leaves chicks vulnerable to predation. In some cases, if an area becomes associated with ongoing disturbance, species might change their foraging areas, overwintering sites, etc. Whether the routine activities related to aquaculture will have a significant impact is however difficult to assess.⁴⁵²

Noise: There are major information gaps about the effects of sound, particularly the effect on animal populations in the wild and aquatic ecosystems. However, specialists are increasingly concerned about the effects of anthropogenic sounds upon aquatic animals, including fish.⁴⁵³ Noise associated with routine aquaculture operations has not been shown to cause any injury to fish,⁴⁵⁴ although it might have an effect on fish behaviour. For example, Atlantic cod show a stress response to anthropogenic noise that can affect spawning performance.⁴⁵⁵ Other cases show that aquaculture noise might result in behavioural responses in some species of fish, such as herring, that can disrupt normal life processes.⁴⁵⁶ These are likely to be localized impacts.

Marine mammals have been shown to be more negatively affected by marine noise, although the impacts may vary across species. Cetaceans are much more significantly affected when noise masks the sounds used to communicate forage or navigate and they may avoid noisy areas. However, seals can become habituated to continuous noise, possibly caused by hearing loss.⁴⁵⁷

⁴⁴⁷ Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁴⁴⁸ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁴⁴⁹ Skei, J. (2014) *Exploring moulting Common eider (Somateria mollissima) escape responses to-wards ship traffic* [Master's thesis]. Norwegian University of Science and Technology.

⁴⁵⁰ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]: 23-4. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁴⁵¹ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]: 37. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁴⁵² Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 13.

⁴⁵³ Popper, A. N., & Hawkins, A. D. (2019) An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes. *Journal of Fish Biology* 94.5: 692–713.

⁴⁵⁴ Popper, A.N., Hawkins, A.D., Fay, R.R. et al. (2014) *Sound Exposure Guidelines for Fishes and Sea Turtles: a technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*. Springer: 50.

⁴⁵⁵ Sierra-Flores, R., Atack, T., Migaud, H. & Davie, A. (2015) Stress response to anthropogenic noise in Atlantic cod *Gadus morhua* L. *Aquacultural Engineering* 67: 67-76.

⁴⁵⁶ Olesiuk, P.F., Lawson, J.W. & Trippel, E.A. (2012) *Pathways of effects of noise associated with aquaculture on natural marine ecosystems in Canada*. Research Document 2010/025. Canadian Science Advisory Secretariat/Fisheries and Oceans Canada: 28.

⁴⁵⁷ Olesiuk, P.F., Lawson, J.W. & Trippel, E.A. (2012) *Pathways of effects of noise associated with aquaculture on natural marine ecosystems in Canada*. Research Document 2010/025. Canadian Science Advisory Secretariat/Fisheries and Oceans Canada.

With regard to other animals, including seabirds, there seems to be greater tolerance for constant background noise disturbance than for the perceived threat from sudden noises or the presence of humans or predators.⁴⁵⁸ However, there is research to show how a range of human activities can create disturbance and potentially change behaviour in water birds: more information is needed to identify the specific impacts on individual species.⁴⁵⁹

Light: The fact that aquaculture facilities often use artificial lighting systems within the net pens is an indication of how great an influence light can have on fish species. Research shows that there are a range of effects which can come from artificial light on fish, including impacts on migration and reproductive behaviour. However, this has not been quantified with regards to the lighting systems used at aquaculture facilities on wild fish.⁴⁶⁰

There are no studies on the effect of aquaculture lighting on birds, however, research into the effects of artificial lighting on bird species in general clearly indicates a range of potential impacts, according to the species, the location and the season. This includes attraction to artificial lights, disorientation, behaviour changes, etc.

Artificial lights are thought to be another potential attraction for plankton around aquaculture facilities.⁴⁶¹

Potential impacts of discharge of organic waste: The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It is presumed this is due to the supply of waste feed that falls from the net pens. Some studies have suggested that the fish attracted to the waste feed can benefit from additional food source, which may increase growth, thereby triggering early maturation. This may influence spawning and migrations, with the risk of spawning occurring at sub-optimal locations. It is also possible that the biochemical composition of the aquaculture feed affects the wild fish who eat it, such as reducing the viability of offspring. There is some evidence to suggest that saithe, in particular, are of much poorer quality when they eat a lot of waste feed.⁴⁶²

Discharge of chemicals: Since 2012, sea lice treatments have been given 12 times at Skogsholmen⁴⁶³ and 26 times at Igerøy Ø.⁴⁶⁴ Sea lice treatments, including baths, may affect a range of non-target species. Crustaceans are particularly vulnerable to sea lice chemicals, with their abundance and richness has been found to be affected. Beyond 'no effect concentrations', shrimp in particular are likely to die.⁴⁶⁵ Such treatments have also been found to be deadly for lobster and crayfish larvae, etc., and can be a significant risk.⁴⁶⁶

As a result of the direct impacts on crustaceans, there may be indirect impacts on those predators who eat crustaceans and would find reduced food available locally. For example, shrimp are one of the preferred foods of cod and eider ducks mostly eat molluscs and crustaceans. However, these connections are poorly understood.⁴⁶⁷

⁴⁵⁸ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]: 13. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁴⁵⁹ Borgmann, K. (2011) *A review of human disturbance impacts on waterbirds* [unpublished report]. Audubon. Available from: <http://www.yourwetlands-org.aviandesign.net/pdf/A%20Review%20of%20Human%20Disturbance%20Impacts%20on%20Waterbirds.pdf>

⁴⁶⁰ Follestad, A. 2014. *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie*. - NINA Rapport 1081: 52-54. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

⁴⁶¹ Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁴⁶² Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁴⁶³ Barents Watch (2022) *Lice treatments: Skogsholmen* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/treatments?locality=33157>

⁴⁶⁴ Barents Watch (2022) *Lice treatments: Igerøy Ø* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/treatments?locality=18936>

⁴⁶⁵ E.g., Frantzen, M., Bytingsvik, J., Tassara, L. *et al.* (2020) Effects of the sea lice bath treatment pharmaceuticals hydrogen peroxide, azamethiphos and deltamethrin on egg-carrying shrimp (*Pandalus borealis*). *Marine Environmental Research* 159.

⁴⁶⁶ E.g., Parsons, A.E., Escobar-Lux, R.H., Sævik, P.N. *et al.* (2020) The impact of anti-sea lice pesticides, azamethiphos and deltamethrin, on European lobster (*Homarus gammarus*) larvae in the Norwegian marine environment. *Environmental Pollution* 264.

⁴⁶⁷ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 13.

Discharge of non-fish waste: Concerns about the effect of microplastics on the marine environment and their distribution through food chains are increasing. With regard to Vega, it has been suggested that nano- and microplastics might travel, for example, from plankton to mussels to eider ducks.⁴⁶⁸

Interactions with predators: The impact assessment that formed part of the Helgeland Coastal Plan concluded that only gulls would be potentially impacted, at a low level, by aquaculture.⁴⁶⁹ The Nova Sea facility at Skogsholmen has recorded 7 dead cormorants caught in its nets since 2019,⁴⁷⁰ whereas at Igerøy Ø one cormorant and one crow were found.⁴⁷¹

The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It is presumed this is due to the supply of waste feed that falls from the net pens. However, the aggregation in close proximity to the farmed fish means that the risks associated with disease transmission are higher.⁴⁷²

Lice infestation: Estimates of the risk on wild Atlantic salmon populations vary from low to high according to year and location; while it is noted that there is a much higher risk for sea trout and Arctic charr populations in counties with high salmon farming activity.⁴⁷³ The latest risk report for Norwegian aquaculture by the Institute of Marine Research concluded that in the Helgeland to Bodø production area (in which Vega is located) that there is a low probability of lice infestation for migrating salmon in the area from farmed fish.⁴⁷⁴ Since 2012 the Igerøy Ø facility has been above the weekly permitted lice levels 26 times, most recently twice in 2021;⁴⁷⁵ whereas at Skogsholmen lice counts have been above the limit 13 times since 2012, most recently three times in 2021.⁴⁷⁶

Disease transmission: There is a high frequency of viral disease outbreaks in Norwegian salmon aquaculture facilities, which suggests that there is an extensive release of pathogens for these diseases in many areas to which wild fish are exposed. The lack of data has led some specialists to conclude that a risk estimate for disease transmission is not possible,⁴⁷⁷ although the Institute of Marine Research concluded there is low to moderate risk of infectious diseases being transmitted.⁴⁷⁸ Igerøy Ø has never had a reported disease outbreak.⁴⁷⁹ However, Skogsholmen had an infectious salmon anaemia outbreak in June 2021; consequently, the farmed fish were

⁴⁶⁸ Follestad, A., Moe, B. & Thomassen, J. 2017. Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ærfugl og ærfugl-drift i Vegaøyen verdensarvområde. NINA Rapport 1405 [online]: 70. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

⁴⁶⁹

Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystzoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak*: 23.

⁴⁷⁰ Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 22.

⁴⁷¹ Nova Sea (2022) *Igerøy Ø* [online]. Available from: <https://novasea.no/en/igeroy-o/>

⁴⁷² Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima: 29. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁴⁷³ Taranger, G.L. Karlsen, Ø., Bannister, R.J. et al. (2015) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming, *ICES Journal of Marine Science* 72.3: 997–1021. Available from: <https://doi.org/10.1093/icesjms/fsu132>

⁴⁷⁴ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. et al. (eds) *Risikoreport norsk fiskeoppdrett 2022 - risikovurdering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2022-12>

⁴⁷⁵ Barents Watch (2022) *Salmon lice: Igerøy Ø* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/lice?locality=18936>

⁴⁷⁶ Barents Watch (2022) *Salmon lice: Skogsholmen* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/lice?locality=33157>

⁴⁷⁷ Taranger, G.L. Karlsen, Ø., Bannister, R.J. et al. (2015) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming, *ICES Journal of Marine Science* 72.3: 997–1021. Available from: <https://doi.org/10.1093/icesjms/fsu132>

⁴⁷⁸ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. et al. (eds) *Risikoreport norsk fiskeoppdrett 2022 - risikovu-dering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2022-12>

⁴⁷⁹ Barents Watch (2022) *Fish disease: Igerøy Ø* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/disease?locality=18936>

slaughtered, the facility disinfected and quarantined for three months.⁴⁸⁰ The case is considered closed although an area of the Vega, Herøy and Alstahaug municipalities is being monitored by the Norwegian Food Safety Authority for a period of two years (Figure 3.30).⁴⁸¹

Transfer of genetic material: A risk assessment of the impact of Norwegian Atlantic salmon farming found that there was a moderate risk of genetic changes to wild fish populations due to the transfer of genetic material from escaped farmed salmon.⁴⁸² The Norwegian Scientific Advisory Committee for Atlantic Salmon Management note that the biggest threats to wild salmon stocks are from escaped farmed salmon, salmon lice and infections related to fish farming are the biggest threats to wild salmon. They recently concluded that sufficient measures are not being taken to stabilize or reduce these threats.⁴⁸³ Similar concerns have been expressed by the Norwegian Veterinary Institute.⁴⁸⁴ No escapes have been reported from the existing facilities in Vega.

Attributes of the heritage place:

HUMAN SETTLEMENT

Presence of aquaculture facilities within the seascape: Igerøy is far away from the World Heritage area to not impact on inhabited islands. However, the Skogsholmen facility is close to and visible from land areas and also key fairways of what historically was one of the more important centres in the outer islands of the World Heritage area. It has been noted that local perceptions of the current amount of marine traffic - and therefore the potential increase related to aquaculture - varies between individuals with no accurate data of small boat traffic available to confirm or refute perceptions.⁴⁸⁵ Local and visitor perceptions would appear to identify the barge element as the principal source of visual disturbance.

Presence in socio-economic context: The two largest businesses in Vega are aquaculture companies, while the fourth largest is a company which processes fish for consumption.⁴⁸⁶ These are important to the local economy and there are 21 people directly employed in aquaculture. Another three estimated to be indirectly gaining employment from the supply chain, and 15 people working for the fish processing company.⁴⁸⁷ In other places, aquaculture can have ripple effects within the economy when buying supplies and services for their facilities, however, these types of suppliers are not found at Vega. For example, all the fish farmed in Vega are sent for slaughter in Lurøy municipality, along the coast to the north.⁴⁸⁸

Noise: Given the distance from a houses and settlements on the nearby islands, noise disturbance is mostly an issue for users of the fairways.

⁴⁸⁰ Barents Watch (2022) *Fish disease: Skogsholmen* [online]. Available from: <https://www.barentswatch.no/nedlasting/fishhealth/disease?locality=33157>

⁴⁸¹ The original regulations from July 2021: <https://lovdata.no/dokument/LF/forskrift/2021-07-13-2391>, these were amended in January 2022: <https://lovdata.no/dokument/LTI/forskrift/2022-01-18-78>.

⁴⁸² Taranger, G.L. Karlsen, Ø., Bannister, R.J. *et al.* (2015) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming, *ICES Journal of Marine Science* 72.3: 997–1021. Available from: <https://doi.org/10.1093/icesjms/fsu132>

⁴⁸³ Thorstad, E.B., Forseth, T. & Fiske, P. (2021) *Status for norske laksebestander i 2021. Rapport fra Vitenskapelig råd for lakseforvaltning* 16 [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2830680>

⁴⁸⁴ Sommerset, I., Walde, C.S., Jensen, B.B. *et al.* (eds) (2022) *Fiskehelse rapporten 2021* [online]. Veterinærinstituttets årlige oversikt over fiskehelsen i Norge. Available from: <https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2022/fiskehelse rapporten-2021>

⁴⁸⁵ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrift i Vegaøyan verdensarvområde. NINA Rapport 1405* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

⁴⁸⁶ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 26.

⁴⁸⁷ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 28.

⁴⁸⁸ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 29.

Light: Given the distance from a houses and settlements on the nearby islands, light disturbance is mostly an issue for users of the fairways.

Presence in socio-economic context: The two largest businesses in Vega are aquaculture companies, while the fourth largest is a company which processes fish for consumption.⁴⁸⁹ These are important to the local economy and there are 21 people directly employed in aquaculture. Another three estimated to be indirectly gaining employment from the supply chain, and 15 people working for the fish processing company.⁴⁹⁰ In other places, aquaculture can have ripple effects within the economy when buying supplies and services for their facilities, however, these types of suppliers are not found at Vega. For example, all the fish farmed in Vega are sent for slaughter in Lurøy municipality, along the coast to the north.⁴⁹¹ In the promotion of equitable economic models in light of the UN 2030 Sustainable Development goals, it is also possible to observe that not many of the economic benefits of the specific facility are reaching those who reside or frequent that area of the archipelago.

Funding for the municipality: The municipality gains annual income from the Aquaculture Fund, most recently in 2021 this amounted to 6,680,843 NOK.⁴⁹²

Attributes of the heritage place:

FISHING TRADITIONS

Presence of aquaculture facilities in the seascape: The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It has been suggested that this aggregation of wild fish may affect resource availability for fishers because no fishing can be carried out within 100 m of an aquaculture facility. However, there is a lack of data to show to what extent this affects fisheries.⁴⁹³

Species: There may be indirect impacts on wild fish populations when habitats, which serve as spawning and nursery areas, are significantly affected. Crustaceans and other invertebrates are likely to be affected by chemical sea lice treatments. Cod shift feeding grounds when preferred food sources, e.g., shrimp, are reduced in number.

Attributes of the heritage place:

EIDER TENDING

Research has not been carried out to connect the presence of individual aquaculture facilities to the declining eider population, however, it is known that many sources of disturbance can cause the sensitive eider to relocate. Disturbances can cause a mother bird to temporarily leave the nest, which leaves chicks vulnerable to predation. In some cases, if an area becomes associated with ongoing disturbance, species might change their foraging areas, overwintering sites, etc.⁴⁹⁴

⁴⁸⁹ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnmessige Virkninger*. Menon Economics: 26.

⁴⁹⁰ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnmessige Virkninger*. Menon Economics: 28.

⁴⁹¹ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnmessige Virkninger*. Menon Economics: 29.

⁴⁹² Fiskeridirektoratet (2022) *Havbruksfondet* [online]. Available from: <https://www.fiskeridir.no/Akvakultur/Tema/Havbruksfondet>

⁴⁹³ Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima: 22. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁴⁹⁴ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrif i Vegaøyen verdensarvområde. NINA Rapport 1405* [online]: 78. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

Cumulative impact(s):

Visual impacts: Encountering multiple facilities through the Vega Archipelago increases the industrial character of aquaculture and its contrast to the small-scale human presence which otherwise characterises the World Heritage property.⁴⁹⁵

Population declines: The negative impacts of aquaculture may magnify the effects of other factors that are the context of the sharp decline in some fish and seabird populations.

The wild salmon population is already under pressure from human activities (including aquaculture) and large-scale decline in sea survival, with the population currently at half the levels recorded in the 1980s. Climate– caused changes to the environment is impacting the population negatively.

The decline in population of several seabird species indicates a series of existing factors that impact them, including: climate change, changes in fisheries, fluctuations in the pelagic fish stocks and changes in the kelp forest systems.⁴⁹⁶

The negative impacts of aquaculture on seabirds may magnify the effects of other factors that are the context of the sharp decline in seabird populations. Such disturbance might accumulate with other stressors, particularly during the moulting period (the process of shedding and growing new feathers), when adult birds are at their most vulnerable. In addition, Follestad highlights that measuring direct responses to individual traffic disturbances underestimates the serious cumulative effects that may occur when sensitive animals avoid large areas associated with traffic.⁴⁹⁷ Even though these factors are not entirely understood, it is important not to ignore them or to magnify their effects.⁴⁹⁸

The potential reduction of crustaceans as a food source for eider ducks and other species, should also be seen in the context of a significant reduction in mussels along the Norwegian coast, which is the other preferred food of eiders.⁴⁹⁹

Noise: Noise from aquaculture is mostly localized and short-term, however, it contributes to broader problems of increasing noise levels in the sea, in particular, background marine traffic noise.

It is recommended that the aquaculture companies use electricity supplied from land, reducing the noise/vibration levels associated with a generator. Other simple measures, such as turning off engines and machinery when not required, can reduce impacts. Feeders can emit food directly under water instead of through the air. In some cases, the transmission of noise from the facility to the water can be minimized by mounting equipment such as compressors and pressure-washers on rubber pads or tires. Greater attention to noise pollution should be paid at important periods for vulnerable species, e.g., breeding and moulting periods for eider. Acoustic devices used to deter predators, such as seals, should not be used so that they do not cause disturbance to non-target species.

⁴⁹⁵ SWECO (2016) *Vegaøyen Verdensarv – visuell karakter* [unpublished report]. Available from:

<https://www.fylkesmannen.no/contentassets/1fbc385a200d4891b07e0cf75bbac9ff/vegaoyen-verdensarv--visuell-karakter--SWECO-rapport-2016.pdf>

⁴⁹⁶ Fauchald, P., Barrett, R. T., Bustnes, J. O., Erikstad, K. E., Nøttestad, L., Skern-Mauritzen, M. & Vikebø, F. B. (2015) *Sjøfugl og marine økosystemer. Status for sjøfugl og sjøfuglenes næringsgrunnlag i Norge og på Svalbard. NINA Rapport 1161* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2594604>; Anker-Nilssen, T., Barrett, R.T., Lorentsen, S.-H., Strøm, H., Bustnes, J.O., Christensen-Dalsgaard, S., Descamps, S., Erikstad, K.E., Fauchald, P., Hanssen, S.A., Lorentzen, E., Moe, B., Reiertsen, T.K. & Systad, G.H. (2015) *SEAPOP. De ti første årene. Nøkkeldokument 2005-2014*. Norsk institutt for naturforskning.

⁴⁹⁷ Follestad, A. (2012) *Kunnskapsoversikt over effekter av forstyrrelser på fugler: Innspill til for-valtningsplaner for Lista- og Jærstrendene. NINA Rapport 851* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2643168>

⁴⁹⁸ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ærfugl og ærfugl-drift i Vegaøyen verdensarvområde. NINA Rapport 1405* [online]: 78. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

⁴⁹⁹ Andersen, S., Grefsrud, E.S., Mortensen, S., Naustvoll, L.J., Strand, Ø., Strohmeier, T. & Sælemyr, L. (2017) *Meldinger om blåskjell som er forsvunnet – oppsummering for 2016. Rapport fra Havforskningen 4-2017*.

Light: The facilities need to consider in each case when the use of light is necessary, what level of light is appropriate, if alternate colour lights can be used and if the light can be shielded to direct it only where needed.

Organic discharge: The discharge from the facilities in Vega municipality should be seen in the wider context of the emissions of organic waste from the large number aquaculture facilities that are located along the Helgeland coast. Aquaculture facilities are the second largest source of the overall and continuous increase in nitrogen and phosphorus found in the coastal waters of Nordland.⁵⁰⁰ Monitoring of the existing aquaculture situation throughout the county, show that there was an increase in both nitrogen and phosphorus from aquaculture in Nordland in 2020.⁵⁰¹ In 2019 there were significant algal blooms in Nordland and Troms that deteriorated environmental conditions to such an extent that 8 million farmed fish died.⁵⁰² It has been found that the decline in the population of coastal cod magnifies the effects of eutrophication on coastal ecosystems.⁵⁰³

Climate change: a range of factors related to climate change are already placing coastal ecosystems under pressure⁵⁰⁴ and affecting the processes within specific habitats e.g., shifts in spawning grounds.⁵⁰⁵ Specifically in relation to organic discharges from aquaculture, more regular and stronger storm events cause the re-suspension of sediments, thereby accelerating oxygen consumption and nutrient loading.⁵⁰⁶ Increased sea temperatures favour more algal blooms. Escapes of farmed fish are more likely when there are storm events causing unforeseen damage to net pens.⁵⁰⁷ Research shows how molluscs and crustaceans, such as mussels and crabs, struggle to build shells following ocean acidification.⁵⁰⁸

Kelp forests and eelgrass meadows: reduced light penetration has been seen along the Norwegian coast for a long time, which limits the depth at which kelp and eelgrass can grow, and therefore reduces the areas available for these habitats.⁵⁰⁹ Destructive fishing practices can also cause damage.

Maerl beds: the maerl are at risk from other sources of sediment smothering, including that produced by trawling and from sewage discharges. As the maerl beds in Norway are not yet mapped, there are no current strategies to protect them.⁵¹⁰

⁵⁰⁰ Guerrero, J-L. & Sample, J.E. (2021) *Kildefordelte tilførsler av nitrogen og fosfor til norske kystområder i 2019. NIVA rapport 7729* [online]: 72-75. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2985724>

⁵⁰¹ Guerrero, J-L. & Sample, J.E. (2021) *Kildefordelte tilførsler av nitrogen og fosfor til norske kystområder i 2019. NIVA rapport 7729* [online]: 72-75. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2985724>

⁵⁰² Sommerset I, Walde C S, Bang Jensen B, Bornø B, Haukaas A & Brun E (eds) (2020) *Fiskehelse rapporten 2019* [online]. Veterinærinstituttet. Available from: <https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2020/fiskehelse rapporten-2019>

⁵⁰³ Baden, S., Stein, F., Hartvig, C. *et al.* (2022) Effects on depth and overgrowth of ephemeral macroalgae on a remote subtidal NE Atlantic eelgrass (*Zostera marina*) community. *Marine Pollution Bulletin* 177: 113497. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2987355>

⁵⁰⁴ Węśławski, J., Kendall, M., Włodarska-Kowalczyk, M. *et al.* (2011) Climate change effects on Arctic fjord and coastal macrobenthic diversity—observations and predictions. *Marine Biodiversity* 41: 71–85.

⁵⁰⁵ Langangen, Ø., Färber, L., Stige, L.C., Diekert, F.K., Barth J.M.I., Matschiner, M., Berg, P.R., Star, B., Stenseth, N.C., Jentoft, S., & Durant, J.M. (2019) Ticket to spawn: Combining economic and genetic data to evaluate the effect of climate and demographic structure on spawning distribution in Atlantic cod. *Global Change Biology* 25: 134-143.

⁵⁰⁶ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 29.

⁵⁰⁷ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell: 88-9.

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Heinrich, L. & Krause, T. (2016) Fishing in acid waters – a vulnerability assessment of the Norwegian fishing industry in the face of increasing ocean acidification. *Integrated Environmental Assessment and Management*.

⁵⁰⁹ Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene – Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]: 51. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-20-20192020/id2699370/>

⁵¹⁰ Wilson, S. Blake, C. *et al* (2004) Environmental tolerances of free-living coralline algae (maerl): implications for European marine conservation. *Biological Conservation* 120.2: 279-289.

Deep trenches: although investigations have yet to be carried out, these are likely to be areas of natural accumulation of organic matter (e.g., detached kelp fronds and other dead biomass). This might mean that these areas already have existing high levels of organic load.

Water quality: Large areas of the sea at Vega already have poor chemical standards, the various additions from the aquaculture facilities contribute to this overall picture.

Disease transmission: Risk of disease transmission are increased by the existing numbers of aquaculture facilities already in Vega and along the Helgeland Coast. Temperature increases due to climate change, may increase these disease risks.

Potential mitigation/enhancement measure(s):

Currently, there are no plans for new aquaculture facilities in the buffer zone or the wider setting of the World Heritage property due to statutory requirements (e.g. minimum water depth, distance from existing aquaculture facilities). However, should changes in the status quo occur, existing facilities might expand or new facilities be created. There should be careful consideration of where and how any new aquaculture should be permitted in the buffer zone and wider setting of the World Heritage property, given connections within the seascape that allow factors located outside the property to impact on attributes of Outstanding Universal Value.

Mapping: Many mitigation measures require accurate mapping of habitats to inform them, so it is vital that this is completed for the Vega Archipelago's marine habitats, in particular, maerl.

