DELIVERABLE 1.9

Report on the outcomes of scoping, co-design, review and synthesis workshop

Version 2.0

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Executive summary

The SEAwise stakeholder integration aims to ensure that the key issues of relevance, current ecosystem status, potential management measures are identified and prioritised for further evaluation in the project and hence that the end results are relevant to the end users. This deliverable report describes the approach taken to identify the stakeholder community, stakeholder interests and responsibility and subsequently establish ecological and social system priorities. The SEAwise consultations in the first half year of the project had the specific aims to identify key stakeholders, build trust and common understanding between SEAwise scientists and these stakeholders, identify key issues of relevance for ecosystem based fisheries advice, current ecosystem status and potential management measures, identify priorities of these key issues and evaluate how this varies between consultation methods and regions. Stakeholders were contacted through the Mediterranean Advisory Council (MEDAC), Southwestern Waters Advisory Council (SWWAC), Northwestern Waters Advisory Council (NWWAC), North Sea Advisory Council (NSAC). Pelagic Advisory Council (PELAC) and Baltic Sea Advisory Council (BSAC). Scientists participating in the project completed the same exercises for comparison. The choice of consultation method was chosen to enhance equal influence of all participants by minimising the impact of the organising scientists' expectations and emergent group dynamics on group results. Three different approaches were used (individual consultation: 79 contributors, individual consultation in a group environment: 106 contributors and group consultation: 106 contributors). In total, 2752 key issues were identified. Six issues were identified consistently across regions and participant groups: climate change, MPAs, windfarms, employment and small scale fisheries. The remaining words often were identified only by either SEAwise scientists or stakeholders and there were frequent instances where one of these group identified a word in the top 10 whereas the other group did not mention the word. The results highlight the importance of scoping the key topics beyond the scientists participating in the project and the need to consider consultation methods thoroughly. Moving forward in SEAwise, the individual scoping results will be used to identify issues which interested users may first search for and the workshop cloud scoping together with the individual scoping results to identify key topics for advice. The differences between SEAwise participant and stakeholder key topics will be used in the project to raise awareness of the need to talk to end users about the advice produced in advance.

Contents

1. SEAwise background

The SEAwise project works to deliver a fully operational tool that will allow fishers, managers, and policy makers to easily apply Ecosystem Based Fisheries Management (EBFM) in their own fisheries. With the input from advice users, SEAwise identifies and addresses core challenges facing EBFM, creating tools and advice for collaborative management aimed at achieving long-terms goals under environmental change and increasing competition for space. SEAwise operates through four key stages, drawing upon existing management structures and centered on stakeholder input, to create a comprehensive overview of all fisheries interactions in the European Atlantic and Mediterranean. Working with stakeholders, SEAwise acts to:

- Build a network of experts - from fishers to advisory bodies, decision makers and scientists - to identify widely-accepted key priorities and co-design innovative approaches to EBFM.
- Assemble a new knowledge base, drawing upon existing knowledge and new insights from stakeholders and science, to create a comprehensive overview of the social, economic, and ecological interactions of fisheries in the European Atlantic and Mediterranean.
- Develop predictive models, underpinned by the new knowledge base, that allow users to evaluate the potential trade-offs of management decisions, and forecast their long term impacts on the ecosystem.
- Provide practical, ready-for-uptake advice that is resilient to the changing landscapes of environmental change and competition for marine space.

The project links the first ecosystem-scale impact assessment of maritime activities with the welfare of the fished stocks these ecosystems support, enabling a full-circle view of ecosystem effects on fishing productivity in the European Atlantic and Mediterranean. Drawing these links will pave the way for a whole-ecosystem management approach that places fisheries at the heart of ecosystem welfare. In four cross-cutting case studies, each centered on the link between social and economic objectives, target stocks and management at regional scale SEAwise provides:

- Estimates of impacts of management measures and climate change on fisheries, fish and shellfish stocks living close to the bottom, wildlife bycatch, fisheries-related litter and conflicts in the use of marine space in the Mediterranean Sea,
- Integrated EBFM advice on fisheries in the North Sea, and their influence on sensitive species and habitats in the context of ocean warming and offshore renewable energy,
- Estimates of effects of environmental change on recruitment, fish growth, maturity and production in the Western Waters,
- Key priorities for integrating changes in productivity, spatial distribution, and fishers' decision-making in the Baltic Sea to create effective EBFM prediction models.

Each of the four case studies will be directly informed by expert local knowledge and open discussion, allowing the work to remain adaptive to change and responsive to the needs of advice users.

1.1 The role of this deliverable

This deliverable report describes the approach taken to complete the stakeholder integration in steps 1 and 2 of the SEAwise EBFM:
1. Identify the stakeholder community, and with them, maps of the ecoregions, their species and habitats, stakeholder interests and responsibility;
2. Establish ecological and social system priorities under current legislation and regulation, determine major factors influencing these priorities, conduct susceptibility analysis and identify potential management strategies through co-design workshops and systematic reviews

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2. Aims of scoping

The SEAwise stakeholder integration aims to ensure that the key issues of relevance, current ecosystem status, potential management measures are identified and prioritised for further evaluation in the project and hence that the end results are relevant to the end users. The SEAwise consultations in the first half year of the project had the following specific aims