Disturbance from marine traffic: Many mitigation measures are possible to reduce disturbance from increased marine traffic, such as:

- grouping tasks whenever possible so that multiple tasks achieved on a single trip
- following main navigational routes as far as possible
- for the section of the journey between the aquaculture facility and the main navigation route, the most appropriate route should be studied and communicated to all traffic
- boats should pay attention to birds on the fairway and seek to keep their distance. It has been suggested that boats keep at least 700m away from eider ducks and 500-1000 m away from greylag geese⁵¹¹
- speed limits can be introduced when passing by birds on the fairway and near to nesting and moulting sites

In general, the individual aquaculture facilities would need to establish their own regulations for boat routes and speed that take into consideration the geographical distribution of species around the facilities, as well as the different seasonal activities of those species (which may also change between years).⁵¹² Mapping and monitoring of seabirds, such as that already carried out for Nova Sea's existing facility at Skogsholmen, is an important tool for informing any mitigation measures.⁵¹³

Light: It is recommended that protected areas with significant bird populations should be cautious with the use of lighting and mitigate appropriately until specific studies are completed.⁵¹⁴

⁵¹¹ Specific recommendations related to a range of species are provided in Follestad, A. (2014) *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie. -NINA Rapport 1081: 37.* Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

⁵¹² Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrift i Vegaøyen verdensarvområde. NINA Rapport 1405* [online]: 4. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

⁵¹³ Tunheim, O.H. (2022) *Overvåking av sjøfugl for oppdrettslokalitet Skogsholmen* [unpublished report]. Åkerblå.

⁵¹⁴ Follestad, A. (2014) *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie. -NINA Rapport 1081: 40-47.* Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

Organic waste discharge: Fallowing of aquaculture facilities to allow the immediate environment to recover is already regular practice and this should continue, although it is not a suitable mitigation measure where maerl is affected, as regrowth is so slow.⁵¹⁵

Multi-trophic aquaculture might be used to recycle the organic waste from salmon farming to the benefit of kelp or other species; however, this would require careful studies of seasonal variations in order to ensure its efficacy.⁵¹⁶

Chemical discharges: Sea lice chemical treatments should be reduced, particularly during the spring/summer period when many crustacean species. Alternatives should be sought in order to avoid their dispersal into the sea. However, it is noted that a recent report by the Norwegian Veterinary Institute expressed serious concerns about the alternatives and it might not be easy to find appropriate mitigation measures.⁵¹⁷

The way in which other chemical products are dispersed into the sea should be examined and reduced.

Non-fish waste: Waste disposal policies need to be adhered to.

Velcro can be used to hang nets, avoiding the need for ropes where possible.

Feed pipes need to be regularly replaced when showing signs of wear to minimize microplastic emissions. Water feeding can reduce the wear.

Interactions with predators: Top and curtain anti-predator nets, with an appropriate mesh size, should be installed at a suitable distance from the fish pens and well maintained to ensure birds do not manage to reach fish from them (reducing the association of food with the facility) and do not get entangled.

Acoustic dissuasion should not be used so that non-target species are not disturbed.

Other methods of dissuasion should be explored but no lethal methods for eliminating predators should be permitted at the aquaculture facilities.

Interactions between farmed and wild fish: Aquaculture companies need to ensure existing measures are implemented to improve disease controls and prevent escapes, although the Norwegian Scientific Advisory Committee for Atlantic Salmon believes that the present mitigation measures are insufficient to stabilize and reduce these threats.⁵¹⁸

With regard to escapes, procedures and inspections can be improved to avoid technical failures and human errors, in particular, improvements to the design of equipment at exposed sites where storm damage may be incurred.⁵¹⁹

Recapture nets should be present at facilities in case of escapes.

Enhancing socio-economic impacts: Employment policies could be adopted that favour the selection of local residents (where the necessary knowledge and skills exist) and encourage the new workers to take up residency in Vega.

The aquaculture companies should favour local service providers and suppliers wherever possible, although it is noted industry procurement is not currently available at Vega.⁵²⁰

Annual income gained by the municipality from the Aquaculture Fund could be used to contrast the concentration of wealth model that the aquaculture industry can represent locally, by focussing on benefits in the form of equitable economic opportunities in the specific geographic area of the archipelago affected.

⁵¹⁵ Hall-Spencer, J., White, N., Gillespie, E. *et al.* (2006) Impact of fish farms on maerl beds in strongly tidal areas. *Marine Ecology Progress Series* 326: 1-9.

⁵¹⁶ Reitan, K.I. (2013) Seasonal- and depth-dependent growth of cultivated kelp (*Saccharina latissima*) in close proximity to salmon (*Salmo salar*) aquaculture in Norway. *Aquaculture* 414-415: 191-201.

⁵¹⁷ Sommerset, I., Walde, C.S., Jensen, B.B. *et al.* (eds) (2022) *Fiskehelse rapporten 2021* [online]. Veterinærinstituttets årlige oversikt over fiskehelsen i Norge. <https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2022/fiskehelse-rapporten-2021>

⁵¹⁸ Thorstad, E.B., Torbjørn, F. & Fiske, P. (2021) *Status for norske laksebestander i 2021* [online]. Vitenskapelig råd for lakseforvaltning. Available from: <https://brage.nina.no/nina-xmliui/handle/11250/2830680>

⁵¹⁹ Mowi (2021) *Integrated Annual Report 2021* [online]: 54. Available from: <https://mowi.com/blog/mowi-annual-report-2021/>

⁵²⁰ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune - Samfunnsmessige Virkninger*. Menon Economics: 40.

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- an open seascape and coastal landscape made up of a myriad of islands, islets and skerries
- diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape
- bountiful nature
- rich maritime resources of the Vega Archipelago
- considered as the most important wintering area for seabirds in the Nordic region
- The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- the cultural landscape of the Vega Archipelago continues to be managed in a traditional manner, using time-honoured management techniques
- The rich maritime resources of the Vega Archipelago... benefited local peoples'
- 'fishermen/farmers have, over the past 1,500 years, maintained a sustainable living'

Other heritage values:

- The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe

TABLE 4.3.4 Potential impacts on the World Heritage property of nature areas in the Vega section of the Helgeland Coastal Plan

Element of the proposed coastal plan:	NATURE AREAS
<p>The protected areas within the Vega municipality have been taken into consideration within the Helgeland Coastal Plan, according to their designation:</p> <ul style="list-style-type: none"> • <i>Nature reserves</i> (Lånan/Skjærvær, Kjellerhaugvatnet and Holandsosen): the natural values must not be impaired • <i>Bird protection areas</i> (Lånan, Flovær and Skjærvær, Muddværet): activities that affect species can be limited • <i>Landscape conservation area</i> (Hysvær/Søla): the distinctive character of the landscape shall not be significantly changed <p>Important habitats (e.g., kelp forests, eelgrass meadows and soft-bottom areas) were considered important for biodiversity and sustainable development and therefore needed conservation. One way of doing this was to designate areas shallower than 20 m (which support the greatest biodiversity) as not appropriate for aquaculture.</p> <p>However, the Helgeland Coastal Plan does note that at times decisions may be made in favour of aquaculture that are at the expense of nature.⁵²¹</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	GEOLOGY AND LANDSCAPE FEATURES
<p>The inclusion of the Hysvær/Søla landscape conservation area would be beneficial for maintaining the distinctive character of that landscape. However, it is not clear if any genuine restrictions would be placed on activities in this area.</p>	
Attributes of the heritage place:	TERRESTRIAL HABITATS
<p>The inclusion of the nature reserves at Lånan/Skjærvær, Kjellerhaugvatnet and Holandsosen would provide some protection of the terrestrial habitats found in these areas. However, it is not clear if any genuine restrictions would be placed on activities in this area.</p>	
Attributes of the heritage place:	MARINE HABITATS
<p>The various protected areas include large expanses of sea and would therefore provide some protection for the marine habitats there. However, it is not clear if any genuine restrictions would be placed on activities in this area.</p>	

⁵²¹ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 20.*

Attributes of the heritage place:	SPECIES
<p>The inclusion of the bird protection areas at Lånan, Flovær and Skjærvær, and Muddværet would provide protection for the sea bird populations. However, it is not clear if any genuine restrictions would be placed on activities in this area.</p> <p>Greater protection of marine habitats which provide spawning or nursery areas would provide some protection for fish populations and other species.</p>	
Attributes of the heritage place:	FISHING TRADITIONS
<p>The protection of marine habitats, with consequent support for spawning and juvenile fish survival, would indirectly have a positive impact on fishing.</p>	
Attributes of the heritage place:	EIDER TENDING
<p>The inclusion of the bird protection areas, particularly the one at Lånan, would provide some protection for the eider ducks, limiting disturbance and encouraging them to stay in areas where eider tenders can work with them.</p>	
Cumulative impact(s):	
<p>The protection of these specific areas should work in harmony with the management of the World Heritage property which surrounds them.</p>	
Potential mitigation/enhancement measure(s):	
<p>The identification of appropriate activities that can be allowed within the protected areas and other key habitats need to be identified. This needs to be done on the basis of understanding of socio-ecological system processes in order to ensure meaningful management of these designations.</p>	
Heritage values associated with the impacted attributes:	
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • an open seascape and coastal landscape made up of a myriad of islands, islets and skerries • diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape • bountiful nature • rich maritime resources of the Vega Archipelago • considered as the most important wintering area for seabirds in the Nordic region • The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds 	

- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature

Other heritage values:

- The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe

TABLE 4.3.5 Potential impacts on the World Heritage property of outdoor recreation areas in the Vega section of the Helgeland Coastal Plan

Element of the proposed coastal plan:	OUTDOOR RECREATION AREAS
<p>The Helgeland Coastal Plan respects the Outdoor Recreation Act, which aims to ‘protect the natural basis for outdoor recreation and to safeguard the public right of access to and passage through the countryside and the right to spend time there, etc, so that opportunities for outdoor recreation as a leisure activity that is healthy, environmentally sound and gives a sense of well-being are maintained and promoted.’⁵²²</p> <p>This has been done by identifying areas that are:</p> <ul style="list-style-type: none"> • State-protected outdoor recreation areas (these are indicated on the Helgeland Coastal Plan’s map) • Very important outdoor recreation areas • Important outdoor recreation areas • Registered outdoor recreation areas <p>In general, the sea is considered to be an area to which the public has right of access and passage through it.</p> <p>The Helgeland Coastal Plan states that measures which could impair the area’s value for outdoor recreation should not be admitted.⁵²³</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	TERRESTRIAL HABITATS
<p>Sensitive areas can be eroded and the landscape degraded if visitation is intensive.⁵²⁴</p>	
Attributes of the heritage place:	SPECIES
<p>Recreational fishing can place fish stocks under significant pressure.⁵²⁵</p> <p>Visitation can disturb sensitive species, in particular during breeding and nesting periods.⁵²⁶</p>	
Attributes of the heritage place:	HUMAN SETTLEMENT
<p>Opportunities to enjoy the sea and landscape of the Vega Archipelago can contribute to community wellbeing. This contribution to quality of life could encourage the population to stay in the municipality or encourage the return of those who have moved away.</p>	

⁵²² Lov om friluftslivet (friluftsløven). Available from: <https://lovdata.no/dokument/NL/lov/1957-06-28-16>

⁵²³ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 1: Plandokument (revisjon 10.06.2019): 24.*

⁵²⁴ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 13.

⁵²⁵ Kleiven, A.R., Fernandez-Chacon, A., Nordahl, J.-H., Moland, E., Espeland, S.H., Knutsen, H., et al. (2016) Harvest Pressure on Coastal Atlantic Cod (*Gadus morhua*) from Recreational Fishing Relative to Commercial Fishing Assessed from Tag-Recovery Data. *PLoS ONE* 11.3: e0149595. <https://doi.org/10.1371/journal.pone.0149595>

⁵²⁶ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 14.

Tourism based on outdoor recreational activities at Vega could potentially contribute to the local economy and thereby support the continued presence of the local community.

Unmanaged and intensive visitation could instead change the population dynamics, economic trends and sense of place, with housing converted to visitor accommodation, shops and services focused on visitor needs, etc.

Potential mitigation/enhancement measure(s):

Restrictions on visitation to areas where birds are nesting or moulting should be continued.

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- considered as the most important wintering area for seabirds in the Nordic region
- The landscape has been shaped by the ongoing interactions between people and nature over 10,000 years
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- length of human presence in this extremely exposed seascape, with evidence of fishers and hunters for over 10,000 years

Other heritage values:

- The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe
- The diversity of ecosystems and ecosystem services, through natural resource use, have given the area cultural and social importance, political influence and a resilient socio-economic model based on multiple income sources

4.4 PREDICTION OF IMPACTS OF THE PROPOSED AQUACULTURE FACILITIES ON THE WORLD HERITAGE PROPERTY

This section of the report identifies the positive and negative impacts which could potentially occur if the two proposed aquaculture facilities at Hysvær and Rørskjæran were included within the Helgeland Coastal Plan and permitted to be installed for operation. It then uses the available information to make an informed prediction of the nature of the effects that would occur if the proposed aquaculture takes place. These potential impacts are described in a series of tables below and this then forms the basis for the final assessment of impact (section 4.5). Where potential negative impacts are identified, the tables note options for mitigation that reduce or avoid the negative impacts.

The tables describing the potential impacts should be read in light of considerations regarding the current state of conservation of the World Heritage property (Table 2.3) and potential mitigation measures in light of considerations regarding its management system (Table 2.6). This is because some attributes do not have ideal conservation status and so are more vulnerable to some interactions with elements of the proposed aquaculture facilities. Similarly, mitigation measures depend on management effectiveness.

In addition, the tables include notes on other factors, outlined in Table 4.2. These existing or potential factors could magnify the potential positive or negative impacts of the proposed aquaculture facilities. In some cases, these factors can increase the vulnerabilities of attributes and can be considered cumulative impacts. The impact tables are informed predictions based on existing data, however, as already noted, the data available is limited due to:

- the lack of some specific details of the aquaculture facilities because those details would be established only once permission is gained (e.g., mooring system at Hysvær) or might vary over time (e.g., number of times lice infestations occur requiring chemical treatment).
- the lack of detailed mapping and other information on the marine habitats and species dependent on them, which are the attributes most affected by the proposed aquaculture.

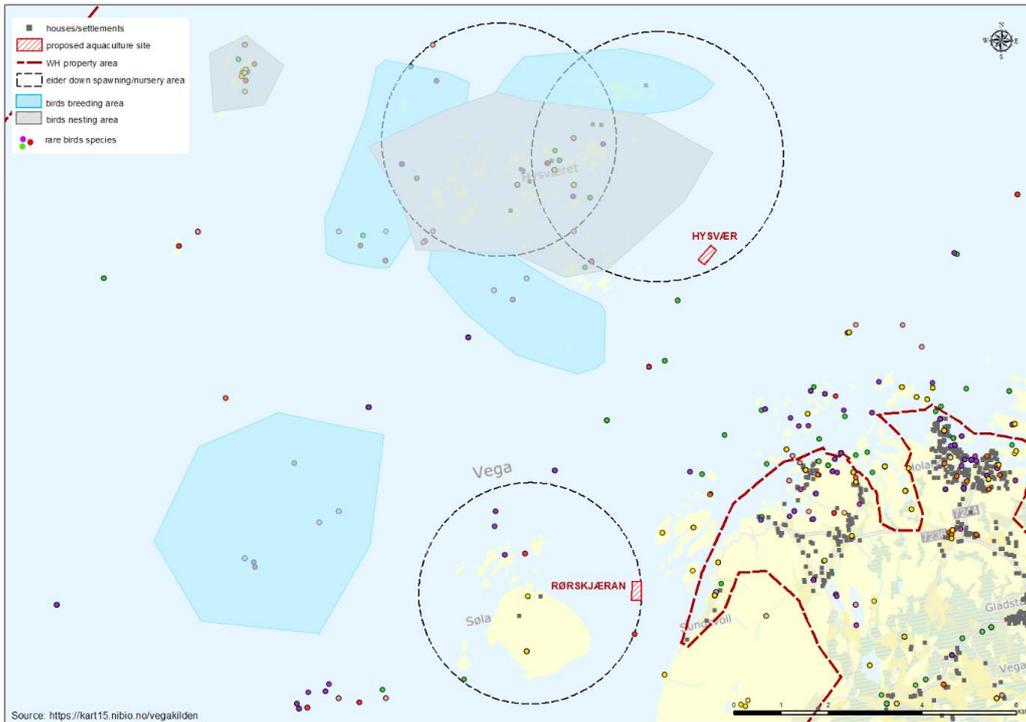
To overcome these information gaps, scientific sources with results from similar contexts have been used (e.g., examples from the Norwegian coastal waters wherever possible or other relevant ecosystems). However, where gaps are significant the final evaluation of the impact assessment (section 4.5) will necessarily need to apply the Precautionary Principle.⁵²⁷

⁵²⁷ 'Akvakulturloven har en egen miljøbestemmelse der det presiseres at havbruk skal etableres, drives og avvikles på en miljømessig forsvarlig måte. I vurderinga av begrepet miljømessig forsvarlig, legges bl.a. føre-var-prinsippet til grunn. Prinsippet innebærer at der det er risiko for alvorlig eller irreversibel skade på naturmangfoldet, skal ikke mangel på kunnskap brukes som begrunnelse for å utsette eller unnlate å sette inn proporsjonale og kostnadseffektive tiltak. Det innebærer for det første at påvirkningen ikke skal vurderes isolert, men på bakgrunn av den miljøbelastning som allerede er skjedd gjennom andre påvirkninger,' Fiskeri- og kystdepartementet (2009) *Strategi for en miljømessig bærekraftig havbruksnæring* [online]. Available from: <https://www.regjeringen.no/no/dokumenter/strategi-for-en-miljomessig-barekraftig/id571066/> '§9 Føre-var-prinsippet: Når det treffes en beslutning uten at det foreligger tilstrekkelig kunnskap om hvilke virkninger den kan ha for naturmiljøet, skal det tas sikte på å unngå mulig vesentlig skade på naturmangfoldet. Foreligger en risiko for alvorlig eller irreversibel skade på naturmangfoldet, skal ikke mangel på kunnskap brukes som begrunnelse for å utsette eller unnlate å treffe forvaltningstiltak,' Lov om forvaltning av naturens mangfold (naturmangfoldloven). Available from: <https://lovdata.no/dokument/NL/lov/2009-06-19-100>

TABLE 4.4.1 Potential impacts on the World Heritage property of installation / deinstallation activities of the proposed aquaculture facilities

Element of the proposed projects:	INSTALLATION / DEINSTALLATION ACTIVITIES
<p>Aquaculture facilities are established in the sea by ships bringing specialist teams who lay out the mooring system, anchoring the farm to the seabed, and then setting up the net pens within that structure. These activities create noise and additional marine traffic in ways that are described for more routine activities in Tables 4.4.4 and 4.4.5. However, installation activity is more intense and lasts several weeks; for this reason it is considered separately here.</p> <p><i>Details specific to Hysvær:</i> The installation of an aquaculture facility within coastal waters foresees the presence of one ship for mooring and one for setting up the net pens. These activities take approximately three weeks. When the facility is no longer in use, it would be removed in a similar way.</p> <p><i>Details specific to Rørskjæran:</i> It is noted that the proposed facility at Rørskjæran has already been partially installed and so would require less time to complete installation. The installation and deinstallation procedures would be similar to those for Hysvær.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	HYDROGRAPHY / WATER QUALITY
<p>Boat engine emissions are similar to other local marine traffic and would affect water quality to the same degree.</p>	
Attributes of the heritage place:	SPECIES
<p>Daily traffic to the aquaculture facility, together with noise and movement around the locality have the potential to cause disturbance to marine species, including fish and seabirds (see Tables 4.4.4 and 4.4.5 for more details). The approximate three-week period potentially causes only temporary impacts, compared to ongoing activities. However, the concentration and duration of such activities can have more permanent consequences on sensitive species.⁵²⁸</p> <p>There are seasons when sea birds are more vulnerable to disturbance. For example, eiders, like other bird species, cannot fly for 3-4 weeks during moulting and each time they are disturbed they have to use their limited energy reserves to relocate by swimming, instead of focusing on feeding. This can affect the ability to build up reserves in order to survive the winter or to have the strength to migrate. Another example, is that disturbances can cause a mother bird to temporarily leave the nest, which leaves chicks vulnerable to predation. In some cases, if an area becomes associated with ongoing disturbance, species might change their foraging areas, overwintering sites, etc. As shown by map below, depending on the season in which installation would take place, there would be some potential disturbance to eider ducks by both aquaculture facilities. Other seabird species would also be potentially affected.</p>	

⁵²⁸ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø – en litteraturstudie*. NINA Rapport 1199 [online]: 10. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>



There is not enough information to comment on the effects on fish.

Attributes of the heritage place:

FISHING TRADITIONS

Fishing grounds can be found approximately 300 m from Hysværet and 400 m from Rørskjæran, so while installation activities would not create a direct obstacle there may be limited disturbance for roughly three weeks.



Cumulative impact(s):
<p>The decline in population of several seabird species indicates a series of existing factors that impact them, including: climate change, changes in fisheries, fluctuations in the pelagic fish stocks and changes in the kelp forest systems.⁵²⁹ The potential negative impacts on seabirds may magnify the effects of other factors that are the context of the sharp decline in seabird populations. Such disturbance might accumulate with other stressors, particularly during the moulting period (the process of shedding and growing new feathers), when adult birds are at their most vulnerable. In addition, Follestad highlights that measuring direct responses to individual traffic disturbances underestimates the serious cumulative effects that may occur when sensitive animals avoid large areas associated with traffic.⁵³⁰ Even though these factors are not entirely understood, it is important not to ignore them or to magnify their effects.⁵³¹</p>
Potential mitigation measure(s):
<p>Installation and deinstallation should be scheduled so that they do not take place during the period during environmentally sensitive periods. This would need to be established for the individual aquaculture facilities according to the specific location and the nearby species.</p> <p>Follestad outlines a series of potential mitigation measures according to species and particularly points to the need to avoid disturbing moulting eider or other ducks, as well as avoiding nesting cormorants.⁵³²</p>
Heritage values associated with the impacted attributes:
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • bountiful nature • rich maritime resources of the Vega Archipelago • considered as the most important wintering area for seabirds in the Nordic region • the rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds • the Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature • the cultural landscape of the Vega Archipelago continues to be managed in a traditional manner, using time-honoured management techniques

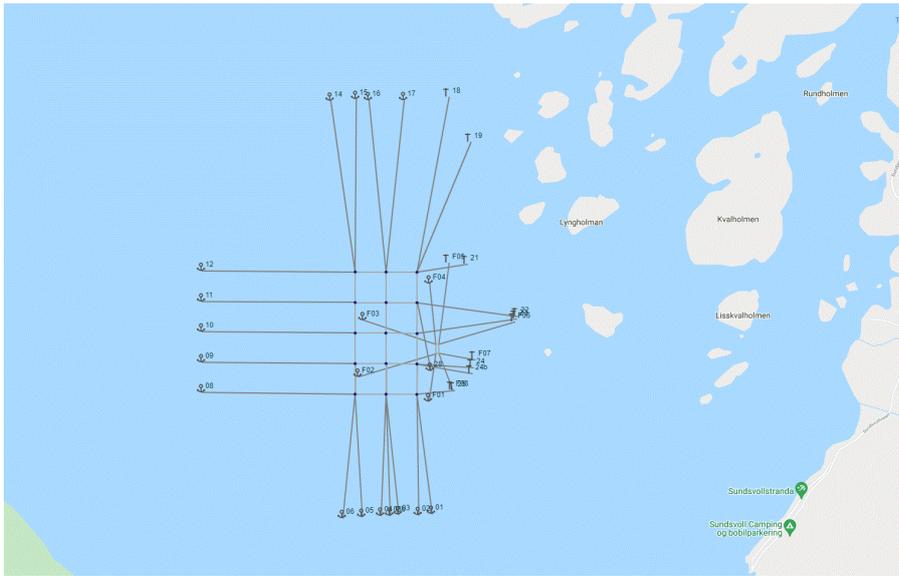
⁵²⁹ Fauchald, P., Barrett, R. T., Bustnes, J. O., Erikstad, K. E., Nøttestad, L., Skern-Mauritzen, M. & Vikebø, F. B. (2015) *Sjøfugl og marine økosystemer. Status for sjøfugl og sjøfuglenes næringsgrunnlag i Norge og på Svalbard. NINA Rapport 1161* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2594604>; Anker-Nilssen, T., Barrett, R.T., Lorentsen, S.-H., Strøm, H., Bustnes, J.O., Christensen-Dalsgaard, S., Descamps, S., Erikstad, K.E., Fauchald, P., Hanssen, S.A., Lorentzen, E., Moe, B., Reiertsen, T.K. & Systad, G.H. (2015) *SEAPOP. De ti første årene. Nøkkeldokument 2005-2014*. Norsk institutt for naturforskning.

⁵³⁰ Follestad, A. (2012) *Kunnskapsoversikt over effekter av forstyrrelser på fugler: Innspill til for-valtningsplaner for Lista- og Jærstrendene. NINA Rapport 851* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2643168>

⁵³¹ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrif i Vegaøyen verdensarvområde. NINA Rapport 1405* [online]: 78. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

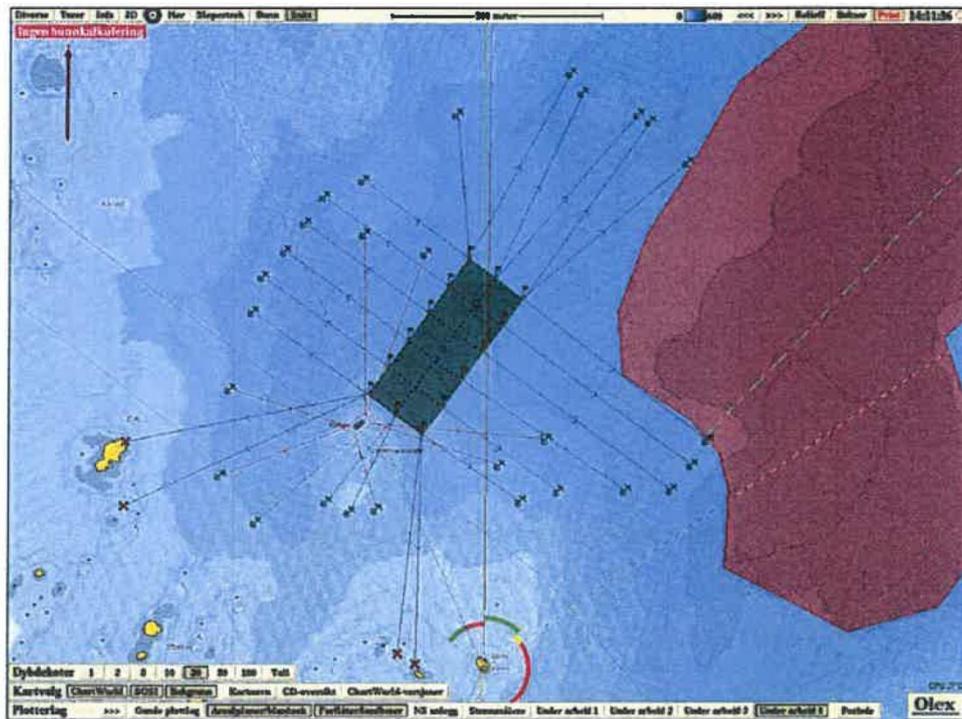
⁵³² Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø – en litteraturstudie. NINA Rapport 1199* [online]: 37. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>; Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrif i Vegaøyen verdensarvområde. NINA Rapport 1405* [online]: 72. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

TABLE 4.4.2 Potential impacts on the World Heritage property of the mooring systems of the proposed aquaculture facilities

Element of the proposed projects:	MOORING SYSTEM
<p>Aquaculture facilities need to be attached to the sea floor in order to maintain their position. Anchors and bolts are attached at multiple points around the facility to ensure its stability.</p> <p>There are deadweight anchors (i.e., a concrete block), drag-embedment anchors (similar to the anchors used for boats, where the anchor embeds into a soft seabed, typically these will weigh from 700-3000 kg), or helical anchors (which screw into the soft bottom). Bolts are used to connect to hard bottoms and are drilled into the rock forming the sea floor. According to the specific bolt used, these have a diameter of 3.2-5.0 cm and are inserted into the rock to a depth of 40-70 cm.</p> <p><i>Details specific to Hysvær:</i> The exact location has not yet been determined and awaits further investigation into current and wave conditions. For this reason, the mooring system has not yet been designed. As a general reference point, it can be considered similar to the facility at Skogsholmen, which has a relatively similar bottom topography (section 3.4). This would involve multiple mooring lines anchored to the seabed all around the facility, with buoys surrounding the site.⁵³³</p> <p><i>Details specific to Rørskjæran:</i> the mooring system is already installed. The complete installation would have 24 mooring lines with 25 anchorage points on the seabed, of these 17 are anchors and 8 bolts, as well as 16 buoys, assuming that their permission request reflects the solution found during installation.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	GEOLOGY AND LANDSCAPE FEATURES
<p><i>Details specific to Rørskjæran:</i> Where bolts are used, these are already inserted into the rock (see map below).</p> 	

⁵³³ Nova Sea (2022) *Svarfra Nova Sea, verdensarv feedback* [unpublished communication].

Details specific to Hysvær: Should bolts be used, these would be inserted into the rock (see map below).



Figur 1: Nytt anleggsforslag på ny lokalitet Hysvær. Rødt område viser reketrålfeltet.

Attributes of the heritage place:	HYDROGRAPHY / WATER QUALITY
<p>The mooring lines connecting the aquaculture facility to the anchors/bolts are slack, allowing some movement. This movement of mooring elements has been shown to cause increased sediment when chains rub across the sea floor.⁵³⁴</p>	
Attributes of the heritage place:	MARINE HABITATS
<p>The mooring lines connecting the aquaculture facility to the anchors/bolts are slack, allowing some movement. This movement of mooring elements has been shown to affect vegetation, creating bare patches around mooring points⁵³⁵ and where it may take years to recover.⁵³⁶ Decreasing vegetation density can then negatively influence the associated fauna.⁵³⁷</p> <p>There are difficulties associated with removing deadweight anchors when a facility is decommissioned, due to the need for a suitable crane to lift them from the seabed. They are often therefore left in place within the marine environment.</p>	

⁵³⁴ Luff, A.L., Sheehan, E.V., Parry, M. *et al.* (2019) A simple mooring modification reduces impacts on seagrass meadows. *Scientific Reports* 9: 20062.

⁵³⁵ Luff, A.L., Sheehan, E.V., Parry, M. *et al.* (2019) A simple mooring modification reduces impacts on seagrass meadows. *Scientific Reports* 9: 20062.

⁵³⁶ Collins, K.J., Suonpää, A.M., & Mallisonson, J.J. (2010) The impacts of anchoring and mooring in seagrass, Studland Bay, Dorset, UK. *Underwater Technology* 29.3: 117-123.

⁵³⁷ McCloskey, R. M. & Unsworth, R. K. F. (2015) Decreasing seagrass density negatively influences associated fauna. *PeerJ: Life and Environment* 3: e1053.

The mooring lines on the aquaculture facilities can be used as stepping stones for new invasive species moving north along the Norwegian coast. ⁵³⁸
Potential mitigation measure(s):
Eco-mooring systems can be designed which reduce the impact of anchors and mooring chains to a minimum. ⁵³⁹
Heritage values associated with the impacted attributes:
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • Vega's geodiversity includes the only place in the country which belong to the Laurentian continent (North America) and it is a key area for understanding Caledonian geology • bountiful nature • rich maritime resources of the Vega Archipelago <p>Other heritage values:</p> <ul style="list-style-type: none"> • The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe

⁵³⁸ Appendix 3: Christie, H. & Berg, P.R. (2022) *Note on supplementary assessments to the Helgeland intermunicipal master plan for Vega* [unpublished report]. NIVA: 10.

⁵³⁹ Pioch, S. & Léocadie, A. (2017) *Overview of Eco-Mooring Facilities: commented bibliography*. Foundation for Research on Biodiversity. Available from: https://www.icriforum.org/wp-content/uploads/2019/12/OVERVIEW%20of%20eco-mooring-light_0.pdf

TABLE 4.4.3 Potential impacts on the World Heritage property of the presence of the proposed aquaculture facilities within the seascape

Element of the proposed projects:	PRESENCE OF FACILITY WITHIN THE SEASCAPE
<p>The aquaculture facilities would be a physical and visual presence in the archipelago for as long as they remain in operation. They can be expected to be present for a number of years.</p> <p><i>Details specific to Hysvær:</i> There would be a barge that is permanently moored while the facility is in use, containing spaces for the staff to use while on site (e.g., break room, kitchen, shower/WC, changing rooms, etc.) and an automatic feeding centre. This would be potentially connected to an electricity cable that supplies energy from land. There would probably be 10 rings (moored in a 90 x 90 m frame) which would provide the structure for the net pens.⁵⁴⁰</p> <p><i>Details specific to Rørskjæran:</i> a similar facility can be hypothesized for Rørskjæran, although in this case 8 rings are estimated. Given that the difference between 8 rings and 10 is minimal, the description of potential impacts can be considered to apply to both cases.</p> <p>It should be noted that the location of the two proposed facilities would not hinder fairways or block activities within fishing grounds. The facilities can be considered to be of ‘modest scale’ (on a scale from small to large).⁵⁴¹</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	GEOLOGY AND LANDSCAPE FEATURES
<p>It has been recognized that scale and distance are particularly difficult to judge in seascapes due to the extensive open areas and few features to judge scale against.⁵⁴² There is also the very different visual impact of the extensive area of nets versus the more dominating barge which is visible at great distances and much more dissonant with the horizontality of this cultural landscape.</p> <p>The visual impacts were assessed specifically by SWECO and it was concluded that the modest size of the facilities within the open landscape would contain the visual disturbance, even if in both cases it would be the first major modern feature in the seascape.</p> <p>However, sight lines and visual impacts are no the only consideration when assessing sensitivity to change in a cultural landscape and it is considered of greater relevance to characterize the seascape so that this can then inform decisions on continuity and change in that defined seascape.</p> <p>From this perspective, aquaculture facilities would affect visual amenity and the experience of being within the World Heritage property. This is due to the industrial character of aquaculture facilities, with their geometric shapes and</p>	

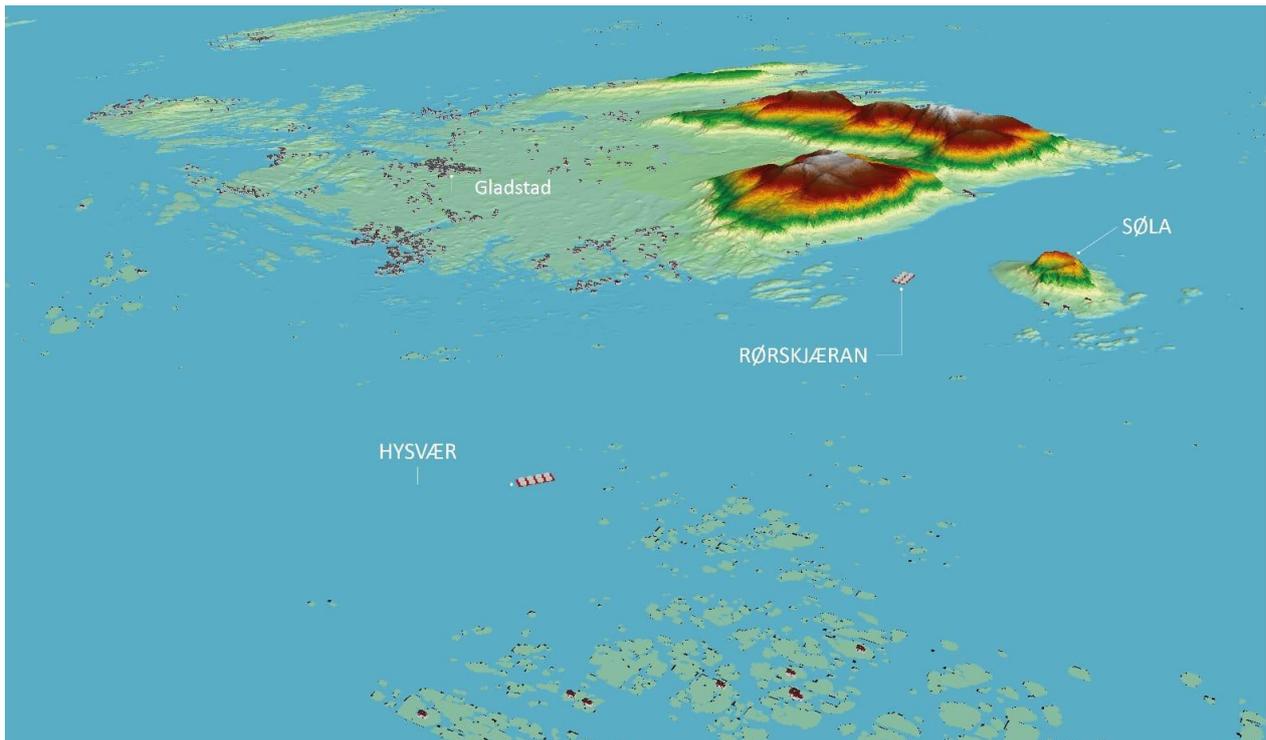
⁵⁴⁰ Nova Sea (2022) *Svarfra Nova Sea, verdensarv feedback* [unpublished communication]; Mowi AS (2022) *Utkast til svar Instead (UNESCO Vega)* [unpublished communication].

⁵⁴¹ Grant, A. (2006) *Landscape/seascape carrying capacity for aquaculture. Scottish Natural Heritage Commissioned Report 215* [online]. Available from: <https://www.nature.scot/doc/naturescot-commissioned-report-215-landscapes-seascape-carrying-capacity-aquaculture>

⁵⁴² Hill, M., Briggs, J., Minto, P. et al. (2001) *Guide to Best Practice in Seascape Assessment*. The Marine Institute.

necessarily high visibility of many components, which contrasts with the overall characterisation of the archipelago (Part 2) with a small-scale human presence.⁵⁴³

Details specific to Hysvær: the aquaculture facility would be visible within the seascape for those passing by the Hysvær islands and is located at an intersection with a key fairway that crosses this group of islands. The very flat character of the outer islands could make the presence of the barge when the facility at Hysvær is in use the most visually impactful element, primarily for users of the fairways but also mutating distant views from human settlement on this group of islands, including the summer restaurant. It would be just discernible from the high peaks of Vega and Sjøla on a clear day but not to the naked eye.

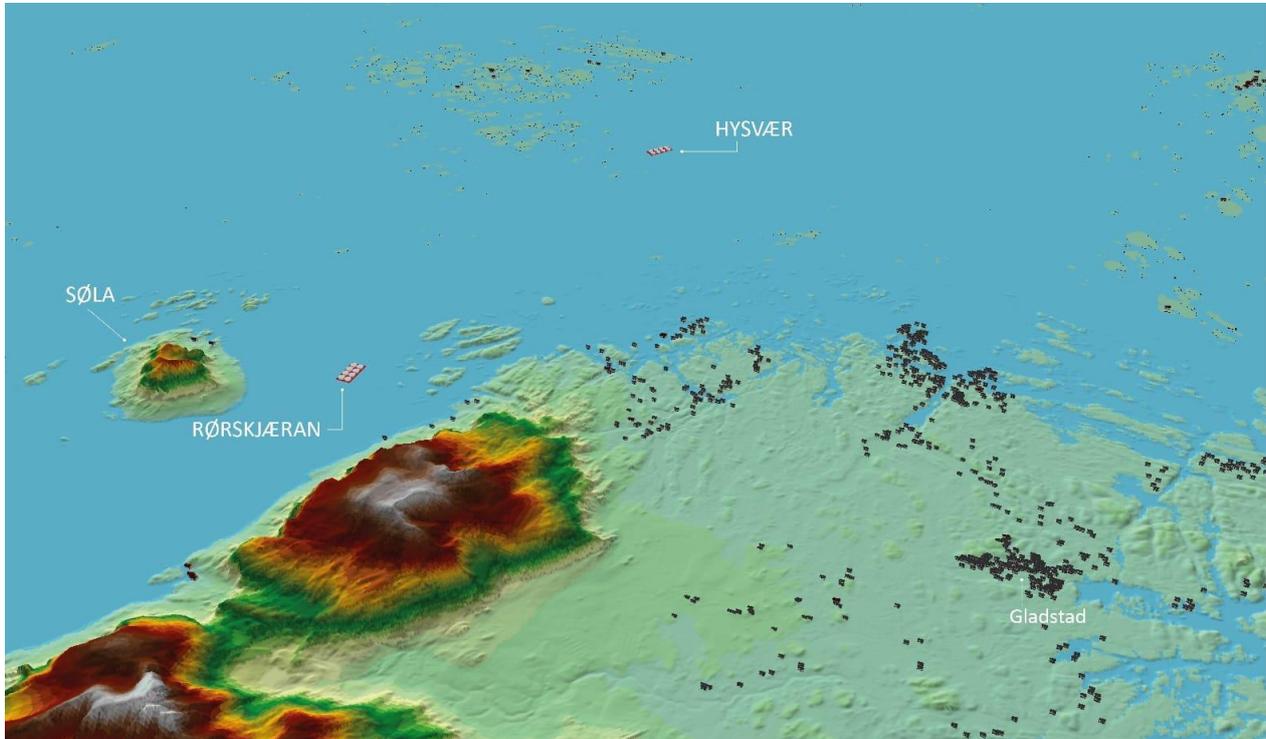


Details specific to Rørskjæran: Figure 3.21 and the images below show that the mooring system for the aquaculture facility is already visible within the seascape for those passing between Vega island and Sjøla (left).



⁵⁴³ SWECO (2016) *VegaoyanVerdensarv – visuellkarakter* [unpublished report]. Available from: <https://www.fylkesmannen.no/contentassets/1fbc385a200d4891b07e0cf75bbac9ff/vegaoyan-verdensarv--visuell-karakter--SWECO-rapport-2016.pdf>

If the very flat character of the outer islands could make the presence of the barge the issue at *Hysvær*, here at *Rørskjæran* the cultural landscape is lived horizontally and vertically due to the much more dramatic coastal area mixing high peaks on two islands with other very low islands. Both the array of nets and the barge would constitute strong visual additions to current views from the north and east coast *Søla* and from the majority of the west coast of Vega main island, and in particular from *Vegatrappa* and the mountain peaks on Vega.



Attributes of the heritage place:	MARINE HABITATS
<p>Aquaculture facilities can provide suitable places for non-indigenous species to settle, acting as stepping stones for their range expansion.⁵⁴⁴ Aquaculture operations, such as net cleaning, can then facilitate their spread into the surrounding natural environment.⁵⁴⁵</p>	
Attributes of the heritage place:	SPECIES
<p>The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It is presumed this is due to the supply of waste feed that falls from the net pens. See Table 4.4.7 for those impacts related to the discharge of organic waste.</p>	

⁵⁴⁴ Carl, C., Guenther, J. & Sunde, L.M. (2011) Larval release and attachment modes of the hydroid *Ectopleura larynx* on aquaculture nets in Norway. *Aquaculture Research* 42: 1056–1060. Mineur, F., Cook, E.J., Minchin, D., Bohn, K., MacLeod, A. & Maggs, C.A. (2012) Changing coasts: marine aliens and artificial structures. In: Gibson, R.N., Atkinson, R.J.A., Gordon, J.D.M., Hughes, R.N. (eds) *Oceanography and Marine Biology: an Annual Review* 50: 189–234.

⁵⁴⁵ Bloecher, N. & Floerl, O. (2020) Towards cost-effective biofouling management in salmon aquaculture: a strategic outlook. *Reviews in Aquaculture* 13.2: 783-795.

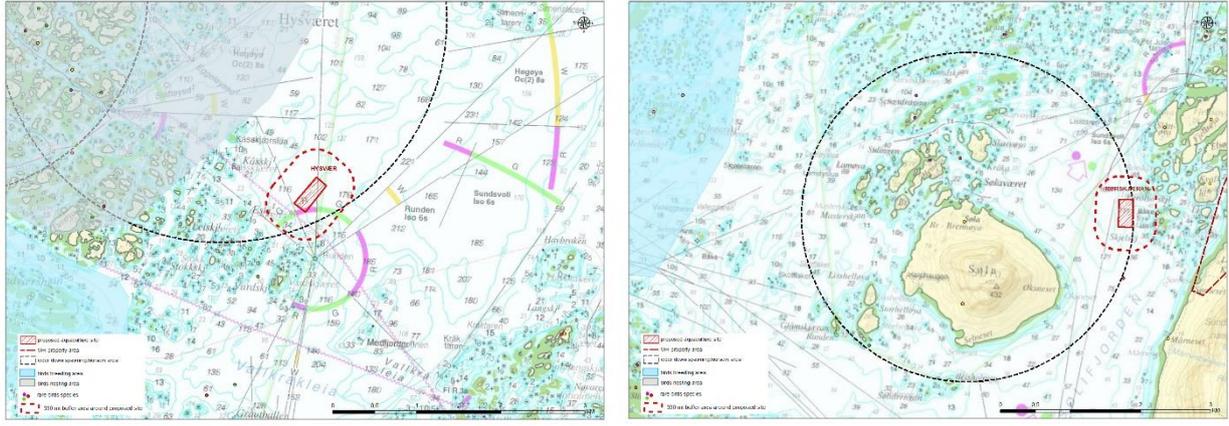
<p>The aggregation of wild fish may in turn attract fish-eating species, e.g., cormorants and other seabirds, seals, etc., who can find food under or near the facility.⁵⁴⁶ However, this can lead to conflict situations with predators (Table 4.4.11) and potential damage to net pens, increasing the risk of escaping farmed fish.</p>	
Attributes of the heritage place:	HUMAN SETTLEMENT
<p>Both proposed facilities would be visible from some houses or farms today, in the case of Hysvær quite distant views and in the case of Rørskjæran partial views, or views from key arrival routes, for properties on Vega island and Sjøla.</p>	
Attributes of the heritage place:	FISHING TRADITIONS
<p>The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It has been suggested that this aggregation of wild fish may affect resource availability for fishers because no fishing can be carried out within 100 m of an aquaculture facility. However, there is a lack of data to show to what extent this affects fisheries.⁵⁴⁷</p>	
Cumulative impact(s):	
<p>Encountering multiple facilities through the Vega Archipelago increases the industrial character of aquaculture and its contrast to the small-scale human presence which otherwise characterises the World Heritage property.⁵⁴⁸</p>	
Potential mitigation measure(s):	
<p>From the perspective of impacts on landscape aspects, one form of mitigation could be seen in the temporary nature of the facilities. Even radical changes can be deemed acceptable in World Heritage properties because of this idea of a temporary presence but only when time intervals are so restricted that they do not change local and visitor perceptions and the temporary change can be seen as a form of diversification or enrichment of the heritage values of the place.</p> <p>Both proponents of the two facilities in question have confirmed a willingness to minimise visual impacts wherever possible given the World Heritage context but safety and functional requirements reduce margins enormously.</p>	
Heritage values associated with the impacted attributes:	
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • an open seascape and coastal landscape made up of a myriad of islands, islets and skerries • bountiful nature • rich maritime resources of the Vega Archipelago 	

⁵⁴⁶ Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁵⁴⁷ Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima: 22. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁵⁴⁸ SWECO (2016) *Vegaøyan Verdensarv – visuell karakter* [unpublished report]. Available from: <https://www.fylkesmannen.no/contentassets/1fbc385a200d4891b07e0cf75bbac9ff/vegaoyan-verdensarv--visuell-karakter--SWECO-rapport-2016.pdf>

TABLE 4.4.4 Potential impacts on the World Heritage property of increased marine traffic serving the facility of the proposed aquaculture facilities

Element of the proposed projects:	INCREASED MARINE TRAFFIC SERVING THE FACILITY
<p>Both aquaculture facilities would have similar levels of traffic serving them and would be serviced by vessels bringing personnel for routine monitoring and maintenance activities, as well as specific inspections.</p> <p>Examples of the levels of traffic to/from the facilities include: the barge would potentially need restocking with feed every two weeks; inspections of fish health would potentially take place every month; net cleaning would potentially be carried out every two weeks. Well boats would transport live fish to and from the facility at the beginning and end of their growth cycle, while dead fish would be periodically removed for disposal.</p> <p>An estimate for the comparable Nova Sea facility at Skogsholmen (section 3.4) shows that during a production cycle two boats were in use daily: one to transport personnel to work at the facility and another for working around the facility. In addition, another 98-122 boats called at the facility in that period with supplies, inspections or other tasks.⁵⁴⁹</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	SPECIES
<p>Boating activity can cause disturbance and consequently stress for ducks, waders and other sea birds, including the eider.⁵⁵⁰ For example, eider ducks are disturbed by boats at a distance of approximately 330 m and it can take them 16 minutes to recover from the disturbance.⁵⁵¹ Other duck species are even less tolerant. The two maps below indicate a 330 m radius around the two proposed aquaculture facilities (red dotted line), any traffic in this area would potentially affect eiders, which is of particular concern given that both facilities overlap with eider areas (black dotted line).</p>	
	

⁵⁴⁹ Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 20.

⁵⁵⁰ Follstad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra ak-vakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁵⁵¹ Skei, J. (2014) *Exploring moulting Common eider (Somateria mollissima) escape responses to-wards ship traffic* [Master's thesis]. Norwegian University of Science and Technology.

Traffic disturbance can range from relatively insignificant behavioural changes to serious effects on birds' survival. Disturbance can have a negative effect because the bird has to leave foraging activities and use increased energy to distance themselves. This can affect the ability to build up reserves in order to survive the winter or to have the strength to migrate. There are seasons when sea birds are more vulnerable to disturbance. For example, eiders, like some other bird species, cannot fly for 3-4 weeks during moulting and each time they are disturbed they have to use their limited energy reserves to relocate by swimming, instead of focusing on feeding.⁵⁵² There are areas within the Vega Archipelago which are used by the large greylag goose for moulting.⁵⁵³

Another example, is that disturbances can cause a mother bird to temporarily leave the nest, which leaves chicks vulnerable to predation. In some cases, if an area becomes associated with ongoing disturbance, species might change their foraging areas, overwintering sites, etc. Whether the routine activities related to aquaculture will have a significant impact is however difficult to assess.⁵⁵⁴

Underwater noise from boats can also be a problem for whales because these sounds can mask the whales' communication for up to 14 km.⁵⁵⁵

Attributes of the heritage place:

HUMAN SETTLEMENT

It has been noted that local perceptions of the current amount of marine traffic - and therefore the potential increase related to aquaculture - varies between individuals with no accurate data of small boat traffic available to confirm or refute perceptions.⁵⁵⁶ However, the map below shows that routes to and from the two proposed aquaculture facilities from Vega island would largely follow existing traffic patterns and therefore would not potentially cause much additional disturbance, if managed well.

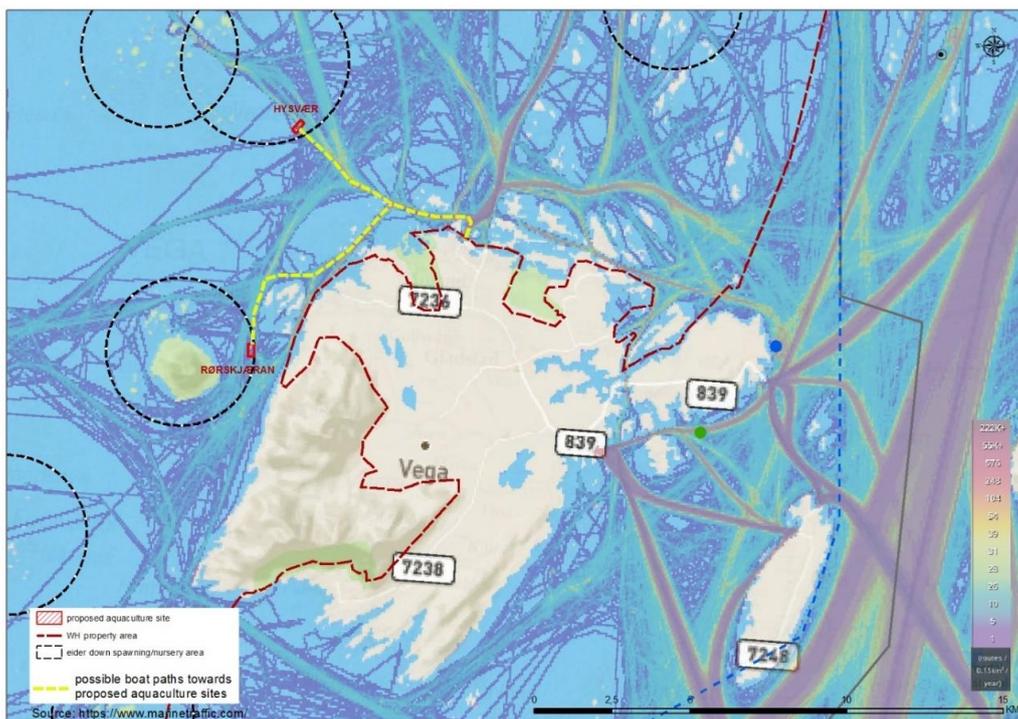
⁵⁵² Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra ak-vakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]: 23-4. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁵⁵³ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra ak-vakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]: 37. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁵⁵⁴ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 13.