- To build trust and common understanding between SEAwise scientists and key stakeholders.
- To identify key issues of relevance for ecosystem based fisheries advice, current ecosystem status and potential management measures
- To identify priorities of these key issues and evaluate how this varies between individuals
- To compare results between regions and group sessions
- To compare results between different scoping methods within a region

3. Identifying the stakeholder community

The stakeholder community was identified as regional industry participants, NGOs, scientists, advisory organisations, managers and policy makers. Industry participants and NGOs were contacted through Advisory councils, effectively making the relevant stakeholder community for these groups the Advisory Council members and collaborators (e.g. UK organisations). This approach meant that an individual participating in more than one Advisory Council can potentially contribute twice to the process. The Advisory Councils contacted were Mediterranean Advisory Council (MEDAC), Southwestern Waters Advisory Council (SWWAC), Northwestern Waters Advisory Council (NWWAC), North Sea Advisory Council (NSAC), Pelagic Advisory Council (PELAC) and Baltic Sea Advisory Council (BSAC). Scientists were identified as project participants. Advisory organisations were identified as GFCM and ICES, specifically the GFCM and ICES members of the SEAwise Advisory Board as well as ICES project participants. Managers and policy makers were contacted through project participant networks.

4. Scoping methods

The aim of the stakeholder consultation will impact the choice of the most appropriate consultation method. The choice of consultation method was therefore carefully considered in advance. Specific attention was given to minimise the impact of the organising scientists' expectations and emergent group dynamics on group results. Comparability of results was ensured by using common methods in all regions and group sessions.

Three different approaches was used to identify key issues of relevance, current ecosystem status and potential management measures (Individual consultation, individual consultation in a group environment and group consultation). Two approaches used to identify priorities of these key issues and evaluate how this varies between individuals (Individual consultation, individual consultation in a group environment). The combination of these methods allowed the identification of key priorities with and without group dynamics. The key issues were discussed in further detail in a group consultation to allow a common understanding of their definition.

4.1 Build trust and common understanding

Trust and common understanding was built by discussing the project aims and approaches with stakeholders regularly before and after the onset of the project. Further, existing networks of the project participants were used to reach out to stakeholders to highlight the projects and the potential benefits for stakeholders from participating. Participants in the discussions were provided with a short description of the project (Annex A) and an introduction to how to contribute. The discussions also opened for suggestions for any topics that the consulted persons would like to receive more information on, not restricted to topics intended to be covered at the SEAwise proposal stage. As a minimum, three presentations were made in all Advisory Councils, the first presenting the project before or right after the project onset, a second describing the individual and workshop scoping activities and a third reporting the results of the individual and workshop scoping activities back to the Advisory Council.

4.2 Individual scoping

The individual scoping was designed to frame the input within Ecosystem Based Fisheries Management while not restricting participants to specific words or issues. In an attempt to inspire persons more visually oriented as well as persons inspired by seeing text, the individual scoping was performed by providing participants with a power point presentation of their ecosystem (fig. 1) along with potential ideas for issues to consider in Ecosystem Based Fisheries Advice (fig. 2). They were instructed to:

1. Think about your ecosystem
2. Think about who you are. Do you self-identify most as scientist, NGO, industry or interested citizen? Which gender? Write the reply on the slide.
3. Think about the things in your ecosystem. Make a list of items that you would like to get ecosystem based advice on for this ecosystem.
4. Put these items onto your map as text boxes or pictures from slide 8. Alternatively, draw on paper and take a photo. If using icons or drawings, please write next to them what they mean.
5. Choose arrows to show important connections between the items
6. Take a screen shot, save the presentation or take a photo and email it to ar@aqua.dtu.dk

Individual scoping contributions were generally supplied prior to any workshop activity, and the results are considered to represent the views of stakeholders prior to engaging with the project. Further, as the individual scoping contributions are independent of each other, the results are considered to be representative of the proportion of individuals identifying a specific issue as relevant for Ecosystem Based Fisheries Advice. The groups consulted included scientists and other project participants at the kick-off meeting in the first month of the project and Advisory Council members and collaborators in months 3 to 6 of the project. The individual scoping was introduced at Advisory Council meetings and participants signing up for the Advisory Council workshop were further contacted directly by email to complete the activity.

Fig. 1. Example of a regional slide on which key issues can be added by individual participants.