⁵⁵⁵ Abdulla, A. & Linden, O. (2008) *Maritime Traffic Effects on Biodiversity in the Mediterranean Sea, Volume 1 - Review of Impacts, Priority Areas and Mitigation Measures*. IUCN. Erbe, C. (2002) Underwater noise of whale-watching boats and potential effects on killer whales (*Orcinus orca*), based on an acoustic impact model. *Marine Mammal Science* 18: 394–418.

⁵⁵⁶ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrift i Vegaøyane verdensarvområde*. NINA Rapport 1405 [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>



Attributes of the heritage place:	FISHING TRADITIONS
<p>The additional traffic would not affect fishing traditions, as the boats would not need to cross fishing grounds but would largely follow existing fairways.</p>	
Cumulative impact(s):	
<p>Follestad highlights that measuring direct responses to individual traffic disturbances underestimates the serious cumulative effects that may occur when sensitive animals avoid large areas associated with traffic.⁵⁵⁷ Even though these factors are not entirely understood, it is important not to ignore them or to magnify their effects.⁵⁵⁸</p>	
Potential mitigation measure(s):	
<p>Some mitigation measures are possible to reduce disturbance, such as:</p> <ul style="list-style-type: none"> • grouping tasks whenever possible so that multiple tasks achieved on a single trip • following main navigational routes as far as possible • for the section of the journey between the aquaculture facility and the main navigation route, the most appropriate route that avoids approaching bird areas should be studied and communicated to all traffic 	

⁵⁵⁷ Follestad, A. (2012) *Kunnskapsoversikt over effekter av forstyrrelser på fugler: Innspill til for-valtningsplaner for Lista- og Jærstrendene*. NINA Rapport 851 [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2643168>

⁵⁵⁸ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrif i Vegaøyane verdensarvområde*. NINA Rapport 1405 [online]: 78. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

- boats should pay attention to birds on the fairway and seek to keep their distance. It has been suggested that boats keep at least 700 m away from eider ducks and 500-1000 m away from greylag geese⁵⁵⁹
- speed limits can be introduced when passing by birds on the fairway and near to nesting and moulting sites

In general, the individual aquaculture facilities would need to establish their own regulations for boat routes and speed that take into consideration the geographical distribution of species around the facilities, as well as the different seasonal activities of those species (which may also change between years).⁵⁶⁰ Mapping and monitoring of seabirds, such as that already carried out for Nova Sea's existing facility at Skogsholmen, is an important tool for informing any mitigation measures.⁵⁶¹

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- considered as the most important wintering area for seabirds in the Nordic region
- The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature

⁵⁵⁹ Specific recommendations related to a range of species are provided in Follestad, A. (2014) *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie*. -NINA Rapport 1081: 37. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

⁵⁶⁰ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrif i Vegaøyane verdensarvområde*. NINA Rapport 1405 [online]: 4. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

⁵⁶¹ Tunheim, O.H. (2022) *Overvåking av sjøfugl for oppdrettslokalitet Skogsholmen* [unpublished report]. Åkerblå.

TABLE 4.4.5. Potential impacts on the World Heritage property of noise of the proposed aquaculture facilities

Element of the proposed projects:	NOISE
<p>The largest source of noise and vibrations at aquaculture facilities is usually associated with the generator contained within the feed barge and which constantly supplies the energy needs for the facility. Both aquaculture companies have stated that as an alternative, they are considering that the potential new facilities would be connected to an electricity cable that supplies energy from land, thereby largely removing that source of noise.</p> <p>Other noise disturbance is associated with working practices, for examples, aerators, feeders, pressure washers, communication between personnel across the facility, etc. Most of this noise disturbance occurs during working hours, which are approximately 8.00 to 18.00 each day.⁵⁶²</p> <p>These low frequency sounds from engines and generators can travel many kilometres and increase ambient noise levels over large sea areas.</p> <p>The more general noise disturbance related to boat traffic is dealt with in Table 4.4.4.</p> <p>Acoustic devices used as anti-predator measures are referred to in Table 4.4.11.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	MARINE HABITATS
<p>Sound can affect a range of species (see below), even causing animals to avoid noisy areas and move to less disturbed locations. This can impact on the quality of the habitat as a whole as the community changes.⁵⁶³</p>	
Attributes of the heritage place:	SPECIES
<p>There are major information gaps about the effects of sound, particularly the effect on animal populations in the wild and aquatic ecosystems. However, specialists are increasingly concerned about the effects of anthropogenic sounds upon aquatic animals, including fish.⁵⁶⁴</p> <p>Noise associated with routine aquaculture operations has not been shown to cause any injury to fish,⁵⁶⁵ although it might have an effect on fish behaviour. For example, Atlantic cod show a stress response to anthropogenic noise that can affect spawning performance.⁵⁶⁶ Other cases show that aquaculture noise might result in behavioural responses</p>	

⁵⁶² Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 18.

⁵⁶³ Olesiuk, P.F., Lawson, J.W. & Trippel, E.A. (2010) Pathways of effects of noise associated with aquaculture on natural marine ecosystems in Canada. *Canadian Science Advisory Secretariat Research Document 2010/025* [online]. Available from: <https://waves-vagues.dfo-mpo.gc.ca/Library/345630.pdf> Peng, C., Zhao, X. & Liu, G. (2015) Noise in the Sea and Its Impacts on Marine Organisms. *International Journal Environmental Research and Public Health* 12.10: 12304-23

⁵⁶⁴ Popper, A. N., & Hawkins, A. D. (2019) An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes. *Journal of Fish Biology* 94.5: 692–713.

⁵⁶⁵ Popper, A.N., Hawkins, A.D., Fay, R.R. et al. (2014) *Sound Exposure Guidelines for Fishes and Sea Turtles: a technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*. Springer: 50.

⁵⁶⁶ <https://www.sciencedirect.com/science/article/abs/pii/S0144860915000503>

in some species of fish, such as herring, that can disrupt normal life processes.⁵⁶⁷ These are likely to be localized impacts.

Marine mammals have been shown to be more negatively affected by marine noise, although the impacts may vary across species. Cetaceans are much more significantly affected when noise masks the sounds used to communicate forage or navigate and they may avoid noisy areas. However, seals can become habituated to continuous noise, possibly caused by hearing loss.⁵⁶⁸

Apart from studies on boat traffic (Table 4.4.4) there have been no specific studies on the effects of aquaculture-related disturbances on birds or marine mammals. With regard to other animals, including seabirds, there seems to be greater tolerance for constant background noise disturbance than for the perceived threat from sudden noises or the presence of humans or predators.⁵⁶⁹ However, there is research to show how a range of human activities can create disturbance and potentially change behaviour in water birds: more information is needed to identify the specific impacts on individual species.⁵⁷⁰

Attributes of the heritage place:

HUMAN SETTLEMENT

Distances in this seascape mean that any noise levels will be to some extent naturally mitigated. However, even when modest, industrial noise is in sharp contrast to the Vega Archipelago's sense of place and the soundscape associated with traditional resource use practices.

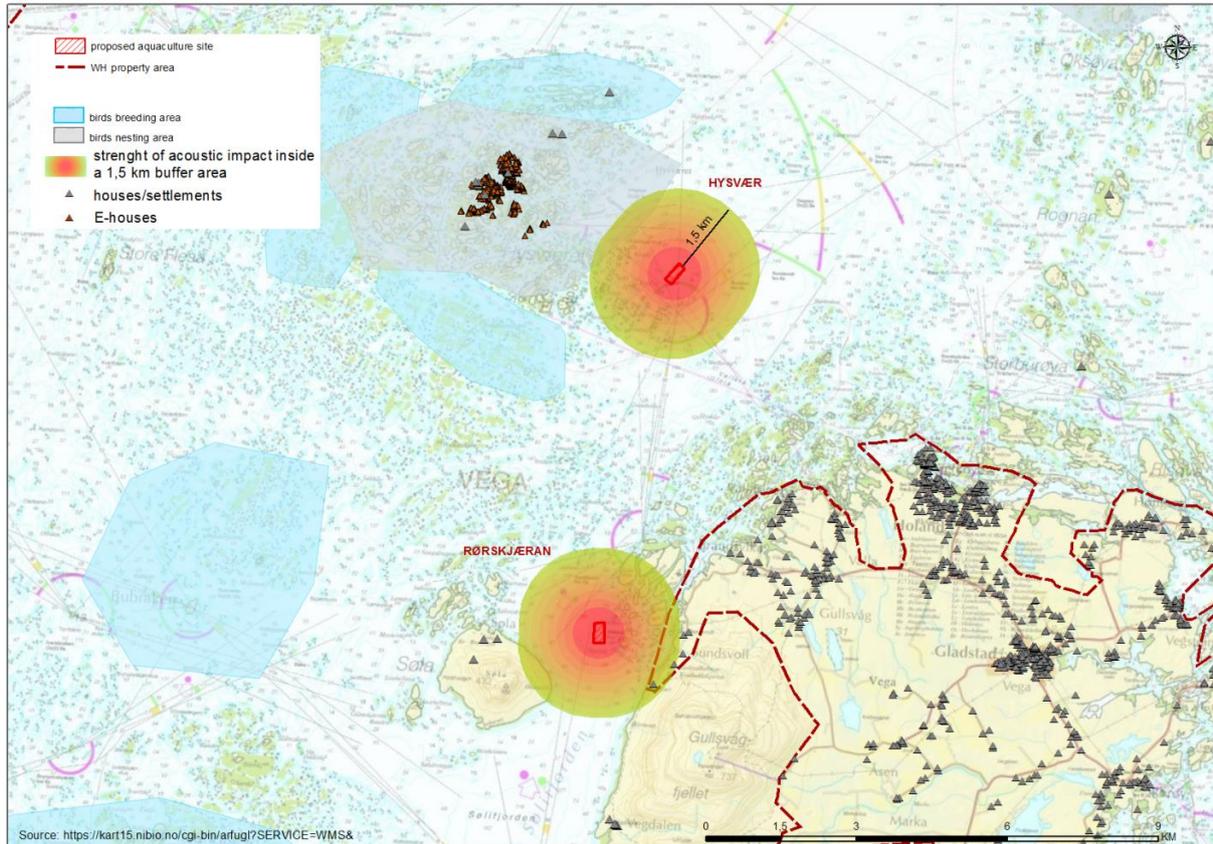
The ICOMOS / IUCN Advisory Mission noted that it might be possible to hear the Hysvær facility on the islands. Noise disturbance from the two facilities reaching the nearest dwellings on Hysvær or the Vegatrappa area, respectively, would be dependent on wind direction and lack of obstacles/natural windbreaks. Given the distance from a houses and settlements on the nearby islands, noise disturbance is only an issue for users of the fairways and potentially for people directly in front of the Rørskjæran site (see map below).

⁵⁶⁷ Olesiuk, P.F., Lawson, J.W. & Trippel, E.A. (2012) *Pathways of effects of noise associated with aquaculture on natural marine ecosystems in Canada. Research Document 2010/025*. Canadian Science Advisory Secretariat/Fisheries and Oceans Canada: 28.

⁵⁶⁸ Olesiuk, P.F., Lawson, J.W. & Trippel, E.A. (2012) *Pathways of effects of noise associated with aquaculture on natural marine ecosystems in Canada. Research Document 2010/025*. Canadian Science Advisory Secretariat/Fisheries and Oceans Canada.

⁵⁶⁹ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø – en litteraturstudie. NINA Rapport 1199* [online]: 13. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁵⁷⁰ Borgmann, K. (2011) *A review of human disturbance impacts on waterbirds* [unpublished report]. Audubon. Available from: <http://www.yourwetlands-org.aviandesign.net/pdf/A%20Review%20of%20Human%20Disturbance%20Impacts%20on%20Waterbirds.pdf>



Cumulative impact(s):

Noise from aquaculture would probably be localized and short-term, however, it would contribute to broader problems of increasing noise levels in the sea, in particular, background marine traffic noise.

These potential negative impacts may magnify the effects of other factors that are the context of the sharp decline in seabird populations and the disturbance caused by marine traffic (Table 4.4.4).

Potential mitigation measure(s):

It is recommended that the aquaculture companies use electricity supplied from land, reducing the noise/vibration levels associated with a generator. Other simple measures, such as turning off engines and machinery when not required, can reduce impacts. Feeders can emit food directly under water instead of through the air. In some cases, the transmission of noise from the facility to the water can be minimized by mounting equipment such as compressors and pressure-washers on rubber pads or tires. Greater attention to noise pollution should be paid at important periods for vulnerable species, e.g., breeding and moulting periods for eider.

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- bountiful nature
- rich maritime resources of the Vega Archipelago'

- considered as the most important wintering area for seabirds in the Nordic region
- The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature

TABLE 4.4.6. Potential impacts on the World Heritage property of artificial light from the proposed aquaculture facilities

Element of the proposed projects:	LIGHT
<p>Both facilities would need to install the required navigation markers, including lights, as required by the Norwegian Coastal Administration. These must be visible in daylight up to 2 nautical miles.</p> <p>Barges are usually particularly well lit, also for security reasons, although these details have not been confirmed.</p> <p>It is not clear if the facilities will use aquaculture lighting systems within the net pens in order to increase the rate of growth in the fish.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	MARINE HABITATS
<p>The use of lighting systems in net pens could have impacts. Light conditions are one of the dynamic features of habitats and disruptions to natural light regimes can significantly affect the composition of communities within an ecosystem. Artificial lighting can eliminate variations in light conditions and natural light patterns. Some studies show that light pollution can have an effect on aquatic habitats.⁵⁷¹</p>	
Attributes of the heritage place:	SPECIES
<p>The fact that aquaculture facilities often use artificial lighting systems within the net pens is an indication of how great an influence light can have on fish species. Research shows that there are a range of effects which can come from artificial light on fish, including impacts on migration and reproductive behaviour. However, this has not been quantified with regards to the lighting systems used at aquaculture facilities on wild fish.⁵⁷²</p> <p>There are no studies on the effect of aquaculture lighting on birds, however, research into the effects of artificial lighting on bird species in general clearly indicates a range of potential impacts, according to the species, the location and the season. This includes attraction to artificial lights, disorientation, behaviour changes, etc. It is recommended that protected areas with significant bird populations should be cautious with the use of lighting and mitigate appropriately until specific studies are completed.⁵⁷³</p> <p>Artificial lights are thought to be another potential attraction for plankton around aquaculture facilities.⁵⁷⁴</p>	

⁵⁷¹Follestad, A. (2014) *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie*. NINA Rapport 1081: 54. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

⁵⁷²Follestad, A. (2014) *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie*. NINA Rapport 1081: 52-54. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

⁵⁷³Follestad, A. (2014) *Effekter av kunstig nattbelysning på naturmangfoldet – en litteraturstudie*. NINA Rapport 1081: 40-47. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2388109>

⁵⁷⁴Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

Attributes of the heritage place:	HUMAN SETTLEMENT
<p>The artificial light emitted from the facilities will be visible in the two locations and would be dissonant with the sense of place of the cultural landscape. In the case of Hysvær seasonal residents on the outer islands will be impacted. In the case of Rørskjæran it could be detrimental to the atmosphere of the west coast of Vega island, particularly with regard to iconic moments enjoyed by both residents and visitors (see photo below for an example).⁵⁷⁵</p> 	
<p>Cumulative impact(s):</p>	
<p>These potential negative impacts may magnify the effects of other factors that are the context of the sharp decline in seabird populations.</p>	
<p>Potential mitigation measure(s):</p>	
<p>The facilities need to consider in each case when the use of light is necessary, what level of light is appropriate, if alternate colour lights can be used and if the light can be shielded to direct it only where needed.</p>	
<p>Heritage values associated with the impacted attributes:</p>	
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • bountiful nature • rich maritime resources of the Vega Archipelago' • considered as the most important wintering area for seabirds in the Nordic region • The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds • The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature • The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature 	

⁵⁷⁵ Image sourced from a visitor review at https://www.tripadvisor.com/Attraction_Review-g1504517-d17733658-Reviews-Vegatrappa-Vega_Nordland_Northern_Norway.html

TABLE 4.4.7 Potential impacts on the World Heritage property of discharge of organic waste of the proposed aquaculture facilities

Element of the proposed projects:	DISCHARGE OF ORGANIC WASTE
<p>Organic waste is produced by aquaculture facilities in terms of excess feed, fish excretion and fish excrement. Research commissioned, in part by Marine Harvest, has shown that organic waste can be found up to 100 m away from aquaculture net pens, even in areas with strong currents.⁵⁷⁶</p> <p>It is estimated that there would be approximately 800,000 salmon producing organic waste at the proposed facilities.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	HYDROGRAPHY / WATER QUALITY
<p>The discharge of large quantities of waste from the fish can lead to eutrophication. This is where high levels of organic nutrients and minerals in the water encourages rapid growth of micro-organisms and algae with a resultant lack of oxygen in the water.</p> <p>Suspended particles can increase the turbidity of the water column. Any algae blooms or similar phenomena caused by the high levels of organic nutrients and minerals in the water also results in a reduction of light (light attenuation).</p> <p>Fish faeces cause increases in ammonium, nitrogen and phosphate, this can lead to phosphate concentrations doubling or quadrupling within water column. Decomposition of organic matter can lead to increased levels of hydrogen sulphide.⁵⁷⁷</p>	
Attributes of the heritage place:	MARINE HABITATS
<p>The discharge of large quantities of waste from the fish can lead to eutrophication. This is where high levels of organic nutrients and minerals in the water encourages rapid growth of micro-organisms and algae. The resultant lack of oxygen in the water causes animals and other organisms dependent on oxygen to leave the area. It also results in a reduction of light (light attenuation), which affects plants and other organisms that dependent on photosynthesis, potentially causing them to die off.</p> <p>Depending on the currents within the water column, there can be accumulation of organic waste under or near to aquaculture facilities. This can bury areas of the sea floor, with a potential fragmentation of habitats.</p> <p>All of this can lead to significant changes in the benthic communities living on the sea floor within a marine habitat, reducing biodiversity.⁵⁷⁸</p>	

⁵⁷⁶ Haskoning UK Ltd (2006) *Investigation into the impact of marine fish farm deposition on maerl beds. Scottish Natural Heritage Commissioned Report 213*. Available from: <https://pearl.plymouth.ac.uk/bitstream/handle/10026.1/1425/Hall-Spencer%20%26%20White%202007.pdf?sequence=2&isAllowed=y>

⁵⁷⁷ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 10.

⁵⁷⁸ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 17.

Kelp forests: increased nutrients can fertilize kelp and encourage its growth. However, it has been found that these positive results vary according to depth and season, with poor growth in summer and biofouling.⁵⁷⁹ When organic waste leads to reduced light conditions, it has shown that this can limit the depth to which kelp can grow. When kelp forests are exposed to high levels of nutrients in the long term, it can lead to the kelp being replaced by opportunistic species. When there is a build up of sediment on the sea floor, this can prevent new kelp plants from growing.⁵⁸⁰

Maerl beds: maerl beds are red algal coralline gravels and are highly susceptible to the effects of organic waste from aquaculture. Where organic waste builds up over maerl it has been shown to cause the areas of maerl to die.⁵⁸¹ This was even the case in locations with strong currents. It is difficult for such a slow-growing habitat to recover, even if an aquaculture site is left fallow for a period. The community dependent on the maerl can change as a result: biodiversity significantly reduces at the location, for example, small crustaceans have been found to be particularly affected. Instead, scavenging fauna and specific tolerant of organic increases are attracted.⁵⁸²

Deep trenches: there are defined areas of the sea within the Vega Archipelago that are significantly deeper than the surrounding, generally shallow sea floor. These have the potential to become areas where greater amounts of organic waste settle and accumulate, although currents within the water column will affect the extent to which this happens.

Eelgrass meadows: Eutrophication from aquaculture, leading to light attenuation, has been found to reduce eelgrass growth and a related low abundance of macrofaunal assemblage.⁵⁸³ However, the partial mapping of the eelgrass in the Vega Archipelago, suggests that distance from the proposed aquaculture facilities is sufficiently great to not have an impact.

Details specific to Hysvær: due to the lack of detailed habitat mapping, it is difficult to predict the precise interactions that the proposed facility would have. However, there are concerns that the organic waste from the proposed aquaculture facility at Hysvær would have both potential positive and negative impacts on the kelp; and a potential negative impact if accumulating in the neighbouring deep trench.

Details specific to Rørskjæran: due to the lack of detailed habitat mapping, it is difficult to predict the precise interactions that the proposed facility would have. However, there are concerns that the organic waste from the proposed aquaculture facility at Rørskjæran would have a potential negative impact on any nearby maerl beds; and a potential negative impact if accumulating in the neighbouring deep trench.

Attributes of the heritage place:	SPECIES
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The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It is presumed this is due to the supply of waste feed that falls from the net pens. Some studies have suggested that the fish attracted to the waste feed can benefit from additional food source, which may increase growth, thereby triggering early maturation. This may influence spawning and migrations, with the risk of spawning occurring at sub-optimal locations. It is also possible that the biochemical composition of the aquaculture

⁵⁷⁹ Handå, A., Forbord, S., Wang, X. *et al.* (2013) Seasonal- and depth-dependent growth of cultivated kelp (*Saccharina latissima*) in close proximity to salmon (*Salmo salar*) aquaculture in Norway. *Aquaculture* 414-415: 191-201.

⁵⁸⁰ Husa, V., Kutti, T., Grefsrud, E.S. *et al.* (2016) *Effekter av utslipp fra akvakultur på spesielle marine naturtyper, rødlista habitat og arter* [online]. Havforskningsinstituttet: 12-13. Available from: <https://imr.brage.unit.no/imr-xmlui/handle/11250/2408850>

⁵⁸¹ Wilson, S. Blake, C. *et al.* (2004) Environmental tolerances of free-living coralline algae (maerl): implications for European marine conservation. *Biological Conservation* 120.2: 279-289.

⁵⁸² Hall-Spencer, J., White, N., Gillespie, E. *et al.* (2006) Impact of fish farms on maerl beds in strongly tidal areas. *Marine Ecology Progress Series* 326: 1-9.

⁵⁸³ Baden, S., Stein, F., Hartvig, C. *Et al.* (2022) Effects on depth and overgrowth of ephemeral macroalgae on a remote subtidal NE Atlantic eelgrass (*Zostera marina*) community. *Marine Pollution Bulletin* 177: 113497. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2987355>

feed affects the wild fish who eat it, such as reducing the viability of offspring. There is some evidence to suggest that saithe, in particular, are of much poorer quality when they eat a lot of waste feed.⁵⁸⁴

Small crustaceans have been found to be particularly affected when the sea floor is smothered in organic waste, with significant reductions in the local area.⁵⁸⁵ This may affect eider ducks foraging near to aquaculture, as their feeding grounds might be impacted.⁵⁸⁶

Attributes of the heritage place:

FISHING TRADITIONS

There may be indirect impacts on wild fish populations if those habitats, which serve as spawning and nursery areas are significantly affected.

Cumulative impact(s):

The discharges from the proposed new facilities should be seen in the wider context of the emissions of organic waste from the existing aquaculture facilities that are located along the coast. Existing aquaculture facilities are the second largest source of the overall and continuous increase in nitrogen and phosphorus found in the coastal waters of Nordland.⁵⁸⁷ Monitoring of the existing aquaculture situation throughout the county, show that there was an increase in both nitrogen and phosphorus from aquaculture in Nordland County in 2020.⁵⁸⁸ In 2019 there were significant algal blooms in the counties of Nordland and Troms that deteriorated environmental conditions to such an extent that 8 million farmed fish died.⁵⁸⁹ It has been found that the decline in the population of coastal cod magnifies the effects of eutrophication on coastal ecosystems.⁵⁹⁰

Climate change: a range of factors related to climate change are already placing coastal ecosystems under pressure⁵⁹¹ and affecting the processes within specific habitats e.g., shifts in spawning grounds.⁵⁹² Specifically in relation to organic discharges from aquaculture, more regular and stronger storm events cause the re-suspension of sediments, thereby accelerating oxygen consumption and nutrient loading.⁵⁹³ Increased sea temperatures favour more algal blooms.

⁵⁸⁴ Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁵⁸⁵ Hall-Spencer, J., White, N., Gillespie, E. *et al.* (2006) Impact of fish farms on maerl beds in strongly tidal areas. *Marine Ecology Progress Series* 326: 1-9.

⁵⁸⁶ Follestad, A. (2015) *Effekter av forstyrrelser på fugl og pattedyr fra akvakulturanlegg i sjø - en litteraturstudie*. NINA Rapport 1199 [online]: 25. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2366308>

⁵⁸⁷ Guerrero, J-L. & Sample, J.E. (2021) *Kildefordelte tilførsler av nitrogen og fosfor til norske kystområder i 2019*. NIVA rapport 7729 [online]: 72-75. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2985724>

⁵⁸⁸ Guerrero, J-L. & Sample, J.E. (2021) *Kildefordelte tilførsler av nitrogen og fosfor til norske kystområder i 2019*. NIVA rapport 7729 [online]. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2985724>

⁵⁸⁹ Sommerset I, Walde C S, Bang Jensen B, Bornø B, Haukaas A & Brun E (eds) (2020) *Fiskehelse rapporten 2019* [online]. Veterinærinstituttet. Available from: <https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2020/fiskehelse rapporten-2019>

⁵⁹⁰ Baden, S., Stein, F., Hartvig, C. *Et al.* (2022) Effects on depth and overgrowth of ephemeral macroalgae on a remote subtidal NE Atlantic eelgrass (*Zostera marina*) community. *Marine Pollution Bulletin* 177: 113497. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2987355>

⁵⁹¹ Węśławski, J., Kendall, M., Włodarska-Kowalczyk, M. *et al.* (2011) Climate change effects on Arctic fjord and coastal macrobenthic diversity—observations and predictions. *Marine Biodiversity* 41: 71–85. Available from: <https://link.springer.com/article/10.1007%2Fs12526-010-0073-9>

⁵⁹² Langangen, Ø., Färber, L., Stige, L.C., Diekert, F.K., Barth J.M.I., Matschiner, M., Berg, P.R., Star, B., Stenseth, N.C., Jentoft, S., & Durant, J.M. (2019) Ticket to spawn: Combining economic and genetic data to evaluate the effect of climate and demographic structure on spawning distribution in Atlantic cod. *Global Change Biology* 25: 134-143.

⁵⁹³ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 29.

Kelp forests and eelgrass meadows: reduced light penetration has been seen along the Norwegian coast for a long time, which limits the depth at which kelp and eelgrass can grow, and therefore reduces the areas available for these habitats.⁵⁹⁴ Destructive fishing practices can also cause damage.

Maerl beds: the maerl are at risk from other sources of sediment smothering, including that produced by trawling and from sewage discharges. As the maerl beds in Norway are not yet mapped, there are no current strategies to protect them.⁵⁹⁵

Deep trenches: although investigations have yet to be carried out, these are likely to be areas of natural accumulation of organic matter (e.g., detached kelp fronds and other dead biomass). This might mean that these areas already have existing high levels of organic load.

Species: these potential negative impacts may magnify the effects of other factors that are the context of the sharp decline in some fish and seabird populations.

Details specific to Rørskjæran: the C-survey carried out for the proposed facility for Rørskjæran revealed high organic content already. In particular, there are preconditions for organic waste overloading the adjacent trench and depleting oxygen there.

Potential mitigation measure(s):

Many mitigation measures require accurate mapping of habitats to inform them, so it is vital that this is completed for the Vega Archipelago's marine habitats, in particular, maerl. Aquaculture facilities proposed for locations near to presumed maerl beds should not be permitted until their absence is demonstrated.

Planning for new aquaculture facilities should include the identification of their potential area of influence before positioning them. This is not just the area immediately under the facility but will require a knowledge of currents throughout the water column in different seasons, the dispersion of organic material, areas of likely deposition of organic material (including natural accumulation), and sensitive species/habitats.⁵⁹⁶

The results of habitat mapping and identification of areas of influence will allow decisions to be made regarding suitable locations for aquaculture:

- facilities should not be positioned where they can negatively impact maerl
- it would be advisable to not position them where organic sediment could smother areas where kelp is beginning to recover
- established kelp areas should not be exposed to organic waste over long-term periods to reduce the risk of being replaced by opportunistic species
- avoiding aquaculture near to kelp, eelgrass and other habitats which function as nursery areas for fish stocks should be considered, as occurs in other countries.⁵⁹⁷

⁵⁹⁴ Klima- og miljødepartementet (2020) *Meld. St. 20 (2019–2020) Helhetlige forvaltningsplaner for de norske havområdene — Barentshavet og havområdene utenfor Lofoten, Norskehavet, og Nordsjøen og Skagerrak* [online]: 51. Available from: <https://www.regjeringen.no/no/dokumenter/meld.-st.-20-20192020/id2699370/>

⁵⁹⁵ Wilson, S. Blake, C. *et al* (2004) Environmental tolerances of free-living coralline algae (maerl): implications for European marine conservation. *Biological Conservation* 120.2: 279-289.

⁵⁹⁶ Bannister, R.J., Valdemarsen, T., Hansen, P.K., Holmer, M. & Ervik, A. (2014) Changes in benthic sediment conditions under an Atlantic salmon farm at a deep, well-flushed coastal site. *Aquaculture Environmental Interactions* 5: 29-47. Available from: [.brage.unit.no/imr-xmlui/handle/11250/282960](https://brage.unit.no/imr-xmlui/handle/11250/282960) and Bannister, R.J., Johnsen, I.A., Hansen, P.K., Kutti, T. & Asplin, L. (2016) Near-

and far-field dispersal modelling of organic waste from Atlantic salmon aquaculture in fjord systems, *ICES Journal of Marine Science* 73.9: 2408–2419. Available from: <https://doi.org/10.1093/icesjms/fsw027>

⁵⁹⁷ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 26.

Fallowing of aquaculture facilities to allow the immediate environment to recover is already regular practice and this should continue, although it is not a suitable mitigation measure where maerl is affected, as regrowth is so slow.⁵⁹⁸

Multi-trophic aquaculture might be used to recycle the organic waste from salmon farming to the benefit of kelp or other species; however, this would require careful studies of seasonal variations in order to ensure its efficacy.⁵⁹⁹

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- bountiful nature
- rich maritime resources of the Vega Archipelago'
- considered as the most important wintering area for seabirds in the Nordic region
- The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The rich maritime resources of the Vega Archipelago... benefited local peoples'
- 'fishermen/farmers have, over the past 1,500 years, maintained a sustainable living'

Other heritage values:

- The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe

⁵⁹⁸ Hall-Spencer, J., White, N., Gillespie, E. *et al.* (2006) Impact of fish farms on maerl beds in strongly tidal areas. *Marine Ecology Progress Series* 326: 1-9.

⁵⁹⁹ Reitan, K.I. (2013) Seasonal- and depth-dependent growth of cultivated kelp (*Saccharina latissima*) in close proximity to salmon (*Salmo salar*) aquaculture in Norway. *Aquaculture* 414-415: 191-201.

TABLE 4.4.8 Potential impacts on the World Heritage property of discharge of chemicals of the proposed aquaculture facilities

Element of the proposed projects:	DISCHARGE OF CHEMICALS
<p>Lice treatments are the most common type of chemicals used at aquaculture facilities. The chemical treatments can be added directly to the net pens or to the fish temporarily transferred to a pen within a well boat for bathing; in both cases the chemicals end up released into the sea. Oral treatments may disperse into the sea through feed and excrement. The industry as a whole is making efforts to reduce chemical treatments. However, Mowi estimates that a third of lice outbreaks requiring treatment use chemical solutions.⁶⁰⁰ Nova Sea and Vega Sjøfarm report that in recent years they have only used azamethiphos and emamectin; at the comparable Skogsholmen facility they have not used bathing treatments but emamectin has been used twice in recent years (2014 and 2020).⁶⁰¹</p> <p>Detergents and disinfectants are used to maintain hygiene standards at aquaculture facilities and lower the risk of disease outbreaks. They are toxic to the environment, although they enter the marine environment in diluted forms. For example, at the comparable Nova Sea Skogsholmen facility, EnduroSuper and ADDI Aqua are currently in use, although there are plans to shift to LifeClean.⁶⁰²</p> <p>Other chemicals may enter the sea from the facility through discharge of greywater from the barge from, for example, showers and handwashing.⁶⁰³</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	HYDROGRAPHY / WATER QUALITY
<p>Although there would be an increased presence of chemicals in water directly under and around the aquaculture facilities, there has been no research to understand if normal use of such chemicals would have an effect on water quality. Any such research would need to be specific to the individual products being used, their level of dilution, persistence and solubility in water and the marine currents.</p>	
Attributes of the heritage place:	MARINE HABITATS
<p>Residues of lice treatments have been found to be more widely distributed in the benthic (seafloor) environment than previously thought and remain longer than expected after cessation of use. They can affect the abundance, diversity and community structure of benthic ecology.⁶⁰⁴</p>	

⁶⁰⁰ Mowi (2021) *Salmon Farming Industry Handbook*. Mowi: 33.

⁶⁰¹ Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 12.

⁶⁰² Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 13.

⁶⁰³ Nova Sea (2022) *Svarfra Nova Sea, verdensarv feedback* [unpublished communication].

⁶⁰⁴ E.g., Bloodworth, J.W., Baptie, M.C., Preedy, K.F. & Best, J. (2019) Negative effects of the sea lice therapeutant emamectin benzoate at low concentrations on benthic communities around Scottish fish farms. *Science of the Total Environment* 669: 91-102.

Specifically, sea lice chemicals are known to be a considerable risk to maerl and the subsequent recovery time for maerl beds can be long.⁶⁰⁵

Details specific to Rørskjæran: although complete mapping of habitats remains to be completed, there seems to be the presence of maerl beds within 1 km distance of the proposed aquaculture location which might be affected.

Attributes of the heritage place:	SPECIES
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Sea lice treatments, including baths, may affect a range of non-target species. Crustaceans are particularly vulnerable to sea lice chemicals, with their abundance and richness has been found to be affected. Beyond 'no effect concentrations', shrimp in particular are likely to die.⁶⁰⁶ Such treatments have also been found to be deadly for lobster and crayfish larvae, etc., and can be a significant risk.⁶⁰⁷

As a result of the direct impacts on crustaceans, there may be indirect impacts on those predators who eat crustaceans and would find reduced food available locally. For example, shrimp are one of the preferred foods of cod and eider ducks mostly eat molluscs and crustaceans. However, these connections are poorly understood.⁶⁰⁸

Details specific to Hysvær: there is a shrimp field at a distance of 250 m from the proposed location of the aquaculture facility with the potential for shrimp to be affected by sea lice chemicals

Attributes of the heritage place:	FISHING TRADITIONS
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Details specific to Hysvær: it is noted in particular that the proposed facility for Hysvær is directly adjacent to a registered shrimp field, at a distance of 250 m, meaning that shrimp fishing might be affected by chemical sea lice treatments.

Lobster catches might be negatively affected if larvae mortality increases due to chemical treatments.

Cod might shift feeding grounds if preferred food sources, e.g., shrimp, are reduced in number.

Cumulative impact(s):

Large areas of the sea at Vega already have poor chemical standards (section 2.2.3), the various additions from the aquaculture facilities would contribute to this overall picture.

Many of the species that are affected directly or indirectly are already facing other pressures, including climate change, population declines, etc.

⁶⁰⁵ E.g., Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 8; Legrand, E., Parsons, A.E., Escobar-Lux, R.H. *et al.* (2022) Effect of sea lice chemotherapeutant hydrogen peroxide on the photosynthetic characteristics and bleaching of the coralline alga *Lithothamnion soriferum*. *Aquatic Toxicology* 247.

⁶⁰⁶ E.g., Frantzen, M., Bytingsvik, J., Tassara, L. *Et al.* (2020) Effects of the sea lice bath treatment pharmaceuticals hydrogen peroxide, azamethiphos and deltamethrin on egg-carrying shrimp (*Pandalus borealis*). *Marine Environmental Research* 159.

⁶⁰⁷ E.g., Parsons, A.E., Escobar-Lux, R.H., Sævik, P.N. *et al.* (2020) The impact of anti-sea lice pesticides, azamethiphos and deltamethrin, on European lobster (*Homarus gammarus*) larvae in the Norwegian marine environment. *Environmental Pollution* 264.

⁶⁰⁸ Appendix 2: Hinderaker, S.E. & Nielsen, A. (2022) *Current Status of Important Nature Values in the Vega Archipelago*. NIBIO: 13.

The potential reduction of crustaceans as a food source for eider ducks and other species, should also be seen in the context of a significant reduction in mussels along the Norwegian coast, which is the other preferred food of eiders.⁶⁰⁹

Previous research has explored acidification's effects on molluscs and crustaceans, such as mussels and crabs, which struggle to build shells following ocean acidification.⁶¹⁰

Potential mitigation measure(s):

Sea lice chemical treatments should be reduced, particularly during the spring/summer period when many crustacean species.

Alternatives should be sought in order to avoid their dispersal into the sea. However, it is noted that a recent report by the Norwegian Veterinary Institute expressed serious concerns about the alternatives and it might not be easy to find appropriate mitigation measures.⁶¹¹

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- bountiful nature
- rich maritime resources of the Vega Archipelago'
- considered as the most important wintering area for seabirds in the Nordic region
- The rich maritime resources of the Vega Archipelago... benefited... as many as 228 species of birds
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The rich maritime resources of the Vega Archipelago... benefited local peoples
- fishermen/farmers have, over the past 1,500 years, maintained a sustainable living

Other heritage values:

- The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe

⁶⁰⁹ Andersen, S., Grefsrud, E.S., Mortensen, S., Naustvoll, L.J., Strand, Ø., Strohmeier, T. & Sælemyr, L. (2017) *Meldinger om blåskjell som er forsvunnet – oppsummering for 2016. Rapport fra Havforskningen 4-2017.*

⁶¹⁰ Heinrich, L. & Krause, T. (2016) Fishing in acid waters – a vulnerability assessment of the Norwegian fishing industry in the face of increasing ocean acidification. *Integrated Environmental Assessment and Management.*

⁶¹¹ Sommerset, I., Walde, C.S., Jensen, B.B. et al. (eds) (2022) *Fiskehelse rapporten 2021* [online]. Veterinærinstituttets årlige oversikt over fiskehelsen i Norge. <https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2022/fiskehelse rapporten-2021t>

TABLE 4.4.9 Potential impacts on the World Heritage property of release of heavy metals into water from antifoulants of the proposed aquaculture facilities

Element of the proposed projects:	RELEASE OF HEAVY METALS INTO WATER FROM ANTIFOULANTS
<p>The nets at aquaculture facilities are coated in antifoulants to reduce fouling, which is the growth of organisms on underwater elements of the facility. To minimise the biofouling growth nets are usually coated with a biocide, mainly copper, sometimes with the addition of copper pyrithione, zinc pyrithione or tralopyril. These antifoulants can disperse into the sea over time, although this can be speeded up when then nets are cleaned: it has been estimated that up to 30% of the coatings are removed from nets during the first time they are cleaned with pressure-washing.⁶¹²</p> <p>The Norwegian Environment Agency assumes that 85% of the copper is lost to the environment.⁶¹³ Copper can be found in high concentrations on the seabed under and around aquaculture facilities depending on sedimentation rates and water currents.⁶¹⁴</p> <p><i>Details specific to Rørskjæran:</i> It is noted that Mowi reports recent research into alternative antifoulants but these have not yet been developed.⁶¹⁵</p> <p><i>Details specific to Hysvær:</i> Nova Sea does not used nets with copper at its existing facility at Skogsholmen and it is understood that it does not intend to do so at Hysvær.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	HYDROGRAPHY / WATER QUALITY
<p>There is no monitoring of copper in the water column related to specific aquaculture facilities, so there is insufficient data to assess potential impacts on water quality.⁶¹⁶</p>	
Attributes of the heritage place:	MARINE HABITATS
<p>The latest risk report for Norwegian aquaculture by the Institute of Marine Research concluded that in the Helgeland to Bodø production area (in which the Vega Archipelago is located) that there is an overall low risk of</p>	

⁶¹² Bloecher, N. & Floerl, O. (2020) Towards cost-effective biofouling management in aquaculture: a strategic outlook. *Reviews in Aquaculture* 13.2: 783-795. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1111/raq.12498#raq12498-bib-0019>

⁶¹³ Skarbøvik, E., Allan, I., Sample, J.E. et al. (2016) *Elvetilførsler og direkte tilførsler til norske kystområder*. NIVA Report 7217 [online]: 23. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2492428>

⁶¹⁴ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. et al. (eds) *Risikorapport norsk fiskeoppdrett 2022 - risikovurdering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2022-12>

⁶¹⁵ Mowi (2021) *Salmon Farming Industry Handbook*. Mowi.

⁶¹⁶ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. et al. (eds) *Risikorapport norsk fiskeoppdrett 2022 - risikovurdering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2022-12>

environmental effects from copper emissions.⁶¹⁷ However, it is acknowledged that copper in the water (which is not currently measured) can reduce the fertility and growth of kelp.⁶¹⁸

Attributes of the heritage place:	SPECIES
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Copper can be toxic to different organisms and when it accumulates in the environment it can reduce species diversity. There is a lack of knowledge on forms of copper in the sediment and on toxicity data for several species living in the sediment under fish farms.⁶¹⁹

Exposure to low concentrations of copper can have health impacts in fish⁶²⁰ and other marine species, including invertebrates, such as mussels and sea urchins.⁶²¹ It is therefore a potential risk to marine species in the vicinity of the aquaculture facilities, in particular the shrimp fishery that is directly adjacent to the Hysvær site.

Attributes of the heritage place:	FISHING TRADITIONS
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It is noted that the levels of copper found within fish and other harvested species do not exceed health and safety limits, so do not affect fishing activities.

Cumulative impact(s):

Increases in copper in Norwegian coastal waters have been estimated to increased proportionately to the number of aquaculture facilities present.⁶²² It was estimated that 1,251 tonnes of copper were added to Norwegian coastal waters in 2016 alone,⁶²³ of which 442 tonnes of copper were discharged along the coast of the Norwegian Sea, i.e., the coast on which the Vega Archipelago is found.⁶²⁴

This should also be seen in the larger context of the Vega Archipelago's sea waters failing to meet Water Directive standards with regards to the chemical conditions.⁶²⁵

⁶¹⁷ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. et al. (eds) *Risikoreport norsk fiskeoppdrett 2022 - risikovurdering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2022-12>

⁶¹⁸ Husa, V., Kutti, T., Grefsrud, E.S. et al. (2016) *Effekter av utslipp fra akvakultur på spesielle marine naturtyper, rødlista habitat og arter* [online]. Havforskningsinstituttet: 12-13. Available from: <https://imr.brage.unit.no/imr-xmlui/handle/11250/2408850>

⁶¹⁹ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. et al. (eds) *Risikoreport norsk fiskeoppdrett 2022 - risikovurdering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2022-12>

⁶²⁰ Azizishirazi, A., Dew, W.A., Bougas, B., Bernatchez, L. & Pyle, G.G. (2015) Dietary sodium protects fish against copper-induced olfactory impairment. *Aquatic Toxicology* 161: 1-9; Borg, D.A. & Trombetta, L.D. (2010) Toxicity and bioaccumulation of the booster biocide copper pyrithione, copper 2-pyridinethiol-1-oxide, in gill tissues of *Salvelinus fontinalis* (brook trout). *Toxicology and Industrial Health* 26: 139–150.

⁶²¹ Oliveira, I.B., Beiras, R., Thomas, K.V. et al. (2014) Acute toxicity of tralopyril, capsaicin and triphenylborane pyridine to marine invertebrates. *Ecotoxicology* 23: 1336–1344; Oliveira, I.B., Groh, K.J., Stadnicka-Michalak, J. et al. (2016) Tralopyril bioconcentration and effects on the gill proteome of the Mediterranean mussel *Mytilus galloprovincialis*. *Aquatic Toxicology* 177: 198-210.

⁶²² Skarbøvik, E., Allan, I., Sample, J.E. et al. (2016) *Elvetilførsler og direkte tilførsler til norske kystområder. NIVA Report 7217* [online]: 45. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2492428>

⁶²³ Skarbøvik, E., Allan, I., Sample, J.E. et al. (2016) *Elvetilførsler og direkte tilførsler til norske kystområder. NIVA Report 7217* [online]: 78. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2492428>

⁶²⁴ Skarbøvik, E., Allan, I., Sample, J.E. et al. (2016) *Elvetilførsler og direkte tilførsler til norske kystområder. NIVA Report 7217* [online]: 201. Available from: <https://niva.brage.unit.no/niva-xmlui/handle/11250/2492428>

⁶²⁵ Kartverket (no date) *NVE Temakart* [online]. Available from: https://temakart.nve.no/link/?link=tilstand_biologiske_kvalitetselement

Potential mitigation measure(s):

Climate change is causing greater biofouling and therefore its management with antifoulants cannot be stopped.⁶²⁶ Mowi reports research into alternatives to current antifoulants but these are not yet available.⁶²⁷ It is therefore considered that there are no current mitigation measures available.

Copper levels in the water column – not just in sea floor sediments – could be monitored with C-surveys.

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- The area as a whole is representative of settlements on the strandflat
- ... diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape
- ... bountiful nature
- The rich maritime resources of the Vega Archipelago not only benefited local peoples, but also as many as 228 species of birds
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The cultural landscape of the Vega Archipelago continues to be managed in a traditional manner, using time-honoured management techniques
- ... a distinctive way of life centred around the sustainable use of natural resources, including fishing, farming and eider down harvesting
- The rich maritime resources of the Vega Archipelago... benefited local peoples
- fishermen/farmers have, over the past 1,500 years, maintained a sustainable living

Other heritage values:

- The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe

⁶²⁶ Dobretsov, S., Coutinho, R., Rittschof, D., Salta, M., Ragazzola, F. & Hellio, C. (2019) The oceans are changing: impact of ocean warming and acidification on biofouling communities. *Biofouling* 35.5: 585-595.

⁶²⁷ Mowi (2021) *Integrated Annual Report 2021* [online]. Available from: <https://mowi.com/blog/mowi-annual-report-2021/>

TABLE 4.4.10 Potential impacts on the World Heritage property of production of non-fish waste of the proposed aquaculture facilities

Element of the proposed projects:	PRODUCTION OF NON-FISH WASTE
<p>Aquaculture facilities can generate a range of non-fish waste products, including feed bags; harvest plastics; chemical containers; fish mortalities and ensiling; cages, tanks and redundant equipment; cage nets; wooden pallets; handling materials and wastes. Cutting ropes from abutment and repairs on board, as well as grid cuts have been identified as significant sources of plastic emissions from aquaculture.⁶²⁸</p> <p>In addition, it has been found that plastic element of the facility, such as feed pipes, can be a significant source of microplastics. Traces of microplastics have been found on the gills of farmed fish and in sediment and water samples near aquaculture facilities.⁶²⁹</p>	
Attributes of the heritage place:	WATER QUALITY
<p>On the basis of monitoring of macroplastics from aquaculture, it is likely that some elements may be lost into the sea, although this will be reduced thanks to the waste disposal policies of each aquaculture company.</p> <p>Estimates for microplastic emissions from aquaculture vary: the discharge of microplastics from feed pipes in Norwegian salmon aquaculture is between 10-100 tonnes annually.⁶³⁰ The individual contribution of each aquaculture facility would be a proportion of this.</p>	
Attributes of the heritage place:	SPECIES
<p>Concerns about the effect of microplastics on the marine environment and their distribution through food chains are increasing. With regard to Vega, it has been suggested that nano- and microplastics might travel, for example, from plankton to mussels to eider ducks.⁶³¹</p>	
Potential mitigation measure(s):	
<p>Waste disposal policies need to be adhered to.</p>	

⁶²⁸ Johnsen, H.R., Haarr, M.L., Roland, A.O. *et al.* (2019) *Sluttrapport HAVPLAST – Kartlegging av marin plast fra norsk sjømatnæring – SALT rapport 1040* [online]. SALT Lofoten AS. Available from: <https://www.nordlandsforskning.no/nb/publikasjoner/report/sluttrapport-havplast-marin-plast-fra-norsk-sjomatnaering-kartlegging>

⁶²⁹ Gomiero, A., Haave, M., Kögel, T., *et al.* (2020). Tracking of plastic emissions from aquaculture industry. NORCE Report 4/2020. Available from: <https://norceresearch.brage.unit.no/norceresearch-xmlui/bitstream/handle/11250/2649891/Rapport%20NORCE%20milj%C3%B8%204-2020.pdf?sequence=4>

⁶³⁰ Bay-Larsen, I.A., Vangelsten, B.V., Nogueira, L.A. *et al.* (2019) *Sluttrapport HAVPLAST – Marin plast fra norsk sjømatnæring – kartlegging, kvantifisering og handling* [online]: 22. Available from: <https://www.nordlandsforskning.no/nb/publikasjoner/report/sluttrapport-havplast-marin-plast-fra-norsk-sjomatnaering-kartlegging>

⁶³¹ Follestad, A., Moe, B. & Thomassen, J. (2017) *Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ær-fugl og ærfugldrif i Vegaøyan verdensarvområde. NINA Rapport 1405* [online]: 70. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

Velcro can be used to hang nets, avoiding the need for ropes where possible.

Feed pipes need to be regularly replaced when showing signs of wear to minimize microplastic emissions. Water feeding can reduce the wear.

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- ... bountiful nature
- The rich maritime resources of the Vega Archipelago not only benefited local peoples, but also as many as 228 species of birds
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature

Other heritage values:

- The clear water, exposed location and strong currents mean that the lushness and diversity of the aquatic environment differ from the other areas of shallow water in Europe

TABLE 4.4.11 Potential impacts on the World Heritage property of interaction with predators of the proposed aquaculture facilities

Element of the proposed projects:	INTERACTION WITH PREDATORS
<p>Scavenging and predatory species can be attracted by the high density of fish to be found at aquaculture facilities. It has been estimated that in comparable contexts 60-90% of aquaculture facilities have bird-related problems (e.g. cormorants, herons and shags; in some cases gulls), and 80% have also been attacked by seals.⁶³² Aquaculture may be more attractive to predators in the context of declining wild fish stocks.</p> <p>Predator management range from lethal to non-lethal techniques (e.g., acoustic devices and anti-predator nets). Even when non-lethal techniques are employed, birds and mammals can be killed during their interactions with fish farms, in particular, by becoming entangled in nets.</p> <p>The impact assessment that formed part of the Helgeland Coastal Plan noted a potential risk to seabirds from interactions with aquaculture facilities. The assessment notes the potential for birds to be caught in the nets which enclose the top/sides of the net pens to stop birds from preying on the farmed fish. They also note that sometimes birds are shot to reduce predation.⁶³³</p> <p>Nova Sea reports that it does not currently use any scaring devices at its existing facilities,⁶³⁴ although in the past they used measures such as propane cannons (birds), power wire (otters), seal screams (high-frequency sound), lighting systems (birds) and top nets in various dimensions (birds).⁶³⁵</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	SPECIES
<p>The impact assessment that formed part of the Helgeland Coastal Plan concluded that only gulls would be potentially impacted, at a low level, by aquaculture.⁶³⁶</p> <p>The comparable situation at the Nova Sea facility at Skogsholmen has recorded 7 dead cormorants caught in its nets since 2019.⁶³⁷</p>	

⁶³² Beveridge, M.C.M. (2001) Aquaculture and wildlife interactions. In: Uriarte, A. & Basurco, B. (eds) *Environmental Impact Assessment of Mediterranean Aquaculture Farms*. CIHEAM: 57-66. Available from: <http://om.ciheam.org/om/pdf/c55/01600220.pdf>

⁶³³ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 23*

⁶³⁴ Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 25.