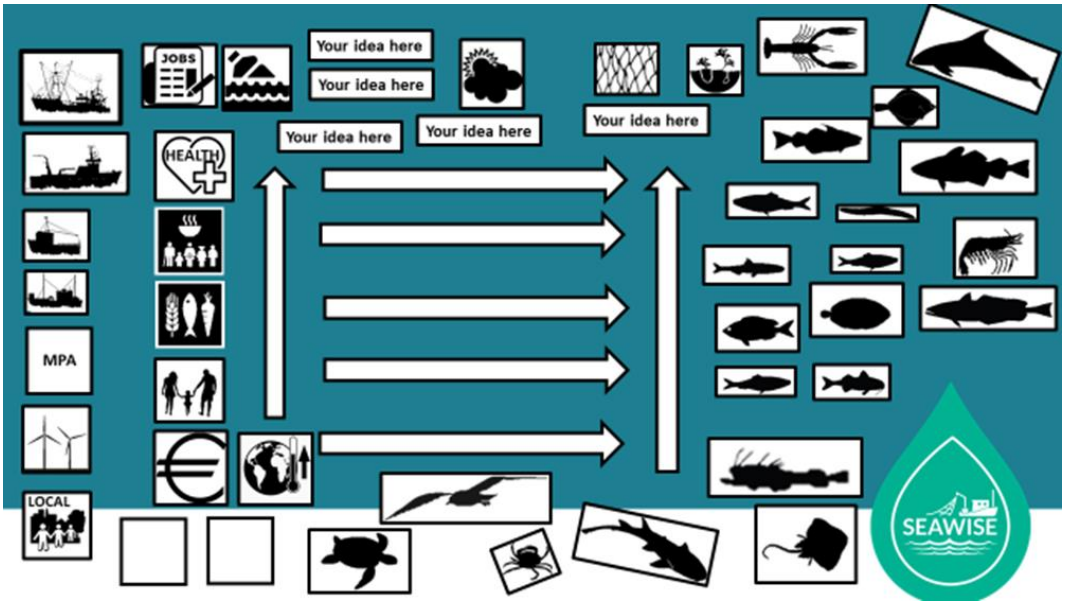

Fig. 2. Icons provided as inspiration or to use directly on the regional slide on which key issues can be added by individual participants.

4.3 Workshop scoping (quantitative)

Workshops to identify key issues were conducted with scientists and other project participants at the kick-off meeting in the first month of the project and Advisory Council members and collaborators in months 3 to 6 of the project. The workshops were initiated with asking participants to identify their background, region of interest and gender using the interactive tool slido (www.sli.do). Slido logs all poll reaults individually and hence subsequently allows linking replies to subgroups. Participants were then asked to contribute to three word clouds. A word cloud shows all words entered in the slido app with the size of the word reflecting how often the word appears. The questions asked were:

- Which ecological items would you like advice on?

- Which social items would you like advice on?
- Which items would you like to know the impact of?

Examples of word clouds are seen in fig. 3. After this, a discussion of the words entered was completed to provide further information. This process is described in section 4.4. Following these discussions, three additional questions were asked if time allowed:

- Which commercial stocks or species would you like advice on?
- Which non-commercial species and habitats would you like know the effect of fishing on?
- Which fisheries management measures do you think are relevant in your area?

Finally, a free text question was asked to identify topics participants would like SEAwise to talk about next meeting. The workshops scopings of MEDAC, SWWAC and NWWAC were completed with simultaneous translation during the meeting to at least three languages. Word cloud entries were translated in the coding of the data by a SEAwise partner fluent in the specific language as well as English.

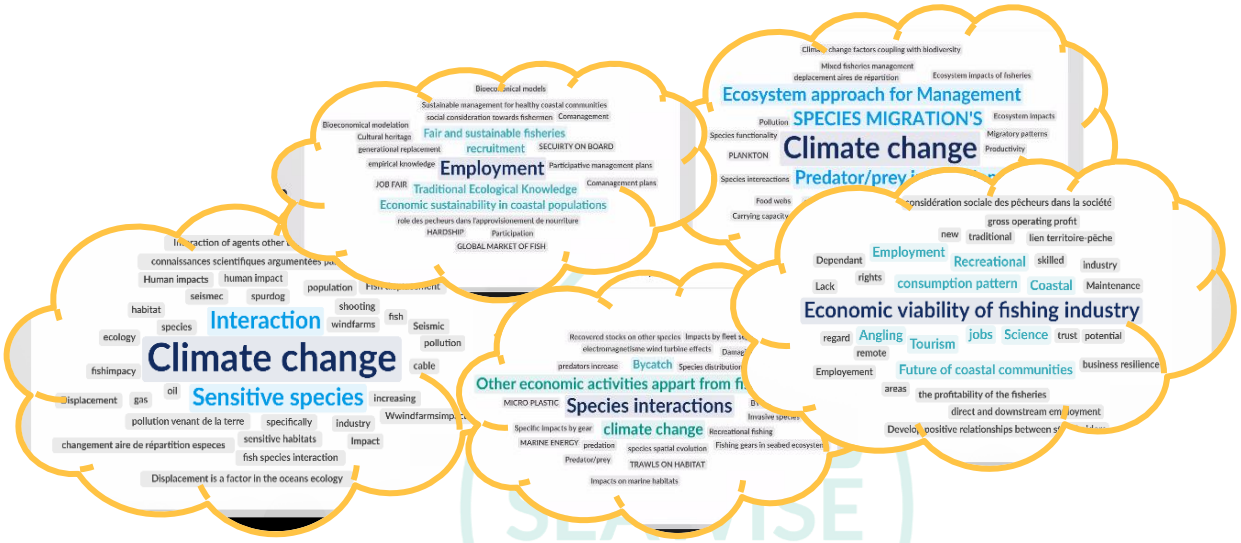

Fig. 3. Examples of word clouds recorded with different questions at Advisory Council workshops.

4.4 Workshop scoping (qualitative)

Following the completion of the word clouds on ecological items for advice, social items for advice and items which impact these, all entries were discussed one by one to ensure that the project representatives understood what was meant with the words listed. Further words were added if they were identified during this process. The workshops scopings of MEDAC, SWWAC and NWWAC were completed with simultaneous translation during the meeting to at least three languages.

4.5 Consultation of advisory organisations, managers and policy makers

SEAwise collaborates with advisory organisations, managers and policy makers through presenting results in relevant for and through the SEAwise Advisory Board. During the first half year of the project, this work has encompassed several meetings with ICES, the SEAwise Advisory Board as well as two presentations for

the European Parliament organised by the Intergroup on 'Climate Change, Biodiversity and Sustainable Development' (December 13 2021) and 'Renew Europe' (January 26th 2022).

4.6 Synthesis and comparison of results across regions

The results will be synthesised and compared across regions and with previous scoping exercises in the Deliverable 'SEAwise synthesis report on implementation of the EBFM and remaining knowledge gaps throughout the project' due in month 18.

5. Scoping participation overview

5.1 Individual scoping

A total of 79 individual scoping slides were obtained, some of which contained information for more than one region. Among these, 32 were obtained from the various ACs and dedicated contacts to Italian and Greek stakeholders. Among the participants giving their gender, 34% were women. An overview of contributors can be seen below.

Contact forum	Number of individual scopings recieved	Responding men	Responding women	Gender not given	Scientist	NGO	Industry	other
SEAwise partners Mediterranean	14	7	4	3	14	0	0	0
SEAwise partners Western waters	17	0	0	17	17	0	0	0
SEAwise partners North Sea	6	3	3	0	6	0	0	0
SEAwise partners Baltic Sea	9	6	3	0	9	0	0	0
MEDAC	3	1	2	0	0	0	2	1
Greek consultiation	7	6	1	0	0	2	3	2
Italian consultation	7	6	1	0	0	1	5	1
SWWAC	3	1	2	0	0	2	0	1
NWWAC	5	4	1	0	1	0	4	0
NSAC	3	2	1	0	0	0	3	0
PELAC	3	2	1	0	0	0	2	1
BSAC	2	1	1	0	0	2	0	0
Total	79	39	20	20	47	7	19	6

Together, the individual scoping slides contained 1489 key words that were used in the subsequent analyses. Listing only words that occurred at least 5 times in total among the stakeholder contributions resulted in 25 words describing ecological items, 4 words describing fisheries and 13 words describing social items (figs. 5.1 to 5.3).

The most frequently occurring items varied somewhat between SEAwise scientists and stakeholders. The SEAwise stakeholder consultations identified 270 ecological words while the Seawise scientists identified 472, corresponding to on average 8 and 10 words per participant, respectively. The top 10 ecological items mentioned by stakeholders were climate change, commercial fish/shellfish, marine mammals, seabirds, turtles, cod, climate, litter, shrimps, herring, invasive species and pollution (the last three shared rank). SEAwise scientists named the top 10 ecological items in order of occurrence as climate change, benthic habitats, marine mammals, cod, climate, commercial fish/shellfish, litter, shrimps, hake, seabirds, biodiversity, hake and species interactions (the last three shared a rank of 10). Benthic habitats, biodiversity and hake were almost exclusively mentioned by SEAwise scientists (5 times mentioned by stakeholders, 22 times identified by scientists) and turtles, invasive species and pollution mostly mentioned by stakeholders (2-5 times mentioned by scientists, 6-10 times by stakeholders). Acknowledging that hake is a commercial species, the divergence was on benthic habitats and biodiversity (scientists mostly) versus turtles, invasive species and pollution (stakeholders mostly). The top 5 fisheries items identified in the stakeholder consultations was small-scale fisheries, fishing, fisheries, medium-scale fisheries and large-scale fisheries. Among the SEAwise scientists, the words were fisheries, small-scale fisheries, large-scale fisheries, fishing and pelagic fisheries.

The stakeholder consultations identified the top 10 items as employment/jobs, windfarms, local communities, MPAs, food supply, revenue, people, pollution, governance, socioeconomic impacts and profit (the last two shared rank). SEAwise scientists named the top 10 social items in order of occurrence as MPAs, windfarms, local communities, employment/jobs, food supply, revenue, health, other human activities, spatial management, economics, food security, marine spatial planning and society (the last four shared a rank). Acknowledging that economics and socioeconomic impacts is a wider term for many of the listed items, the divergence was on health, other human activities, spatial management, food security, marine spatial planning and society (participants only) versus pollution, people, governance and profit (stakeholders only). Further analyses of the results can be seen in deliverable reports 2.1, 3.1, 4.1 and 5.1.