⁶³⁵ Follstad, A., Moe, B. & Thomassen, J. 2017. Sammenstilling av eksisterende kunnskap om påvirkningsfaktorer og effekter på ærfugl og ærfugldrif i Vegaøyan verdensarvområde. NINA Rapport 1405 [online]: 79. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2472642>

⁶³⁶ Sør-Helgeland Regionråd (2019) *Kystplan Helgeland. Interkommunal kystsoneplan med konsekvensutredning for: Bindal, Sømna, Vega, Vevelstad, Herøy, Dønna, Leirfjord, Nesna, Træna, Lurøy og Rødøy. Del 2: Overordnet konsekvensutredning og konsekvensutredning av enkelttiltak: 23*

⁶³⁷ Tunheim, O.H. & Lindgaard, E.S. (2022) *Risikovurdering av påvirkning på sjøfugl ved lokalitet Skogsholmen* [unpublished report]. Åkerblå AS: 22.

Cumulative impact(s):
The mortality of seabirds should be seen in the context of declining species populations.
Potential mitigation measure(s):
<p>Top and curtain anti-predator nets, with an appropriate mesh size, should be installed at a suitable distance from the fish pens and well maintained to ensure birds do not manage to reach fish from them (reducing the association of food with the facility) and do not get entangled.</p> <p>Other methods of dissuasion should be explored but no lethal methods for eliminating predators should be permitted at the aquaculture facilities. Acoustic methods should also be avoided so as not to cause disturbance to seabirds and other sensitive species.</p>
Heritage values associated with the impacted attributes:
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • ... bountiful nature • The rich maritime resources of the Vega Archipelago not only benefited local peoples, but also as many as 228 species of birds • The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature

TABLE 4.4.12 Potential impacts on the World Heritage property of interactions of farmed fish with wild fish of the proposed aquaculture facilities

Element of the proposed projects:	INTERACTION OF FARMED FISH WITH WILD FISH
<p>Escaped farmed salmon can pose a risk for the genetic modification of the wild salmon populations. They also pose risks for wild populations from lice infections and viral diseases, both of which can lead to death in fish. Transmission risk is increased by the noted phenomenon of aquaculture facilities attracting increased numbers of wild fish.⁶³⁸</p> <p>Facilities are designed to avoid escapes; however, they do sometimes occur due to human error, severe weather and structural issues.</p> <p>To give an idea of how often these escapes occur: escaped farmed fish have been reported from facilities along the Helgeland Coast.⁶³⁹ However, the two existing Nova Sea facilities at Vega have had no escapes.⁶⁴⁰ Mowi reported 4 escape incidents in Norway in 2021, resulting in 909 escaped fish.⁶⁴¹</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	SPECIES
<p>The presence of aquaculture facilities has been found to attract significant numbers of wild fish, such as saithe, cod, haddock and mackerel. It is presumed this is due to the supply of waste feed that falls from the net pens. However, the aggregation in close proximity to the farmed fish means that the risks associated with disease transmission are higher.⁶⁴²</p> <p><i>Lice infestation:</i> Estimates of the risk on wild Atlantic salmon populations vary from low to high according to year and location; while it is noted that there is a much higher risk for sea trout and Arctic charr populations in counties with high salmon farming activity.⁶⁴³ The latest risk report for Norwegian aquaculture by the Institute of Marine Research concluded that in the Helgeland to Bodø production area (in which Vega is located) that there is a low probability of lice infestation for migrating salmon in the area from farmed fish.⁶⁴⁴</p> <p><i>Disease transmission:</i> There is a high frequency of viral disease outbreaks in Norwegian salmon aquaculture facilities, which suggests that there is an extensive release of pathogens for these diseases in many areas to which wild fish are exposed. The lack of data has led BOB to conclude that a risk estimate for disease</p>	

⁶³⁸ Dempster, T., Uglem, I., Sanchez-Jerez, P., Fernandez-Jover, D., Bayle-Sempere, J. T. & Nilsen, R. (2009) Coastal salmon farms attract large and persistent aggregations of wild fish: an ecosystem effect. *Marine Ecology Progress Series* 304: 15-29.

⁶³⁹ Data extracted from the Akvakultur portal of the Directorate of Fi://portal.fiskeridir.no/portal/apps/webappviewer/index.html?id=87d862c458774397a8466b148e3dd147&extent=-1786159.9947%2C5882964.5683%2C3415770.4092%2C8638362.0791%2C25833&showlayers=R%C3%B8mming_7219%3BR%C3%B8mming_7219_0

⁶⁴⁰ Based on reports to the Directorate of Fisheries and included within the ASC reports. <https://www.asc-aqua.org/find-a-farm/ASC00914/> and <https://www.asc-aqua.org/find-a-farm/ASC00925/>

⁶⁴¹ Mowi (2021) *Integrated Annual Report 2021* [online]: 54. Available from: <https://mowi.com/blog/mowi-annual-report-2021/>

⁶⁴² Sæther, B-S., Uglem, I. & Karlsen, Ø. (2013) *Interaksjoner mellom havbruk og ville marine organismer – en kunnskapsoppsummering* [online]. Nofima: 29. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2735237>

⁶⁴³ Taranger, G.L. Karlsen, Ø., Bannister, R.J. et al. (2015) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming. *ICES Journal of Marine Science* 72.3: 997–1021. Available from: <https://doi.org/10.1093/icesjms/fsu132>

⁶⁴⁴ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. et al. (eds) *Risikoreport norsk fiskeoppdrett 2022 - risikovurdering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rappport-fra-havforskningen-2022-12>

transmission is not possible,⁶⁴⁵ although the Institute of Marine Research concluded there is low to moderate risk of infectious diseases being transmitted.⁶⁴⁶

Transfer of genetic material: A risk assessment of the impact of Norwegian Atlantic salmon farming found that there was a moderate risk of genetic changes to wild fish populations due to the transfer of genetic material from escaped farmed salmon.⁶⁴⁷ It has been noted that the approximate number of escaped farmed salmon for the period 2002-2012 (440,000) is almost exactly the same as the number of wild Atlantic salmon that return each year to spawn in Norwegian waters, so they are a significant addition to the stock.⁶⁴⁸

The Norwegian Scientific Advisory Committee for Atlantic Salmon Management note that the biggest threats to wild salmon stocks are from escaped farmed salmon, salmon lice and infections related to fish farming are the biggest threats to wild salmon. They recently concluded that sufficient measures are not being taken to stabilize or reduce these threats.⁶⁴⁹ Similar concerns have been expressed by the Norwegian Veterinary Institute.⁶⁵⁰

Cumulative impact(s):

Risk of disease transmission are increased by the existing numbers of aquaculture facilities already in Vega and along the Helgeland Coast. Temperature increases due to climate change, may increase these disease risks.

Escapes are more likely when there are storm events causing unforeseen damage to net pens.⁶⁵¹

The wild salmon population is already under pressure from human activities (including aquaculture) and large-scale decline in sea survival, with the population currently at half the levels recorded in the 1980s. Climate change – caused changes to the environment is impacting the population negatively.

Potential mitigation measure(s):

Aquaculture companies need to ensure existing measures are implemented to improve disease controls and prevent escapes, although the Norwegian Scientific Advisory Committee for Atlantic Salmon believes that the present mitigation measures are insufficient to stabilize and reduce these threats.⁶⁵²

⁶⁴⁵ Taranger, G.L. Karlsen, Ø., Bannister, R.J. *et al.* (2015) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming, *ICES Journal of Marine Science* 72.3: 997–1021. Available from: <https://doi.org/10.1093/icesjms/fsu132>

⁶⁴⁶ Grefsrud, E.S., Andersen, L.B., Bjørn, P.A. *et al.* (eds) *Risikoreport norsk fiskeoppdrett 2022 - risikovurdering - Effekter på miljø og dyrevelferd i norsk fiskeoppdrett* [online]. Havforskningsinstituttet. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2022-12>

⁶⁴⁷ Taranger, G.L. Karlsen, Ø., Bannister, R.J. *et al.* (2015) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming, *ICES Journal of Marine Science* 72.3: 997–1021. Available from: <https://doi.org/10.1093/icesjms/fsu132>

⁶⁴⁸ Lien, M.E. (2015) *Becoming Salmon: Aquaculture and the Domestication of a Fish*. University of California Press: 150.

⁶⁴⁹ Thorstad, E.B., Forseth, T. & Fiske, P. (2021) *Status for norske laksebestander i 2021. Rapport fra Vitenskapelig råd for lakseforvaltning 16* [online]. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2830680>

⁶⁵⁰ Sommerset, I., Walde, C.S., Jensen, B.B. *et al.* (eds) (2022) *Fiskehelse rapporten 2021* [online]. Veterinærinstituttets årlige oversikt over fiskehelsen i Norge. Available from: <https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2022/fiskehelse-2021>

⁶⁵¹ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell: 88-9.

⁶⁵² Thorstad, E.B., Torbjørn, F. & Fiske, P. (2021) *Status for norske laksebestander i 2021* [online]. Vitenskapelig råd for lakseforvaltning. Available from: <https://brage.nina.no/nina-xmlui/handle/11250/2830680>

With regard to escapes, it is noted that Mowi is aiming to improve procedures and inspections to avoid technical failures and human errors. They note the need to improve the design of equipment at exposed sites where storm damage may be incurred.⁶⁵³ Recapture nets should be present at facilities in case of escapes.

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- ... bountiful nature
- The rich maritime resources of the Vega Archipelago

⁶⁵³ Mowi (2021) *Integrated Annual Report 2021* [online]: 54. Available from: <https://mowi.com/blog/mowi-annual-report-2021/>

TABLE 4.4.13 Potential impacts on the World Heritage property of on-land traffic and facilities of the proposed aquaculture facilities

Element of the proposed projects:	ON-LAND TRAFFIC AND FACILITIES
<p>Both aquaculture companies have stated that the fish farmed within the proposed facilities would be transported to existing slaughter and processing facilities. No new land-based facilities or transportation infrastructure is foreseen. For this reason, it is considered that there would be no impacts on the World Heritage property.</p>	
<p>Potential mitigation measure(s):</p>	
<p>No new land-based facilities or infrastructure should be built without a specific assessment of their impacts.</p>	
<p>Heritage values associated with the impacted attributes:</p>	
<p>Outstanding Universal Value not impacted</p>	

TABLE 4.4.14 Potential impacts on the World Heritage property of presence in socio-economic context of the proposed aquaculture facilities

Element of the proposed projects:	PRESENCE IN SOCIO-ECONOMIC CONTEXT
<p>New aquaculture facilities create potential direct employment opportunities and ripple effects within the local economy.</p> <p>It is estimated that each aquaculture facility would create 5-10 jobs, although not necessarily for people based in Vega Municipality.</p> <p>It has been estimated that economic ripple effects would be minimal locally due to the small number of relevant sub-contractors that might contribute to aquaculture services. However, each aquaculture facility might cause an additional 2-4 million NOK and 2-4 new jobs created for local sub-contractors.⁶⁵⁴</p> <p>Please note that the socio-economic impacts on other parties, outside of the Vega Archipelago are not considered here as this assessment focuses on the potential impacts to the World Heritage property. For a broader consideration of socio-economic affects see the report by Menon Economics: <i>Tilleggsutredning Kystplan Helgeland i Vega Kommune – Samfunnsmessige Virkninger</i>.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	HUMAN SETTLEMENT
<p>The direct jobs created by the aquaculture facilities would contribute to continued settlement of Vega in those cases where the workers chose to live in the municipality. Looking at the location of workers at existing facilities, it can be estimated that each facility might lead to the settlement in Vega of 3-5 individuals, possibly with family.</p> <p>The other indirect economic opportunities (2-4 million NOK and 2-4 new jobs created for local sub-contractors) would contribute to the local economy and continued opportunities for local residents to live and work in Vega.</p>	
Cumulative impact(s):	
<p>These new economic opportunities would be added to the 21 people already directly employed in aquaculture, three indirectly employed in the supply chain, and 15 working for the fish processing company.⁶⁵⁵</p>	
Potential mitigation measure(s):	
<p>Employment policies could be adopted that favour the selection of local residents (where the necessary knowledge and skills exist) and encourage the new workers to take up residency in Vega.</p>	

⁶⁵⁴ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega–Kommune - Samfunnsmessige Virkninger*. Menon Economics: 39.

⁶⁵⁵ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune – Samfunnsmessige Virkninger*. Menon Economics: 28.

The aquaculture companies should favour local service providers and suppliers wherever possible, although it is noted industry procurement is not currently available at Vega.⁶⁵⁶

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- The area as a whole is representative of settlements on the strandflat
- ... diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The rich maritime resources of the Vega Archipelago... benefited local peoples
- fishermen/farmers have, over the past 1,500 years, maintained a sustainable living

Other heritage values:

- The diversity of ecosystems and ecosystem services, through natural resource use, have given the area cultural and social importance, political influence and a resilient socio-economic model based on multiple income sources

⁶⁵⁶ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune – Samfunnsmessige Virkninger*. Menon Economics: 40.

TABLE 4.4.15 Potential impacts on the World Heritage property of use of marine resources by the proposed aquaculture facilities

Element of the proposed projects:	USE OF MARINE RESOURCES
<p>Like the case of cod or eider down over the centuries, there is nothing new in natural resources from the Helgeland Coast reaching to distant markets. However, the distinguishing feature of salmon aquaculture is that it does not entail working with locally-found marine species, nor does it constitute continuity with natural resource use in the Vega Archipelago over the centuries. Salmon aquaculture is part of a recent trend in the Vega Archipelago of farming a variant of a marine species that is not locally sourced. As a result, this industrial approach to salmon farming does not have the layered exploitation of products worked to differing degrees locally nor are there the usual interdependencies with other types of natural resource use.</p> <p>Should the two new facilities be added to the existing aquaculture facilities in the Vega Archipelago, and with all in full production, a huge amount of this genetic variant of farmed salmon could be reared. In Norway, aquaculture products tend to reach much broader national and international markets than the products of land-based agriculture. While aquaculture in Vega to date, with strong local ownership, has focussed principally on Nordland markets, this is likely to change with the involvement of players that operate nationally and internationally.</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	SPECIES
<p>The fish brought to the aquaculture facility are not locally sourced but are a genetic variant of salmon farmed by the companies. This means no attributes are harvested as part of the aquaculture activities and will not be impacted in this way.</p>	
Attributes of the heritage place:	HUMAN SETTLEMENT
<p>The biodiversity of the Vega Archipelago underpinned a model of diverse natural resource use which contrasts to a community which consolidates a single type of resource use.</p>	
Attributes of the heritage place:	FISHING TRADITIONS
<p>The increasing industrial emphasis on farming a non-local species risks, without proactive measures to support the new generations in fishing, contributing to the end of fishing traditions on this part of the Helgeland Coast.</p>	
Cumulative impact(s):	
<p>Factors like climate change paired with other factors suggest the fragility of Vega’s marine ecosystems could change and increase so the effects of an industrialised model could be more problematic.</p>	

Potential mitigation measure(s):

Agriculture worldwide has illustrated the risks of depending on mono-cultivation; similar imbalance and negative repercussions could be produced by over-industrialization of marine resource use in the Vega Archipelago. Resource use models in such a context should favour diversification.

New forms of mitigation should be explored for new approaches that demonstrate much less damage to immediate ecosystems and habitats.

Heritage values associated with the impacted attributes:

From the Statement of Outstanding Universal Value:

- The area as a whole is representative of settlements on the strandflat
- ... diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape
- The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature
- The rich maritime resources of the Vega Archipelago... benefited local peoples
- fishermen/farmers have, over the past 1,500 years, maintained a sustainable living

Other heritage values:

- The diversity of ecosystems and ecosystem services, through natural resource use, have given the area cultural and social importance, political influence and a resilient socio-economic model based on multiple income sources

TABLE 4.4.16 Potential impacts on the World Heritage property of funding for the municipality by the proposed aquaculture facilities

Element of the proposed projects:	FUNDING FOR MUNICIPALITY
<p>Fees paid for operating aquaculture facilities within the Vega Archipelago would go in part to the Vega Municipality for the benefit of the local community. It is estimated that Vega Municipality would potentially gain about 17.5 million NOK over a period of five years if both aquaculture facilities are permitted.⁶⁵⁷</p>	
Description of potential direct and indirect impacts:	
Attributes of the heritage place:	HUMAN SETTLEMENT
<p>The potential estimated 17.5 million NOK that would be obtained by Vega Municipality if both aquaculture facilities operated over a five-year period would directly benefit the continued settlement on Vega through the provision of municipal services.</p>	
Cumulative impact(s):	
<p>This funding would be in addition to the income that is already received by Vega Municipality on an annual basis from the Aquaculture Fund, for example, 6.6 million NOK in 2021 (see section 3.13 for more details).</p>	
Potential mitigation measure(s):	
<p>A better alignment of approaches to the use of land- and marine-based resources and questions of ownership of the sea might help models of aquaculture that are locally more equitable and green, i.e., not just a low overall carbon footprint but also nearly no risk to local ecosystems.</p>	
Heritage values associated with the impacted attributes:	
<p>From the Statement of Outstanding Universal Value:</p> <ul style="list-style-type: none"> • The area as a whole is representative of settlements on the strandflat • ... diversity and interaction of the natural features and cultural heritage of the Vega Archipelago, forming a unique cultural landscape. This diversity ranges from the islets where down was gathered to the fishing settlements and traditional farming complexes with characteristic field patterns, forming a mosaic in the landscape • The Vega Archipelago now stands as a testimony to people who have developed unique, simple ways to live in and interact with nature • The rich maritime resources of the Vega Archipelago... benefited local peoples • fishermen/farmers have, over the past 1,500 years, maintained a sustainable living 	

⁶⁵⁷ Magnussen, K. (2021) *Tilleggsutredning Kystplan Helgeland i Vega Kommune – Samfunnsmessige Virkninger*. Menon Economics: 44.

Other heritage values:

- The diversity of ecosystems and ecosystem services, through natural resource use, have given the area cultural and social importance, political influence and a resilient socio-economic model based on multiple income sources

4.5 EVALUATION OF IMPACTS ON THE WORLD HERITAGE PROPERTY

Sections 4.3 and 4.4 systematically mapped the different forms of continuity and change represented by the adoption of the Vega section of the Helgeland Coastal Plan and the implementation of the proposed aquaculture facilities, analysing each in terms of how it currently interacts, or could potentially interact, with attributes of ‘Vegaøyane – Vega Archipelago.’

This chapter draws together all those insights in order to evaluate how the various forms of change and continuity come together and impact on the World Heritage property. This includes the impacts of existing use patterns, as well as the potential impacts on attributes of the World Heritage property.

The available information that was outlined in the tables in the previous sections are summarized and then placed in a category that reflects the levels of concern about the potential impact described, the existing vulnerability of the attribute, the existence of cumulative impacts and any potential mitigation that might address the potential impact. These categories range from minor to major negative impacts and minor to major positive impacts (Figure 4.6). It should be noted that where some change might potentially occur but it was at such a low level as to cause the least concern, these were noted as ‘negligible’.

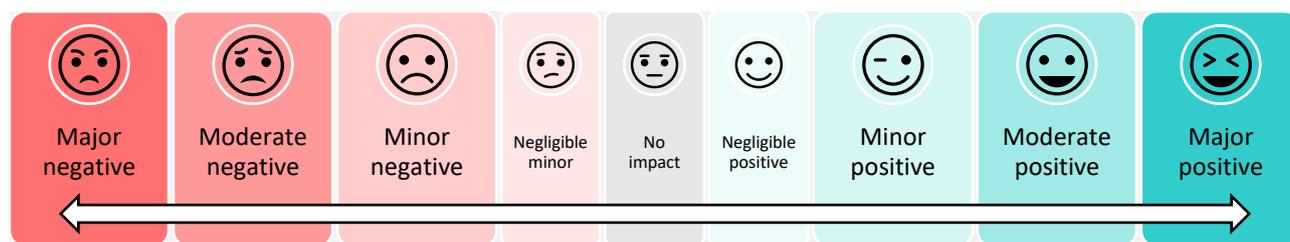


FIGURE 4.6. Impacts are categorized from major negative to major positive impacts. These reflect the level of concern about the potential impact described, the existing vulnerability of the attribute, the existence of cumulative impacts and any potential mitigation that might address the potential impact.

4.5.1 Evaluation of the potential impacts on the World Heritage property of the Vega section of the Helgeland Intermunicipal Master Plan without the new proposed aquaculture facilities

Sections 4.3 provided a systematic analysis of how the core elements of the Helgeland Coastal Plan for Vega interact with the attributes of Outstanding Universal Value of the World Heritage property, also in light of cumulative impacts and margins for mitigation. The outputs of that step-by-step analysis are drawn together in this section and evaluated with a view to gaining an overview of the overall implications of the adoption of this Coastal Plan.

The following Table 4.5 evaluates the forms of change and (above all) continuity represented by the adoption of this zoning plan - analysed net of the two new aquaculture proposals – and the degree to which the impacts are positive.

TABLE 4.5. Evaluation of the impacts on the World Heritage property of the Vega section of the Helgeland Coastal Plan without the new proposed aquaculture facilities

USES OF THE COASTAL AREA	HERITAGE ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	EVALUATION OF IMPACT
Marine traffic and fairways	Species	Boat traffic can disturb wild species	Minor negative impact
		Regulating traffic with identified fairways and restricting the approach of boats to sensitive nesting and moulting sites in key seasons, helps to reduce disturbance	Minor positive impact
	Human settlement	Regular transport connections maintain the population on Vega	Major positive impact
	Eider tending	Traffic regulations near to nesting areas support eider tending	Minor positive impact
Fishing	Water quality	Fishing can generate pollution in the sea, in particular, waste	Minor negative impact
	Species	Fish populations could be harvested to unsustainable limits	Moderate negative impact
	Human settlement	Fishing supports the continued activity of 37 full-time and 36 part-time fishers in Vega Municipality	Moderate positive impact
	Fishing traditions	Fishing supports the continued fisher tradition at Vega	Major positive impact
Existing aquaculture <i>N.B. For impacts of proposed aquaculture, see tables 4.6 and 4.7 below.</i>	Geology and landscape features	Visual impacts from the industrial character of aquaculture facilities, with their geometric shapes and necessarily high visibility, which contrasts with the overall characterisation of the archipelago with a small-scale human presence. Mooring systems impact on the seabed, in some cases remaining permanently in place.	Moderate negative impact
	Water quality	Discharge of large quantities of organic waste, leading to increased turbidity of the water column and light attenuation. Increased suspended particles, higher levels of chemicals, macro- and microplastics all affect the water quality.	Minor negative impact
	Marine habitats	Organic waste can be seen to bury the sea floor, reduce growth, fragment habitats, and cause significant changes to the benthic community. Maerl are particularly at risk. Chemical discharges also affect the abundance, diversity and community structure of benthic ecology.	Moderate negative impact

	Species	Bird species affected by disturbance (e.g., traffic, noise, light, etc.), particularly during vulnerable seasons such as moulting and nesting. Some species of fish and birds are attracted to aquaculture facilities, in some cases, with health consequences. Benthic species are affected by changes in habitat and water quality, in particular, crustaceans are vulnerable to chemical discharges.	Moderate negative impact
	Human settlement	Visual and experiential impacts of industrial facilities within a largely untouched seascape, as well as noise disturbance and lights visible from a distance.	Moderate negative impact
		Direct employment for 21 people in aquaculture at Vega, 15 people working at the fish processing company and another 3 indirectly gaining employment from the supply chain. Municipality gains annual income from the Aquaculture Fund.	Moderate positive impact
	Fishing traditions	Fish stocks indirectly affected by negative impacts on marine habitats, in particular, those that serve as spawning and nursery areas. They are also affected when food species, such as crustaceans, are impacted by chemical treatments, etc.	Minor negative impact
	Eider tending	Disturbance can cause the sensitive eider to abandon their nests and relocate, with negative implications for those tending them.	Moderate negative impact
Nature areas	Geology and landscape features	Potential to support the characteristics of the Hysvær/Søla landscape	Major positive impact
	Terrestrial habitats	Potential to provide protection for the terrestrial habitats found in the protected areas	Major positive impact
	Marine habitats	Potential to provide protection for the marine habitats found in the protected areas	Major positive impact
	Species	Potential to provide protection for the species found in the protected areas, in particular, the sea birds in the bird protection areas and fish using the marine habitats for spawning/nursery areas	Major positive impact
	Fishing traditions	The protection of marine habitats indirectly supports healthier fish stocks for the fishing community	Major positive impact
	Eider tending	Eider ducks protected from disturbance during nesting, allowing eider tenders to work with them	Major positive impact
Outdoor recreation areas	Terrestrial habitats	Sensitive areas can be degraded or degraded by intense visitation	Moderate negative impact
	Species	Recreational fishing can place fish stocks under significant pressure	Moderate negative impact
		Visitation can disturb sensitive species, in particular during breeding and nesting periods	Minor negative impact

	Human settlement	Quality of life can encourage continued human settlement	Moderate positive impact
		Well-managed tourism can potentially contribute to the local economy	Moderate positive impact
		Unmanaged and intensive visitation could have social impacts, such as loss of resident population, conversion of housing to visitor accommodation, etc.	Moderate negative impact

In general, the Vega section of the Helgeland Coastal Plan, without new aquaculture facilities, but including existing aquaculture, would largely have positive impacts on the World Heritage property. Many of the use patterns prescribed would work to assist the self-regulatory capacity of the World Heritage property as part of a wider social-ecological system. However, it is noted that perhaps not all of these uses of the coastal area are supported by regulations that incorporate a full understanding of World Heritage commitments and that the coastal plan would need to be reinforced in order for the predicted positive impacts to be gained.