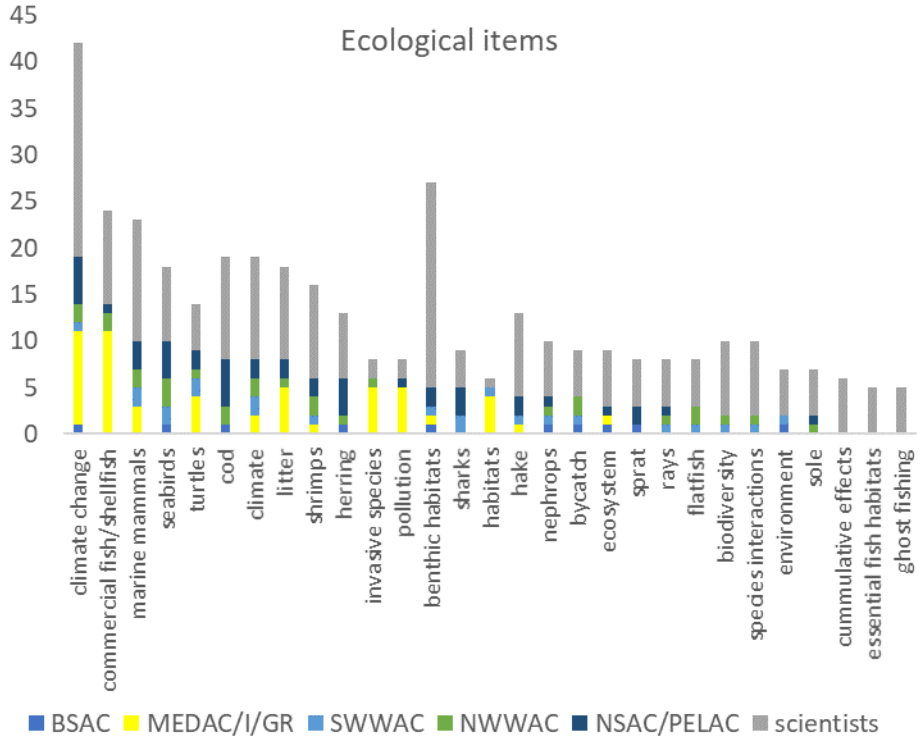

Fig. 5.1. Ecological items occurring at least 5 times in the individual slides from stakeholders or SEAwise scientists.

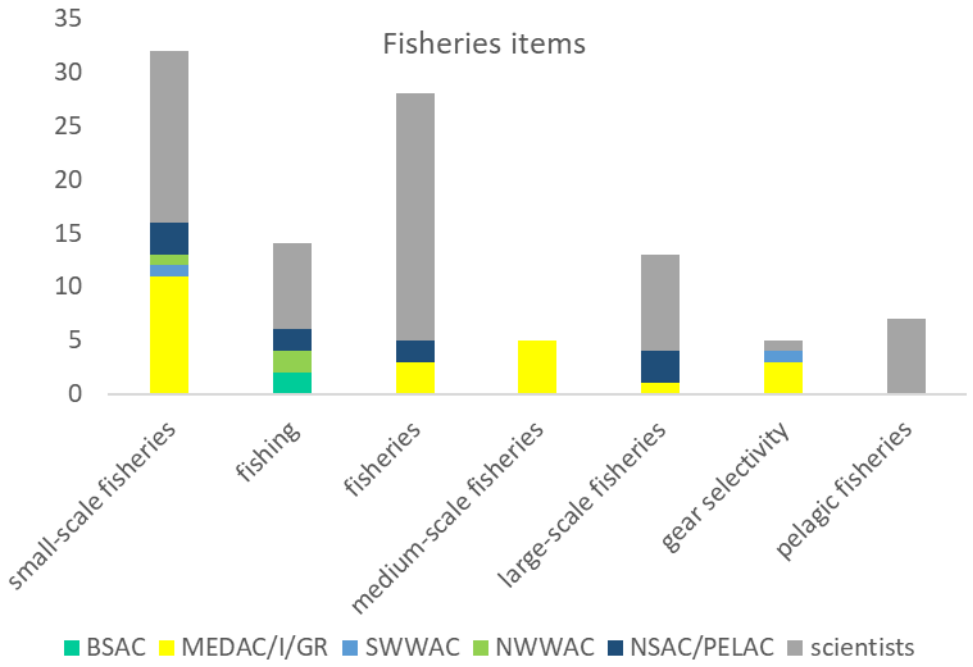

Fig. 5.2. Fisheries items occurring at least 4 times in the individual slides from stakeholders or SEAwise scientists.

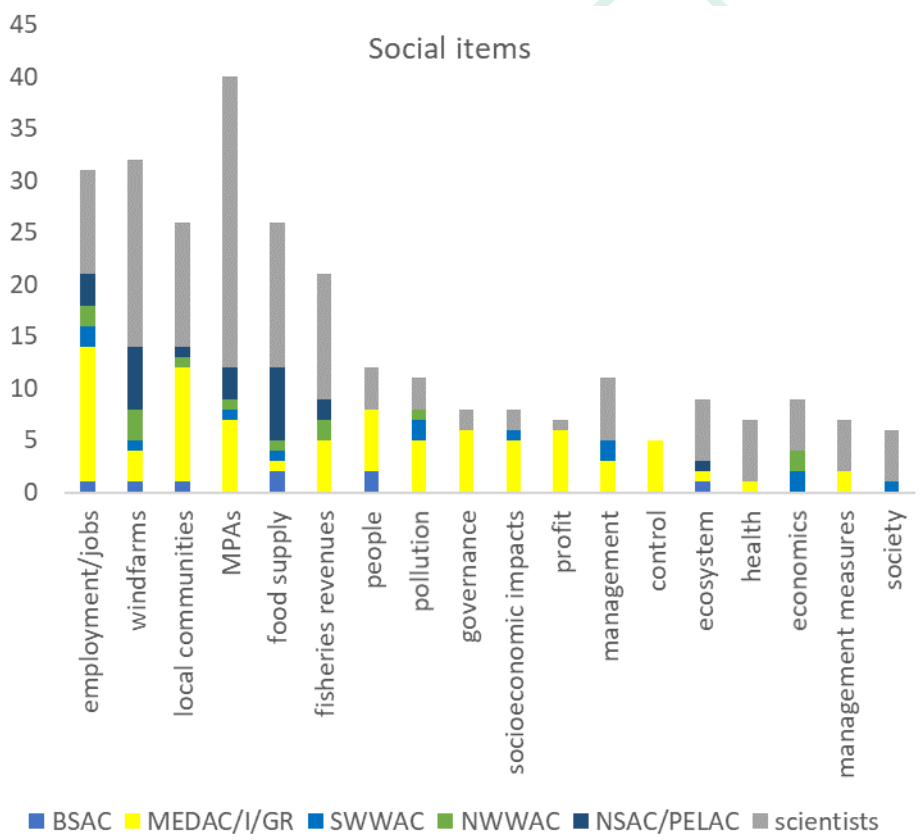

Fig. 5.3. Social items occurring at least 5 times in the individual slides from stakeholders or SEAwise scientists.