The areas of concern are primarily in those areas where change is already or could be more significant – existing aquaculture facilities, overfishing, tourism and depopulation – but this does not constitute an argument against those zoning areas, as much as highlighting the need for regulating and managing use.

4.5.2 Evaluation of the potential impacts on the World Heritage property of the two proposed aquaculture facilities

Based on the information gathered in the previous section, the following summary tables for each of the two proposed aquaculture facilities provide an evaluation of the potential impacts they would have on the World Heritage property of ‘Vegaøyen – Vega Archipelago’.

TABLE 4.6. Evaluation of the potential impacts on the World Heritage property of the proposed aquaculture facility for Hysvær

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
Installation / deinstallation activities	Water quality	Emissions from ships/boats involved in installation, similar to other local marine traffic	Once	2-3 weeks	Reversible	Temporary	Negligible	Negligible negative impact
	Species	Disturbance from intense continuous activity in the area, which could cause sensitive species to relocate temporarily or permanently	Once	2-3 weeks	Irreversible	Permanent	Some	Moderate negative impact
	Fishing traditions	Fishing grounds found 300 m from Hysvær would have some disturbance	Once	2-3 weeks	Reversible	Temporary	Negligible	Negligible negative impact
Mooring system	Geology and landscape features	Mooring system attached to the seabed	Once	Long-term	Reversible	Permanent	Negligible	Minor negative impact
	Water quality	Mooring lines cause increased sediment	Continuous	Long-term	Reversible	Temporary	Negligible	Negligible negative impact
	Marine habitats	Mooring lines cause bare patches of vegetation around anchor points	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
Presence of facility within the seascape	Geology and landscape features	Industrial character of aquaculture facilities in contrast to the characterisation of the seascape	Continuous	Long-term	Reversible	Permanent	Some	Moderate negative impact
	Marine habitats	Potential for facility to encourage settlement of non-indigenous species	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Species	Attraction of wild fish to the facility and, in turn, fish-eating species	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
	Human settlement	Distant views from some houses and fairways	Continuous	Long-term	Reversible	Permanent	Some	Minor negative impact
	Fishing traditions	Area of 100 m around the facility is inaccessible to fishers, this overlaps with the shrimp field, limiting access to some degree	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
Increased marine traffic	Species	Various bird species can be disturbed by marine traffic, causing them to relocate	Intermittent	Long-term	Reversible	Temporary	Some	Minor negative impact
	Human settlement	Increased marine traffic patterns	Intermittent	Long-term	Reversible	Permanent	Negligible	Negligible negative impact
	Fishing traditions	Traffic would not conflict with fishing grounds if following existing fairways	N/A	N/A	N/A	N/A	N/A	No impact
Sound	Marine habitats	Noise can affect the quality of a habitat and cause changes within community	Intermittent	Long-term	Reversible	Temporary	Some	Minor negative impact
	Species	Noise associated with aquaculture activities could behaviour of various species	Intermittent	Long-term	Reversible	Temporary	Some	Minor negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
	Human settlement	Limited noise would reach Hysvær, more would be experienced by those travelling to/from houses on nearby islands	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
Light	Marine habitats	Disruptions to natural light regimes can significantly affect the composition of communities within an ecosystem	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
	Species	Artificial lighting systems can affect fish, bird and other species	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
	Human settlement	Lights would be clearly visible from a distance	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
Discharge of organic waste	Water quality	Discharge of organic waste can lead to high nutrient levels, the rapid growth of micro-organisms/algae and then low oxygen levels. Suspended particles and algal blooms can reduce light. Chemical levels in water change	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
	Marine habitats	Kelp: increased nutrients can encourage growth. Reduced light conditions however limit that at depth. Sediment can prevent new plants growing. Deep trench: risk of sediment build up and oxygen depletion. Eelgrass: light reduction reduces growth.	Continuous	Long-term	Irreversible	Permanent	Large	Moderate negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
	Species	Fish attracted to aquaculture facilities but seem to have potential health implications from eating waste feed	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Fishing traditions	When habitats that function as nursery or spawning grounds are affected, there can be impacts on the fish stocks	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
Discharge of chemicals	Water quality	Increased presence of chemicals in the water directly under or around the facility	Intermittent	Long-term	Reversible	Temporary	Unknown	Minor negative impact
	Marine habitats	Residues of lice treatments can remain in the benthic environment, affecting abundance, diversity and community structure	Continuous	Long-term	Irreversible	Permanent	Unknown	Minor negative impact
	Species	Sea lice treatments affect crustaceans and can be lethal	Intermittent	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Fishing traditions	The shrimp field next to Hysvær should be affected by sea lice treatment, as may lobster catches, and potentially cod if they shift to find their preferred food e.g. shrimp	Intermittent	Long-term	Irreversible	Permanent	Some	Moderate negative impact
Release of heavy metals from antifoulants	Water quality	Copper not to be used as antifoulant at Hysvær	N/A	N/A	N/A	N/A	N/A	No impact
	Marine habitats	Copper not to be used as antifoulant at Hysvær	N/A	N/A	N/A	N/A	N/A	No impact
	Species	Copper not to be used as antifoulant at Hysvær	N/A	N/A	N/A	N/A	N/A	No impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
	Fishing traditions	Copper not to be used as antifoulant at Hysvær	N/A	N/A	N/A	N/A	N/A	No impact
Production of non-fish waste	Water quality	Accidental loss of macroplastics from facilities, as well as ongoing discharge of microplastics from fee pipes	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Species	Nano- and microplastics can build up within a food chain, e.g. from plankton to mussels to eider ducks	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
Interaction with predators	Species	Bird mortality a risk from being caught in nets surrounding the fish cages	Intermittent	Long-term	Irreversible	Permanent	Some	Minor negative impact
Interaction of farmed fish with wild salmonids	Species	Escaped farmed salmon can pose risk of genetic modifications in wild populations. Risk of transmission of lice infections and diseases	Intermittent	Long-term	Irreversible	Permanent	Large	Moderate negative impact
On-land traffic and facilities		No new facilities or transport infrastructure will be required	N/A	N/A	N/A	N/A	N/A	No impact
Presence in socio-economic context	Human settlement	3-5 jobs created for people based in Vega, and other indirect economic opportunities	Continuous	Long-term	Reversible	Permanent	Some	Moderate positive impact
Use of marine resources	Species	There would be no use of Vega's marine resources	N/A	N/A	N/A	N/A	N/A	No impact
	Human settlement	Vega's biodiversity underpinned a model of diverse natural resource use which contrasts to a community focusing on a single type of resource use	Continuous	Long-term	Reversible	Temporary	Some	Moderate negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
	Fishing traditions	Increased emphasis on other marine industries risks undermining efforts to continue local fishing traditions	Continuous	Long-term	Irreversible	Permanent	Some	Moderate negative impact
Funding for municipality	Human settlement	More than 8 million NOK is the estimated amount that Vega Municipality would obtain if the facility operated over five years	Intermittent	Short-term	Irreversible	Permanent	Some	Minor positive impact

TABLE 4.7. Summary of the potential impacts of the proposed aquaculture facility for Rørskjæran and their evaluation

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
Installation / deinstallation activities	Water quality	Emissions from ships/boats involved in installation, similar to other local marine traffic	Once	2-3 weeks	Reversible	Temporary	Negligible	Negligible negative impact
	Species	Disturbance from intense continuous activity in the area, which could cause sensitive species to relocate temporarily or permanently	Once	1-2 weeks	Irreversible	Permanent	Some	Moderate negative impact
	Fishing traditions	Fishing grounds found 400 m from Rørskjæran would have some disturbance	Once	1-2 weeks	Reversible	Temporary	Negligible	Negligible negative impact
Mooring system	Geology and landscape features	Mooring system attached to the seabed	Once	Long-term	Reversible	Permanent	Negligible	Minor negative impact
	Water quality	Mooring lines cause increased sediment	Continuous	Long-term	Reversible	Temporary	Negligible	Negligible negative impact
	Marine habitats	Mooring lines cause bare patches of vegetation around anchor points	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
Presence of facility within the seascape	Geology and landscape features	Industrial character of aquaculture facilities in contrast to the characterisation of the seascape	Continuous	Long-term	Reversible	Permanent	Some	Moderate negative impact
	Marine habitats	Potential for facility to encourage settlement of non-indigenous species	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
	Species	Attraction of wild fish to the facility and, in turn, fish-eating species	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
	Human settlement	Views from some houses, recreational areas and key arrival routes on Vega island and Sjøla	Continuous	Long-term	Reversible	Permanent	Some	Moderate negative impact
	Fishing traditions	Attraction of wild fish to the facility may make them inaccessible to fishers	Continuous	Long-term	Reversible	Temporary	Negligible	Negligible negative impact
Increased marine traffic	Species	Various bird species can be disturbed by marine traffic, causing them to relocate	Intermittent	Long-term	Irreversible	Temporary	Some	Moderate negative impact
	Human settlement	Increased marine traffic patterns	Intermittent	Long-term	Reversible	Permanent	Negligible	Negligible negative impact
	Fishing traditions	Traffic would not conflict with fishing grounds if following existing fairways	N/A	N/A	N/A	N/A	N/A	No impact
Sound	Marine habitats	Noise can affect the quality of a habitat and cause changes within community	Intermittent	Long-term	Reversible	Temporary	Some	Minor negative impact
	Species	Noise associated with aquaculture activities could behaviour of various species	Intermittent	Long-term	Reversible	Temporary	Some	Minor negative impact
	Human settlement	Limited noise would reach the Vegatrappa area, more would be experienced by those travelling to/from Vega island and Sjøla	Continuous	Long-term	Reversible	Permanent	Some	Minor negative impact
Light	Marine habitats	Disruptions to natural light regimes can significantly affect the	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
		composition of communities within an ecosystem						
	Species	Artificial lighting systems can affect fish, bird and other species	Continuous	Long-term	Reversible	Temporary	Some	Minor negative impact
	Human settlement	Lights would be clearly visible from Vega island and Sjøla, in particular from views in the Vegatrappa area	continuous	Long-term	Reversible	Temporary	Some	Moderate negative impact
Discharge of organic waste	Water quality	Discharge of organic waste can lead to high nutrient levels, the rapid growth of micro-organisms/algae and then low oxygen levels. Suspended particles and algal blooms can reduce light. Chemical levels in water change	Continuous	Long-term	Reversible	Temporary	Some	Moderate negative impact
	Marine habitats	Kelp: increased nutrients can encourage growth. Reduced light conditions however limit that at depth. Sediment can prevent new plants growing. Maerl: sediment smothering can cause death. Deep trench: risk of sediment build up and oxygen depletion.	Continuous	Long-term	Irreversible	Permanent	Large	Moderate negative impact
	Species	Fish attracted to aquaculture facilities but seem to have potential health implications from eating waste feed	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Fishing traditions	When habitats that function as nursery or spawning grounds are	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
		affected, there can be impacts on the fish stocks						
Discharge of chemicals	Water quality	Increased presence of chemicals in the water directly under or around the facility	Intermittent	Long-term	Reversible	Temporary	Unknown	Minor negative impact
	Marine habitats	Residues of lice treatments can remain in the benthic environment, affecting abundance, diversity and community structure	Continuous	Long-term	Irreversible	Permanent	Unknown	Minor negative impact
	Species	Sea lice treatments affect crustaceans and can be lethal	Intermittent	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Fishing traditions	Shrimp and lobster catches maybe affected, and potentially cod if they shift to find their preferred food e.g. shrimp	Intermittent	Long-term	Irreversible	Permanent	Some	Minor negative impact
Release of heavy metals from antifoulants	Water quality	85% of copper used in antifoulant coatings of nets dispersed into sea. No monitoring of water column so no data exists of levels in water near aquaculture	Continuous	Long-term	Irreversible	Permanent/ temporary	Unknown	Minor negative impact
	Marine habitats	Some of copper leached into sea settles on sea bed and a portion builds up within marine environment	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Species	Health risks for marine species continually exposed to high levels of copper, so greater risks for less mobile invertebrates	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
	Fishing traditions	Copper levels in fish and other marine species do not exceed health and safety thresholds, so no impact	Continuous	Long-term	N/A	N/A	N/A	No impact
Production of non-fish waste	Water quality	Accidental loss of macroplastics from facilities, as well as ongoing discharge of microplastics from fee pipes	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
	Species	Nano- and microplastics can build up within a food chain, e.g. from plankton to mussels to eider ducks	Continuous	Long-term	Irreversible	Permanent	Some	Minor negative impact
Interaction with predators	Species	Bird mortality a risk from being caught in nets surrounding the fish cages	Intermittent	Long-term	Irreversible	Permanent	Some	Minor negative impact
Interaction of farmed fish with wild salmonids	Species	Escaped farmed salmon can pose risk of genetic modifications in wild populations. Risk of transmission of lice infections and diseases	Intermittent	Long-term	Irreversible	Permanent	Large	Moderate negative impact
On-land traffic and facilities		No new facilities or transport infrastructure will be required	N/A	N/A	N/A	N/A	N/A	No impact
Presence in socio-economic context	Human settlement	3-5 jobs created for people based in Vega, and other indirect economic opportunities	Continuous	Long-term	Reversible	Permanent	Some	Moderate positive impact
Use of marine resources	Species	There would be no use of Vega's marine resources	N/A	N/A	N/A	N/A	N/A	No impact
	Human settlement	Vega's biodiversity underpinned a model of diverse natural resource use which contrasts to a	Continuous	Long-term	Reversible	Temporary	Some	Moderate negative impact

ELEMENT OF PROPOSED AQUACULTURE FACILITY	ATTRIBUTE OF VEGA ARCHIPELAGO	DESCRIPTION OF POTENTIAL IMPACT	FREQUENCY	DURATION	REVERSIBILITY OF CHANGE TO ATTRIBUTE	LONGEVITY OF CHANGE TO ATTRIBUTE	DEGREE OF CHANGE TO ATTRIBUTE	EVALUATION OF IMPACT
		community focusing on a single type of resource use						
	Fishing traditions	Increased emphasis on other marine industries risks undermining efforts to continue local fishing traditions	Continuous	Long-term	Irreversible	Permanent	Some	Moderate negative impact
Funding for municipality	Human settlement	More than 8 million NOK is the estimated amount that Vega Municipality would obtain if the facility operated over five years	Intermittent	Short-term	Irreversible	Permanent	Some	Minor positive impact

With regard to the proposed aquaculture facilities, overall, there would be residual negative impacts of aquaculture on the Outstanding Universal Value of the World Heritage property even with mitigation in place. These potential impacts have been identified as mostly being low to moderate negative impacts, however, they remain a significant concern because:

- they would negatively impact on the attributes of Outstanding Universal Value
- many of those attributes are already vulnerable (section 2.5.4)
- there are cumulative impacts from existing aquaculture and other factors that are putting additional pressure on the attributes, notably the range of changes caused by, for example, the climate crisis, tourism pressures, etc.

It is recognized that the two proposed aquaculture facilities for Hysvær and Rørskjæran have different potential impacts according to location and vicinity to specific attributes, although both would have potential negative impacts on Outstanding Universal Value. The proposed facilities would have potential negative impacts on different areas of the World Heritage property, however, an accumulation of such industrial activities that contrast to the characteristics of the Outstanding Universal Value and which contribute to further weakening a vulnerable ecosystem cannot be considered acceptable.

It is recognized that there are some positive impacts brought by aquaculture, which would be beneficial for the local economy and that merit due attention. However, it is noted that the types and relatively low level of these potential impacts could be gained through alternative economic activities.



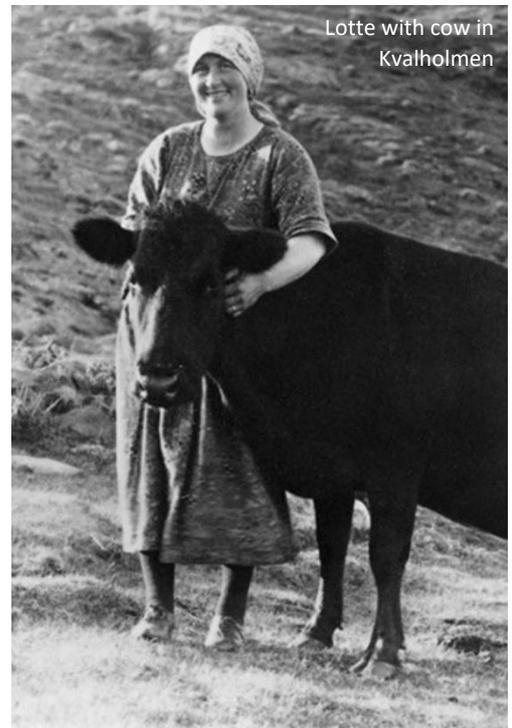
Agnes in Bukkøy



Karen in Skjærvær



Alida in Lånan



Lotte with cow in Kvalholmen



Fishermen in Vega



Nordic cattle belonging to Turid and Gisle that graze on Store Emårsøy Source: Rita Johansen | Vegaøyan World Heritage Foundation



Fisher Daniel Johannessen. Source: Rolf Kluge / Vegøyan World Heritage Foundation



Marine biologists carrying out kelp research at Bremstein in June 2021 Source: *Ascanio D'Andrea* / *Instead Heritage*

5.1 FINAL CONSIDERATIONS ON THE VEGA SECTION OF THE HELGELAND COASTAL PLAN AND THE PROPOSED AQUACULTURE FACILITIES

This closing part of the impact assessment will draw conclusions based on all the material presented in the report so far. There will be comments on the specific proposals that were the subject of this assessment: the Vega section of the Helgeland Coastal Plan and proposed new aquaculture facilities (section 5.2). There are also broader considerations related to the management system of the World Heritage property which have influenced the current situation surrounding planning for the Vega Archipelago (section 5.3), and also have implications for decision-making in the future (section 5.4). An effort has been made to ensure that these concluding sections are accompanied by specific recommendations to help the Norway State Party to move forward in light of its commitments to both the World Heritage Convention and its coastal communities.

5.1.1 The Vega section of the Helgeland Coastal Plan

Most of the uses of Vega Municipality's coastal area that are included within the Helgeland Coastal Plan, excluding the two new aquaculture proposals, are well-established use patterns now proposed for the long-term. Examples include maritime transport connections, fishing areas, bird nesting sites and outdoor areas for the enjoyment of all. Many of these uses of the seascape underpin the Outstanding Universal Value⁶⁵⁸ of the World Heritage property of 'Vegaøyen – The Vega Archipelago'. Recognition of these can be considered to sustain the ongoing management of the World Heritage property.

As the impacts analysis in section 4.3 illustrates, the advantage of adopting a revised Helgeland Coastal Plan for Vega Municipality, *without new aquaculture proposals* in the World Heritage property or the buffer zone, is very evident. There would be the number of positive impacts gained in managing and planning for the seascape. By formalizing the existing uses of the coastal area, decision-makers would have, in a relatively short space of time, a framework within which to take planning decisions for all marine areas of the municipality. Proposals for new or modified uses of this area could then be judged to see if they are compatible within this overall framework, thereby avoiding decisions made on individual cases and ad hoc dispensations made.

It would be necessary, however, for some final adjustments to be made to the coastal plan in order to ensure that World Heritage commitments are fully taken into consideration. Areas of concern arise about the potential negative impacts on Outstanding Universal Value of some activities within the property but also of activities in the buffer zone and wider setting. Examples of such activities are outdoor recreation when it takes the form of tourism managed without sufficient consideration of Outstanding Universal Value, the potential negative impact of large-scale natural resource harvesting, from kelp trawling to recreational fishing, and also wider increases in maritime traffic. Some further reflection is required before adopting the plan so that the Vega community and the World Heritage property can gain the potential positive benefits, without risking any potential negative impacts.

⁶⁵⁸ Outstanding Universal Value is 'the cultural and/or natural significance of World Heritage which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity.' UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]: paragraph 49. Available from: <https://whc.unesco.org/en/guidelines/>

While the greater clarity achieved by the adoption of the intermunicipal coastal plan would already a significant step forward, the long-term conservation and management of the Vega Archipelago would benefit from measures that better meet the needs of this extraordinary place and the local community that brings it to life. New approaches for the World Heritage property that address the complexity of the archipelago as a cultural landscape and as a social-ecological system will take time to develop since they will need to draw on advances in diverse sectors. Specific conclusions and recommendations are explored in sections 5.3 and 5.4. What is certain is that new approaches, in the short-term, will need to translate into more suitable planning and monitoring tools and, in the long-term, into legislative reform, improved governance and more effective management frameworks.

5.1.2 Proposed aquaculture facilities

The Norwegian government is promoting salmon aquaculture as a core pillar of its long-term economic vibrancy, in recognition that the sector is more resource efficient in comparison to the production of other land-based animal proteins and that the aquaculture industry is making technological developments to lessen its environmental impacts.⁶⁵⁹ Although there is no requirement for a coastal plan in Norway to allocate sea areas for the development of aquaculture facilities, the Helgeland Coastal Plan is in line with broader national trends in intermunicipal coastal planning which encourage aquaculture within their areas of jurisdiction.

Vega Municipality is very much aligned with the approach of neighbouring municipalities. Clearly what distinguishes the Vega Archipelago is that it is Norway's only coastal area which has been inscribed on the UNESCO World Heritage List as a cultural landscape,⁶⁶⁰ as well as hosting multiple protected areas designations under Norwegian legislation. As the impacts analysis in section 4.4 illustrates, the expansion of aquaculture in the way proposed at Vega presents a mixed prospect in terms of safeguarding the Outstanding Universal Value of the World Heritage property. Although some potential positive impacts can be identified, specifically regarding employment opportunities and economic gains for the municipality, on the whole the predicted impacts are negative. These impacts from potential negative impacts on the natural environment but also potential negative impacts on the sense of place that cannot be deemed negligible.

Globally, the aquaculture industry is dedicating significant attention to broad environmental impacts by reducing its overall carbon footprint. However, externalities for the immediate environment from farmed fish and, in particular, the impact of numerous aquaculture facilities on fragile marine ecosystems are insufficiently understood. This has also been acknowledged internationally, in the words of former Programme Director for Aquaculture Development at the UN's Food and Agriculture Organization, immediate 'environmental externalities are not being incorporated into cost-benefit analyses.'⁶⁶¹ In other words, the front-load benefits are driving decisions without thought of end-load costs.⁶⁶²

Many of the potential negative impacts on the natural environment could be reduced by mitigation measures but the complete picture suggests that residual negative impacts on attributes of Outstanding Universal Value are inevitable. Indeed, the aquaculture industry implicitly acknowledges that its activities cause

⁶⁵⁹ Strategi Nærings- og fiskeridepartementet Et hav av muligheter – regjeringens havbruksstrategi (2021)

<https://www.regjeringen.no/contentassets/e430ad7a314e4039a90829fcd84c012a/no/pdfs/et-hav-av-muligheter.pdf>

⁶⁶⁰ UNESCO World Heritage Centre (2022) *Decision 28 COM 14B.45: nominations of cultural properties to the World Heritage List (Vegaøyane - The Vega Archipelago)* [online]. Available from: <https://whc.unesco.org/en/decisions/128>

⁶⁶¹ Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 114.

⁶⁶² Sumaila, U.R. (2021) *Infinity Fish: economics and the future of fish and fisheries*. Elsevier.

negative impacts through a series of practices, including regular monitoring of issues from fish disease and lice infestations to the state of the immediate environment, leaving locations fallow when the ecosystem needs to regenerate, ongoing efforts to find alternatives that reduce chemical and organic discharges.

There are several reasons why current aquaculture practices are not appropriate in the case of ‘Vegaøyen – The Vega Archipelago’. First, it is a World Heritage property that has been recognized as being of significance to the global population and with that comes a duty of care: ‘it is not acceptable to lose, damage or alter Outstanding Universal Value because Outstanding Universal Value is irreplaceable.’⁶⁶³

Second, the analysis in Part 4 indicates that there would be potential impacts on numerous attributes, not just one or two. This is particularly critical in the case of the Vega Archipelago’s cultural landscape which is a large self-regulating, social-ecological system. This means the state of conservation depends on interdependencies between multiple elements of the living landscape, more so than found in other typologies of World Heritage (section 2). Furthermore, from the perspective of World Heritage property, there is a complex web of relationships between tangible and intangible attributes and heritage values, which means that negative impacts on one attribute, even if modest, can have repercussions for numerous facets of the Outstanding Universal Value.

Third, in the particular case of the Vega Archipelago it has been seen how the social-ecological system was already fragile at the time of its inscription on the World Heritage List. Although management efforts have brought about positive results for many of the attributes of Outstanding Universal Value, it still remains a property in an extremely vulnerable state of conservation. In addition, the number of factors adding pressure on the property are many, with, in particular, the climate crisis bringing a multitude of changes which have still not been entirely understood. In addition, the Helgeland coast continues to fill with more aquaculture facilities, the cumulative impacts of which add to the risks faced by ‘Vegaøyen - The Vega Archipelago.’

There is also a lack of complete data available on the state and trends of the ecosystems and habitats of ‘Vegaøyen – The Vega Archipelago,’ according to criteria such as, for example, favourable conservation status of habitats.⁶⁶⁴ Such knowledge is crucial in order to measure the extent of negative consequences, its absence constitutes another reason to not risk further harm, which could prove irreversible for the Outstanding Universal Value.

However, it is vital to recognise that the Outstanding Universal Value of ‘Vegaøyen – The Vega Archipelago’ relies on the presence of a vibrant local community, as much as it does on healthy ecosystems. Salmon aquaculture has become a source of economic gain and employment for other Helgeland municipalities. If it is incompatible with World Heritage commitments then alternatives need to be found for Vega Municipality and the local community, so that they are not disadvantaged by their role as custodians of World Heritage.