5.2 Workshop scoping (quantitative)

A total of 98 persons engaged in the word cloud scoping exercises. Among these, 42 were obtained from the various ACs. Among the participants giving their gender, 38% were women. An overview of contributors can be seen below.

Contact forum	Number of cloud scopings recieved	Responding men	Responding women	Gender not given	Scientist	NGO	Industry	other
SEAwise partners Mediterranean	14			14	14	0	0	0
SEAwise partners Western waters	17			17	17	0	0	0
SEAwise partners North Sea	16			16	6	0	0	0
SEAwise partners Baltic Sea	9			9	9	0	0	0
SWWAC	14	5	3	6	0	1	1	2
NWWAC	14	3	1	10	0	2	6	1
NSAC	8	3	1	4	0	0	4	0
PELAC	6	2	3	1	1	1	1	2
BSAC	8	2	3	2	1	1	1	3
Total	106	15	11	79	48	5	13	8

Together, the individual scoping slides contained 1262 key words which were used in the subsequent analyses. Listing only words that occurred at least 5 times in total in either stakeholder or SEAwise scientist input resulted in 22 words describing ecological items and 24 words describing social items (figs. 5.4 and 5.5).

The SEAwise stakeholder consultations identified 280 ecological words while the Seawise scientists identified 284, corresponding to on average 6 and 5 words per participant, respectively. The top 10 ecological items named in stakeholder consultations were climate change, species interactions, cod, plankton, bycatch, benthic habitats, PET species, environment, seals, marine mammals, seabass and sensitive species (the last 7 occurred the same number of times). SEAwise scientists named the top 9 ecological items in order of occurrence as climate change, biodiversity, bycatch, benthic habitats, climate, food web, fish stocks, ecosystem resilience and nutrients. Assuming that PET species, seals, marine mammals and sensitive species can be collectively referred to as biodiversity and cod and seabass as fish stocks, climate, plankton and environment refer to the same issue, the divergence lies in the words species interaction (17 stakeholders, 7 scientists), food web (5 stakeholders, 8 scientists), ecosystem resilience (0 stakeholders, 5 scientists), and nutrients (0 stakeholders, 5 scientists).

The stakeholder consultations identified windfarms, MPAs, employment, economically viable fishing industry, TAC, pollution, Landing obligation, other human activities, food supply, noise, land-sea interactions and technical measures as the top 10 occurring items. SEAwise scientists named the top 10 social items in order of occurrence as MPAs, employment, windfarms, Brexit, recreational fishing, health, marine spatial planning, coastal economy. Further analyses of the results can be seen in deliverable reports 2.1, 3.1, 4.1 and 5.1.

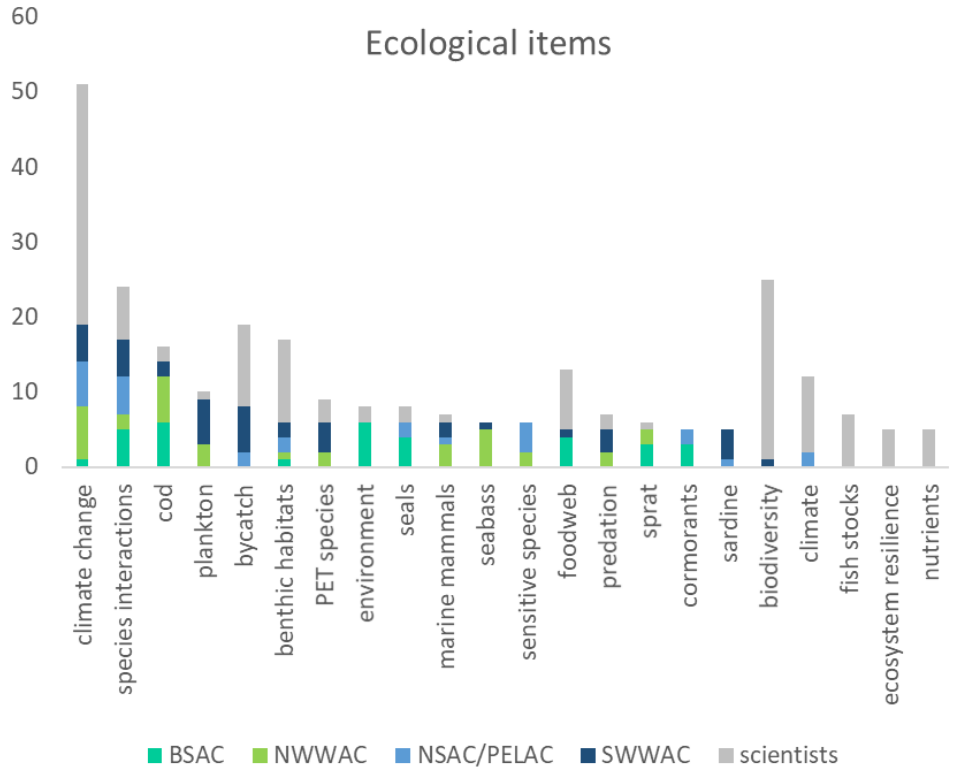

Fig. 5.4. Ecological items occurring at least 5 times in the cloud scoping exercise with stakeholders or SEAwise scientists.

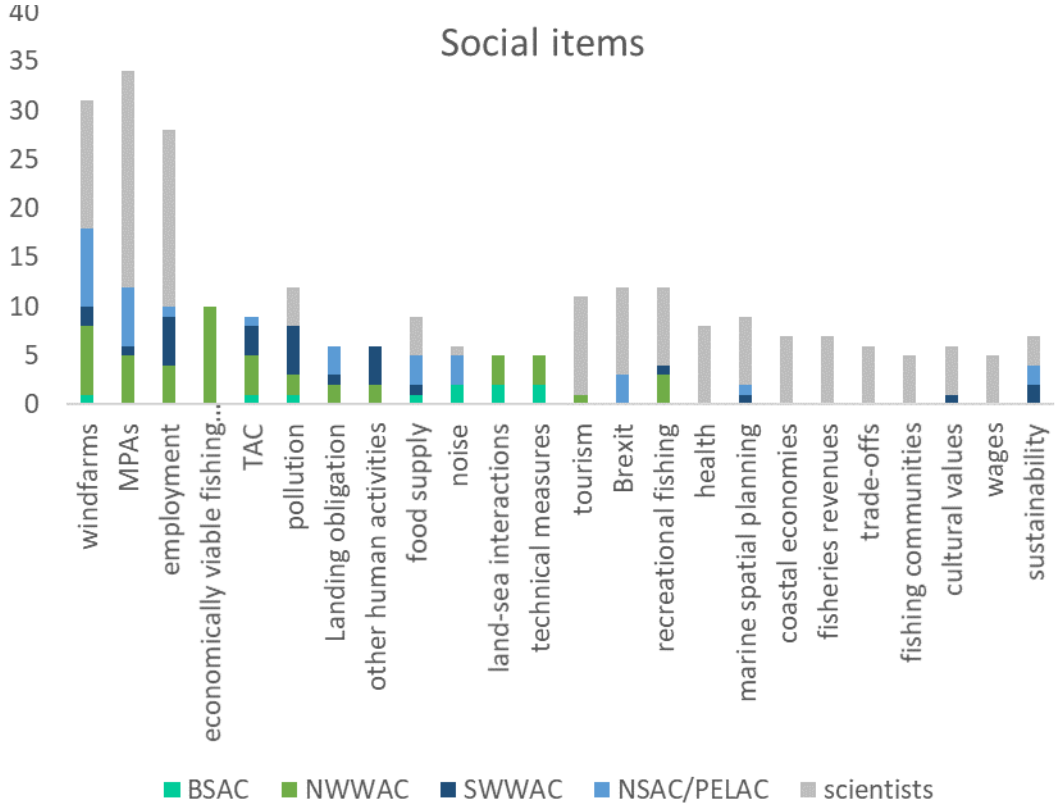

Fig. 5.5. Social items occurring at least 5 times in the cloud scoping exercise with stakeholders or SEAwise scientists.

5.3 Elaboration and consolidation of words

The participants in the word cloud exercise also participated in a qualitative exercise explaining the meaning of the words that appeared in the word clouds in greater detail. The elaboration of the words can be seen below. They are not ordered by importance and are intended for elaboration, not group conclusions.

5.3.1 Western waters

Ecological topics	Description
Climate	Climate change is a fundamental variable that affects several other listed items: - Climate affects the spatial distribution of species, referred to as (fish) displacement or migration by stakeholders. - Climate affects the spatial distribution of fisheries as a consequence of changing spatial distribution of commercial species - Climate change causes the replacement of species with warmer water species - Climate change does not always lead to fleets following the fish, they may also have to target new spp. Maybe new fishing opportunities in WW? - Climate change affects the interactions between species. It's important to track all mobile species, from plankton to fish and their changes in productivity. - Climate change creates the need for clean energy and increasing use of marine space for renewable energy - Climate changes affects static protection areas. MPAs should be climate resilient - When climate change is cause for fewer fish, is that a green light for continued fishing or should it be a red light so we should reduce fishing? - Conflicts between EU member states and third parties (e.g. Norway), because species are moving from one territory to another. Have should we avoid this conflict? - Climate mitigation is more complicated that climate adaptation. The role of fisheriesin mitigating climate change was not only mentioned in relation to the CO_2 emissions, but also to the release of carbon sequestered in the seabed (Sala et al 2021).