Norway can show international leadership within the World Heritage community through identifying uses of the seascape and marine resources that support the wellbeing of the local population, together with the recovery and maintenance of healthy ecosystems. These important pillars of Outstanding Universal Value could be brought together within a broader strategic vision of the social-economic and environmental model

⁶⁶³ UNESCO, ICCROM, ICOMOS & IUCN (2022) *Guidance and Toolkit for Impact Assessment in a World Heritage Context*. UNESCO World Heritage Centre: 27. Available from: <https://whc.unesco.org/en/guidance-toolkit-impact-assessments/>

⁶⁶⁴ Natural England (2021) *Favourable Conservation Status Definitions*. *Natural England Technical Information Note TIN180* [online]. Available from: <http://publications.naturalengland.org.uk/publication/6555489061306368>

for 'Vegaøyane – The Vega Archipelago.' It is vital that the State Party supports the next steps for this World Heritage property and that there is cooperation among the diverse ministries and agencies.

In conclusion, these considerations imply that new aquaculture proposals should not be permitted under current conditions. In addition, under current conditions no new industrial aquaculture should be permitted near to the World Heritage property and, indeed, existing aquaculture facilities should be reconsidered. This requires consideration of existing aquaculture facilities in neighbouring municipalities close to the World Heritage property, in the true spirit of the intermunicipal coastal plan. This also points to the need for a broader review of the buffer zone boundaries and management of the wider setting which is explored further in section 5.3.

5.2 RECOMMENDATIONS ON THE VEGA SECTION OF THE HELGELAND COASTAL PLAN AND THE PROPOSED AQUACULTURE FACILITIES

5.2.1 Recommendations on the Vega section of the Helgeland Coastal Plan

- Vega Municipality is recommended to adopt a revised version of the Helgeland Coastal Plan, *without new aquaculture proposals* within or near to the World Heritage property, in order to provide a clear framework for planning decision-making that takes into consideration World Heritage commitments.
- Marine traffic, fishing and outdoor recreational activities need to be defined and monitored so that the potential positive benefits can be gained for the local community and for the World Heritage property, without risking any potential negative impacts.
- Spatial planning as a whole should be updated for Vega Municipality so that the coastal plan is integrated with a more extensive municipal masterplan. This is so that all land and sea areas of the Vega Archipelago, and their connections, are consistently considered together. These planning tools must guarantee due regard to World Heritage commitments with the introduction of decision making based on heritage values.
- Integrated land and sea planning for the Vega Archipelago should take on greater social-ecological responsiveness in the overall planning framework. One priority, for example, would be the identification of a new category of area: habitats that are the focus of restoration efforts. This would have benefits both for the natural environment and also for community livelihoods; for example, the restoration of marine habitats has shown to create benefits for fisheries and promote food security.⁶⁶⁵
- Another example is the integration of demographic trends, such as depopulation, so every decision is tested against considerations central to safeguarding the Outstanding Universal Value World Heritage and local community wellbeing. World Heritage efforts should also support local community livelihoods, diverse employment opportunities and economic benefits, and a range of other initiatives could be explored which are not on an industrial scale and therefore more likely to be compatible with Outstanding Universal Value.⁶⁶⁶ Other similar areas of northern Norway have been considering ways in which to encourage 'return migration' of people who want to offer quality of life to their families after a period of education and employment away from the islands.⁶⁶⁷

⁶⁶⁵ E.g., Sala, E., Mayorga, J., Bradley, D. *et al.* (2021) Protecting the global ocean for biodiversity, food and climate. *Nature* 592: 397–402. Available from: <https://doi.org/10.1038/s41586-021-03371-z> Pillay, T.V.R. (2004) *Aquaculture and the Environment*. Blackwell Publishing: 146 refers to evidence of substantial colonization of restored seagrass with benefits to fisheries and kelp reforestation is promoted by Hancke, K., Gundersen, H., *et al.* (2018) Helgeland: An Atlantic archipelago (Norway). In: Tunón, H. (ed.) *Biodiversity and ecosystem services in Nordic coastal ecosystems – an IPBES-like assessment*. Vol. 2. *Geographical case studies*. Nordic Council of Ministers.

⁶⁶⁶ In the mid twentieth century many rural communities in the Alps suffered extreme problems of depopulation and poverty but long-term planning, innovation and diversification of the economic model through the seasons has made these rural communities vibrant. These efforts are now being supported by the Foundation for the Dolomites World Heritage property, see: <https://www.dolomitiunesco.info/>

⁶⁶⁷ Kennedy, J.C. (2006) *Island Voices. Fisheries and community survival in northern Norway*. Eburon.

5.2.2 Recommendations on aquaculture

- As no damage or potential harm to Outstanding Universal Value can be considered acceptable, the proposed salmon aquaculture facilities should not be approved, nor should any other new industrial aquaculture or extensions to existing facilities be approved under current conditions.
- At least under current conditions, existing aquaculture facilities within or near the World Heritage property, including neighbouring municipalities should be reconsidered, ideally within a broader review of the buffer zone boundaries and management of the wider setting. Under current conditions, when they come to an end they should not be renewed, nor should new facilities be approved.
- Proposals for other forms of aquaculture that are potentially more compatible with World Heritage could be considered. Locally-owned companies could find that expansion into restorative and multi-trophic aquaculture can potentially provide benefits for the local economy and habitats in the Vega Archipelago.⁶⁶⁸ These may not be of interest to large commercial companies working at industrial scales but are more likely to support Outstanding Universal Value.
- There is a need for intermunicipal evaluation of all existing aquaculture facilities in the World Heritage property and its wider setting, to understand the cumulative impacts of multiple facilities on the Helgeland coast's ecosystems and existing aquaculture facilities should be reconsidered.
- Stronger and more systematic mapping and monitoring of the attributes of 'Vegaøyane – The Vega Archipelago', and their interdependencies, needs to be taken forward to inform future proposals for aquaculture, other uses of the seascape and, indeed, the archipelago as a whole. The need for more complete mapping of marine habitats in order to inform decision-making around the siting of aquaculture is recognized by Norwegian institutions and efforts are already underway to fill data gaps.⁶⁶⁹ However, this needs to be prioritized and made more comprehensive for the Vega Archipelago, so that habitats are mapped and their state of conservation monitored. Until this is complete, the Precautionary Principle needs to be robustly applied.

⁶⁶⁸ The Nature Conservancy (2021) *Global Principles of Restorative Aquaculture* [online]. Available from: https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_PrinciplesofRestorativeAquaculture.pdf

⁶⁶⁹ Kutti, T. & Husa, V. (2021) *Forslag til metode for kartlegging av sårbare arter og naturtyper på dypt vann til søknader om akvakultur i sjø - Kunnskapsleveranse til Fiskeridirektoratet. Rapport fra havforskningen 2021-39* [online]. Available from: <https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2021-39>

5.3 BROADER CONSIDERATIONS ON THE MANAGEMENT SYSTEM FOR THE 'VEGAØYAN – THE VEGA ARCHIPELAGO' WORLD HERITAGE PROPERTY

Managing cultural landscapes has been recognised as raising particular challenges.⁶⁷⁰ However, 'Vegaøyen – The Vega Archipelago' raises the additional complexity of a cultural landscape that has elements of both continuing and fossil/relict landscapes.

World Heritage status has often been associated with tending eider ducks, the outer islands, and particular historical periods; however, the World Heritage property is a much more complex reality. From low-lying islands and shallow waters to the high mountain peaks, these come together in an intricate set of interdependencies to form this vast self-regulating social-ecological system. This means that those managing the property, its buffer zone and its wider setting to meet the requirements of the World Heritage Convention⁶⁷¹ find themselves with very different heritage typologies that cannot be managed in isolation. Even the management of cultural monuments, which is often a simpler task, requires dealing with isolated features that have lost their original purpose and need to be approached in holistic ways.

Moreover, centuries of human use and management of the natural resources make people's ways of life an integral and dynamic part of the place. Even traces of prehistoric human activity need to be managed as part of a network of signs of human presence in this remote and inhospitable place. They illustrate how people have always been dependent on the bounty of the land and the sea, and how ingenious natural resource use defined past existence and still remains the key to the resilience to the present day.

The complexity is not limited to the overlapping layers of meaning of this cultural landscape and the elaborate array of heritage attributes that convey it. In formulating recommendations for the future of the 'Vegaøyen – The Vega Archipelago' World Heritage property (section 5.4), it is important to note how challenging it has been for all parties involved in conserving and managing this World Heritage property to navigate the following issues, notwithstanding shortcomings in governance, planning and management models: a) multiple and often private forms of fragmented ownership, b) multiple overlapping management mandates, c) a buffer zone and wider setting which has an elevated capacity to impact on the effectiveness of conservation and management; and d) marine and land areas with multiple overlapping jurisdictions.

In addition, knowledge gaps have hampered effective and timely decision-making mechanisms in recent years. Resolving these difficulties is a precondition for safeguarding Outstanding Universal Value and integral to the wider obligation of ensuring that World Heritage benefits local people and is central to a thriving local community who can continue to flourish on and care for these islands.

The Vega Archipelago departs from a strong foundation thanks to the World Heritage Foundation's efforts to embed values-led approaches in many of its conservation and management activities. However, planning frameworks for 'Vegaøyen – The Vega Archipelago' would benefit from adjustments to the Planning and

⁶⁷⁰ Mitchell, N., Rossler, M. & Tricaud, P.-M. (eds) *World Heritage Cultural Landscapes*. UNESCO. Available from: https://whc.unesco.org/documents/publi_wh_papers_26_en.pdf

⁶⁷¹ As expressed by the Operational Guidelines: UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]. Available from: <https://whc.unesco.org/en/guidelines/>

Building Act, associated regulations and their implementation, in particular the integration of legislation that empowers authorities and other stakeholders to meet World Heritage obligations.

As Part 2 showed, Vega Archipelago is both representative of the wider Norwegian coastline and its traditional communities, as well as having its own distinct set of characteristics that stem from a unique arrangement of features and processes that meet in this specific place. This means that the Vega Archipelago lends itself to radical innovations in terms of good governance, planning and funding models in order to demonstrate how rural coastal communities can thrive in the twenty-first century in harmony with their environment and their heritage.

Given the nature of the Outstanding Universal Value of ‘Vegaøyane – The Vega Archipelago,’ the objectives of any such innovation would reach well beyond World Heritage obligations for this specific inscription. An experiment of this kind would make Vega a learning site for the entire World Heritage community in management of continuity and change, resilience building and sustainable development models inspired by Outstanding Universal Value. The aim would be to use a holistic understanding of Outstanding Universal Value – including its interdependencies with society and the natural environment – as a catalyst for developing management models which contribute to the Sustainable Development Goals while ensuring that the Vega Archipelago is safely transmitted to future generations.⁶⁷²

⁶⁷² Thereby fulfilling the requirements of the 2015 *Policy for the Integration of a Sustainable Development Perspective into the Processes of the World Heritage Convention*: <https://whc.unesco.org/en/sustainabledevelopment/>

5.4 RECOMMENDATIONS ON THE MANAGEMENT SYSTEM OF 'VEGAØYAN – THE VEGA ARCHIPELAGO' WORLD HERITAGE PROPERTY

5.4.1 Recommendations on legislative frameworks

- Awareness needs to be built around the fact that the UNESCO World Heritage Convention constitutes international legislation. World Heritage is not simply a status but a series of obligations to be met. It is this common misinterpretation that perhaps created misunderstandings around the Statement of Intent outlining the future development of the Vega Archipelago that was signed prior to inscription. Recognizing this is the first step to managing expectations, consensus building and effective governance of World Heritage.
- Norway, like many countries, has attempted to meet the obligations created by the UNESCO World Heritage Convention through existing heritage and territorial planning tools. Given the size and governance and management complexity of many Norwegian World Heritage properties, in particular for 'Vegaøyen – The Vega Archipelago', it would seem desirable to domesticate the Convention with a specific body of national law.

5.4.1 Recommendations on governance

- Norway commendably places emphasis on locating decision making near to local challenges through decentralisation and co-responsibility in governance models, with a major role for local and regional authorities. However, these authorities need to be provided with instruments to meet the requirements of international obligations.
- Decentralisation with regards to World Heritage and protected areas currently means that the decision-making mandate largely lies with elected representatives. This encouraging sign of civil society engagement needs to be balanced and supported by expert input from both individual specialists and institutions. New governance models could help overcome the inherent risk of potential conflicts of interest in small communities.
- In other cases, centralised decision-making still occurs apparently without regional or local consultative processes or intersectoral contributions. One example is that national decision-making for kelp trawling can encroach on a municipality's area of jurisdiction and hence, in the case of the Vega Archipelago, create potential impacts on the World Heritage property. A recent decision for a new campaign of kelp trawling in the Vega Archipelago is a case in point⁶⁷³ and such exceptions to the decentralisation of decision making are a genuine concern in terms of negative impacts and failing to meet the World Heritage requirements. Governance frameworks need to be adjusted.
- The Norwegian government was long-sighted in its creation of dedicated World Heritage coordinators. These are such important roles that adjustments could usefully be made to improve the model. For example, these figures could be given a clearer legal mandate and/or a greater level

⁶⁷³ <https://www.fiskeridir.no/Yrkesfiske/Nyheter/2022/apner-taretraling-pa-helgelandskysten>

of responsibility. It would appear that the World Heritage coordinators carry out advocacy, coordination and formal reporting, but they have not been in a position to improve governance models, decision making and planning tools, nor have they been able to push in the direction of becoming research hubs for values-based monitoring and evaluation, both spheres in which they could make a significant contribution. If a stronger legal mandate is inappropriate, clarity could at least be achieved regarding who has the legal mandate for managing the site (currently in the case of 'Vegaøyen – The Vega Archipelago' this is *de facto* the municipality). Either direction would give the coordinators a value and clarity of purpose that would make their contribution central to meeting World Heritage obligations and other actors tasked with World Heritage management could be empowered.

5.4.2 Recommendations on planning and monitoring frameworks

- The World Heritage coordinator should be the research, knowledge management and monitoring hub for the property. One primary responsibility would be regularly updating the baseline assessment of the World Heritage property, monitoring the state of conservation of the heritage place and the effectiveness of the management system, and helping ensuring that these inform future decision-making processes through proactive management of continuity and change in the cultural landscape.
- Local municipal technical offices and other relevant departments need to be equipped with this baseline assessment of the World Heritage property. Related planning and monitoring tools based on heritage would then be more capable of dealing with, for example, spatial planning and landscape character; resource use and other nature-culture-people interdependencies; the dynamism and responsiveness required when it is recognised that heritage management is the management of change and continuity. This would harness the full potential role of heritage in the sustainable development of the local community.
- Norway's 2003 ratification of the European Landscape Convention was a timely and long-sighted step in view of ever larger World Heritage properties in Norway: 'Vegaøyen – The Vega Archipelago' was followed by the inscription of the West Norwegian Fjords and the landscape containing the 'Rjukan–Notodden Industrial Heritage Site,' and in the same period a major extension was agreed for the 'Røros Mining Town and the Circumference.' Future revisions to the Planning and Building Act could benefit from a dedicated section for World Heritage that creates planning tools that address the complexity that the conservation and management (and liveability) of these large heritage places raise, for example, creating the conditions for land- and seascapes to be addressed together with integrated jurisdiction.
- Furthermore, the values-based approaches promoted by World Heritage could benefit Norwegian legislation for heritage more broadly through crosscutting integration into a revised Planning and Building Act. Planning tools that step beyond the current zoning approach, and can respond better to the speed of change, are recommended. Improvements to the effectiveness and timeliness of planning responses could include:
 - landscape concepts: for example, integrating view cones, consideration of spatial interdependencies, integrating heritage and conservation values into planning tools when

considering new development proposals (e.g., aquaculture facilities, cabins or wind turbines) or significant changes (e.g., relocating highly visible telecommunications infrastructure)

- sustainable development and social-ecological considerations: for example, a greater understanding and proactive management of changes in use patterns of the land- and seascape and their implications for infrastructure and quality of life of local communities (e.g., the Vegatrappa walking route, the seasonal arrival of camper vans or recreational fishers).

5.4.3 Recommendations on capacity building for World Heritage

- New management models are needed to recognize – and then support and reinforce – the role of the Vega people in their heritage place. The Statement of Outstanding Universal Value for ‘Vegaøyan – The Vega Archipelago’ places the local community as an integral part of the World Heritage property and without them the Outstanding Universal Value would collapse. As a living cultural landscape, management processes, not just results, are an integral part of the significance of this heritage place and the basis for looking for ways forward. The local community plays multiple roles: they contribute to governance and management, they assign importance to, and benefit from, the heritage place, and in doing so they become attributes of Outstanding Universal Value. New models for recognizing these roles and processes and for measuring benefits, if successful, could illustrate a much-needed paradigm shift in the heritage sector whereby heritage is finally managed as an integral part of society and thanks to the efforts of non-heritage sectors.
- Norway could very usefully carry out work in the area of buffer zones and wider settings to World Heritage properties and identify a framework for decision-making regarding these areas. The World Heritage system worldwide is struggling to find practical ways to define the different roles of buffer zones for each property, while ensuring that it always provides an added layer of protection. Heritage values-based approaches to planning and management can improve safeguarding and enhancing⁶⁷⁴ Outstanding Universal Value within the property, and also identify which features and qualities of the buffer zone and wider setting have interdependencies with it.
- Norway already sets an excellent example by placing an emphasis on re-examining and improving conditions at its existing World Heritage properties rather than inscribing more. This could extend to a retrospective audit and mapping of attributes that convey Outstanding Universal Value at ‘Vegaøyan – The Vega Archipelago’ and other properties. This is likely to lead to the re-definition of boundaries and buffer zones and the need for either minor or major boundary modifications, or simply more empowered site management that is aware of the strengths and weaknesses of how the World Heritage property was conceived.
- Norway has long played an active role in the World Heritage community through strong contributions to the Committee and funding innovative global capacity building. It would be of even greater benefit to the international community to see a clear example of values-based management of World Heritage that integrates sustainable development perspectives. Given ‘Vegaøyan – The Vega

⁶⁷⁴ UNESCO World Heritage Centre (2021) *The Operational Guidelines for the Implementation of the World Heritage Convention* [online]: paragraph 96. Available from: <https://whc.unesco.org/en/guidelines/>

Archipelago' 's Outstanding Universal Value, which is essentially about resilience and a constant ability for adaptation against a changing hostile environment, there is no better place to create such an example. It would take a radical renegotiation of relationships and priorities among national-level institutions, regional and local authorities, and other stakeholders, but the potential is immense. World Heritage funding could subsidise cutting-edge start-ups that encourage increased occupancy of the Vega Archipelago and multiple, seasonally varying, activities. This would apply a sustainable development perspective to the huge potential of this extraordinary place and its multiplicity of heritage values to create a stronger future through innovation in coastal rural development.

5.5 FINAL CONCLUSIONS

Norway as a State Party to the World Heritage Convention is at a fork in the road when it comes to decision making for ‘Vegaøyane – The Vega Archipelago’ and its coastal community. The prospects and opportunities available to the State Party in the immediate future can be summarised in the following way:

- To adopt the Vega section of the Helgeland Coastal Plan in its current form, including the two proposed aquaculture facilities
- To adopt the Vega section of the Helgeland Coastal Plan after revising it on the basis of World Heritage considerations and without new aquaculture
- To continue without any formal planning framework for Vega Municipality’s sea areas, while permitting the proposed aquaculture facilities
- To continue without any formal planning framework for Vega Municipality’s sea areas but not permitting the proposed aquaculture facilities

On the basis of the findings of this impact assessment, it is recommended that the State Party should work with the Vega Municipality to adopt a revised Helgeland Coastal Plan in light of World Heritage considerations, *without* new aquaculture proposals in the property, its buffer zone or wider setting. There would be a number of positive impacts gained through proactive management and planning for the seascape. By formalizing the existing uses of the coastal area, decision-makers would have a framework within which to take informed planning decisions for the World Heritage property and beyond. Proposals for new or modified uses of this area could then be judged to see if they are compatible within this overall framework, thereby avoiding *ad hoc* decisions made on individual cases. This framework, in time, would need to be reinforced or replaced by measures emerging from the integration of World Heritage commitments into Norwegian legislation and by more suitable planning and management tools, ideally addressing land and sea areas together.

Instead, as no damage or potential harm to Outstanding Universal Value can be considered acceptable, the two proposed aquaculture facilities should not be approved. Moreover, at least under current conditions, existing aquaculture facilities within or near the World Heritage property, including neighbouring municipalities should be reconsidered, ideally within a broader review of the buffer zone boundaries and management of the wider setting. Stronger and more systematic mapping and monitoring of heritage attributes of ‘Vegaøyane – The Vega Archipelago’, and their interdependencies, needs to be taken forward to inform future proposals for aquaculture, other uses of the seascape and, indeed, the archipelago as a whole.

The Outstanding Universal Value of this World Heritage property relies on the presence of a vibrant local community as much as it does on healthy ecosystems. Solutions perhaps lie in the strength of Norway’s international partnerships for World Heritage. Norway has long been an active member of the World Heritage community, encouraging other State Parties to meet their commitments and continually improve management practices. In this context, ‘Vegaøyane – The Vega Archipelago’ becomes an opportunity for Norway to demonstrate leadership through the implementation of new approaches to World Heritage to meet the challenges of the twenty-first century. The priorities would be research and monitoring to understand and manage the Vega Archipelago as a social-ecological system and identifying and actively

supporting ways of life and uses of the landscape, seascape and marine resources that ensure livelihoods and wellbeing of the local population, together with the maintenance of healthy ecosystems.

Figure 5.1 tries to capture how a model of development of the Vega Archipelago that embraces its heritage significance could be decisive when local economic vibrancy and the wellbeing of the local community are seen as part of the Outstanding Universal Value, as much as the health of ecosystems and the survival of natural resource use practices.

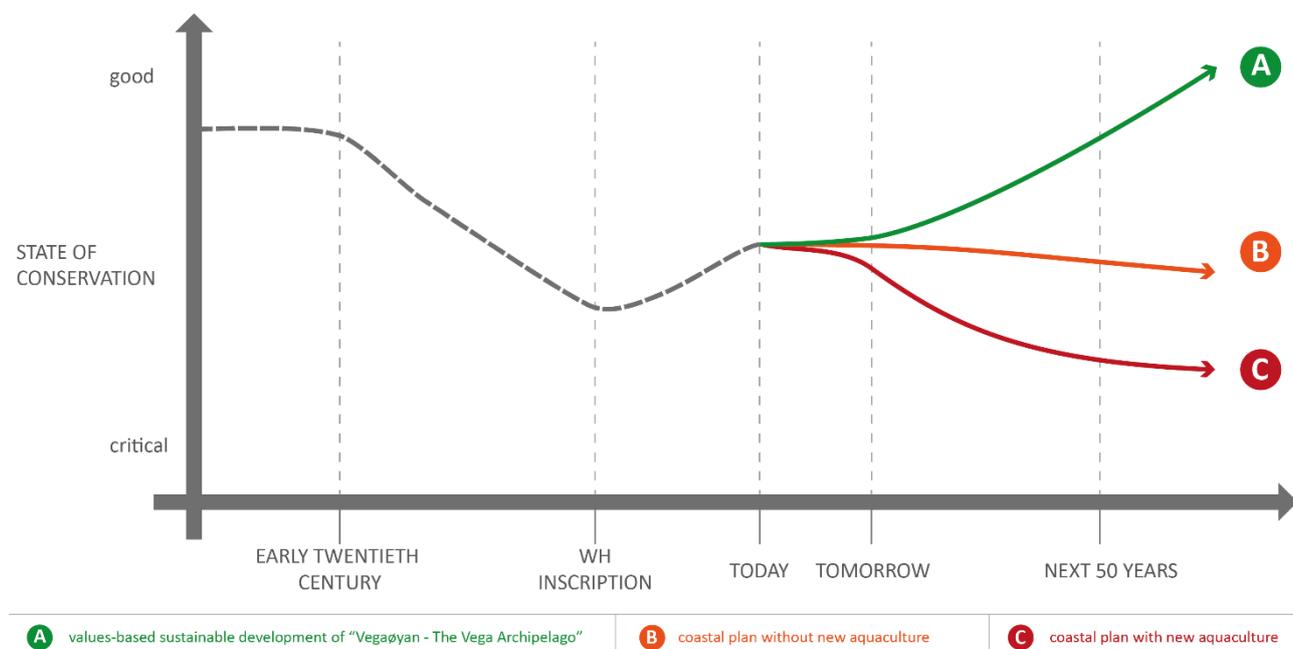


FIGURE 5.1. This schematic overview illustrates past trends and potential future prospects with regards the state of conservation of heritage of ‘Vegaøyen – The Vega Archipelago.’ It compares three scenarios: (A) adjusting legislative frameworks, governance and management to ensure more people-centred, holistic approaches to this cultural landscape and social-ecological system; (B) abandoning industrial aquaculture but maintain current planning, funding and governance models; and, (C) maintaining industrial aquaculture as a pillar of the economic model of the Vega Archipelago. Decisions about which future scenario to pursue need to be made with consideration of both the natural and cultural environment and the people who live there. *Source: Insted Heritage*

A clear long-term vision is needed for the Vega Archipelago based on cultural and natural heritage values and which takes people-centred approaches to safeguarding heritage through empowering local entrepreneurship and rural life. It would require adjustments to how institutions contribute expertise and funding and how they partake in decision making, perhaps stimulating improvements to governance for this World Heritage property to overcome the mismatch between Norway’s strong tradition of decentralization and co-responsibility and the obligations of international legislation.

This paradigm shift in management would be of particular resonance given that sustainable development is at the heart of ‘Vegaøyen – The Vega Archipelago’ ’s Outstanding Universal Value. The archipelago’s model of livelihoods based on the mobility of households - work sector, location and seasons - is at the heart of current research regarding sources of resilience in the face of climate breakdown. Building on existing cultural and natural values, ‘Vegaøyen – The Vega Archipelago’ has the potential to showcase to the global community the way in which sustainable practices and diversification of ways of life can bring benefits for both World Heritage and for society as a whole.



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A detail of a building in Eidem, on Vega island. Source: *Ascanio D'Andrea* / *Instead Heritage*