Species distribution	The distribution of species is affected by climate change, but other factors may also influence the movement of fish. The factors may include wind farms and other (non-fishing) related human activities. Species move because of climate reasons, food availability or other pressures on the species, but there are many unknowns in the interactions with agents other than fishing.
Pollution	Land-based pollution and eutrophication impact on the whole ecosystem, including the population of jellfyfish as well as on fish stocks Other sources of pollution and plastic litter effects on the whole ecosystem and particularly on the nurseries in estuaries
Species interactions	Interactions between species affect the fishing industry.
Sensitive species and habitats	Effects of seagrass and stone reefs on fish stocks. What could be the effect of restoration projects for seagrass, stone reefs (and wind farm construction) on fish stocks? What is their effect on e.g. *Lophelia* reefs? Do these habitats have a high CO_2 sequestration? Not all species can be fished at MSY at the same time, sensitive species need special treatment. Some species are considered more important than others, but who should decide on this? Can anglers decide which species are important and which not?
Spurdog	Spurdog is an example of what can happen when a species was highly overexploited, recovered and became problematic due to large catches and high discard rates. Spurdog was discussed as an invasive species.
Predation	Large predators are returning and causing additional predation pressure on various species like seabass and hake. How much is predation contributing to the competition with fishers? The increasing occurrence of octopus in the northern Bay of Biscay is a cause of predation on crustaceans. Increasing predation pressure in response to climate change or ocean dynamics is required.
Ecosystem functioning and food webs	The concept of ecosystem functioning was highlighted to ensure that all ecosystem functions can be maintained and managed. Ecosystem functioning should also be managed, next to maximising landings, employment and revenues (e.g. small pelagics as food for marine mammals) The functional role of plankton in the food webs should be acknowledged. A bloom of toxic algae affects ecosystem functioning and disrupts the management of shellfish.
Early life stages	The quality of plankton and its link with the survival of planktonic larvae of commercially fished species The pollution from rivers has an impact on nursery areas of Dover sole and the recruits of many commercial fish species in estuaries. The effect of pollution, eutrophication and toxic plankton blooms on recruitment is an important element in EBFM.
Invasive species	What is the impact of the proliferation of invasive species like *Rugulopteryx okamurae* on fisheries?

Social and fisheries topics	Description
Windfarms	The need for clean energy is a consequence of climate change and the need for CO_2 mitigation. The fishing industry is being displaced because of windfarms What is the impact of windfarms on fish during construction and afterwards (noise, electromagnetism), particularly for emblematic species like sharks and *Nephrops norvegicus*.
Other non-fishing human activities	A long list of non-fishing human activities was mentioned. These include gas and oil, cables, seismic shooting, including submarines affecting security of fishing vessels and large whales, tourism, angling, mining, sediment extraction. A lot of knowledge is generated on fisheries (stocks, efficiency, sustainability), but not a lot is known on the impact of other activities (maritime transport, OWF, oil). Does the info exist? What are their impacts, e.g. the impact o pollution on stocks and marine habitat? Why is the management of fisheries always in focus, and not that of other marine activities? What are management measures for other (non-fishing) human activities? It is unfair that e.g. landings of Dover sole must be reduced while the impact does not come from fisheries but rather from pollution.
Pollution	Land-based pollution and eutrophication of the ecosystem, other sources of pollution and plastic litter effects on the whole ecosystem and particularly on the nurseries in estuaries.
Stakeholder collaborations	Scientific advice has a delay in response to ecosystem changes. Science is too slow. Data collection and information flow between stakeholders and science should be prioritized to improve the delayed advisory response to ecosystem changes. Scientific knowledge is of good quality but sometimes outdated. The time that science invests in data collection is too limited. The collaboration between fishers and scientists should be in both ways to increase mutual, generic enrichment of both parties. Science does not explain many observed situations such as the increase in octopusses. Better sharing of scientific knowledge from science towards stakeholders such as Advisory Councils and fishers is required. It's also important to value knowledge from professionals, e.g. fishers have seen the invasion of octopus but science couldn't anticipate this invastion. Shared scientific knowledge is paramount. Scientific agreement should be backed up and scientific knowledge needs to be shared to be recognised for its value. Important to develop positive relationships with stakeholders Scientific opinion on spatial distribution of fish as a consequence of climate change always shows a discrepancy between the scientific results and the actual changes in the sea, also when we get advice on fishing opportunities

	Fishers complain about science being to slow, and scientists do not see what fishers see. Data collection should be improved excellent (what is caught? what is discarded?). If all data would be given, science would improved. Flow of knowledge needs to go both ways: fishers <> science. Fully documented fisheries are a way forward for this. The correct data are crucial, from surveys or from fishers themselves.
Mixed fisheries	Not all species can be fished at MSY at the same time, sensitive species need special treatment. The move from single to multispecies management creates its own problems. Some species are considered more important than others. Some species can reach MSY while others can't. That's a problem.
Economic viability of fisheries	The economic viability of the fishing industry, incuding profitability of fisheries. Resilience of traditional business Activities in WW are in focus, so it must be stressed that there is economic support from EU Good economic indicators are needed. Gross operating profit shows the profitability of the industry and is the most pertinent indicator of the resilience of the fishing industry to new management measures. Turnover does not reflect economic viability. Variable costs should be accounted for.
Employment	Direct and downstream employment
Coastal communities	What is the dependence of the population on fishing activities? Fisheries impacts coastal communities and the whole coastal area where the fishery operates, for employment, food, gross operating profit, economic profitability and the whole food chain. Economic turnover is not a good indicator of societal impact and does not reflect impact and resilience Fishers are historic producers of protein to local communities, which requires recognition of its value.
Society	What is the dependence of the population on fishing activities? What is the social status of fishers in the society? Fisheries are often considered less important than other activities, the perception of fishers have changed from feeding the population at the risk of their lives to overexploiters/looters of the sea (re-iterated point)
Recreational fisheries	There is much information on commercial fisheries, but a lot less on recreational fisheries
Fishing	The fishing industry is diverse, making a description difficult. Definition of small scale and artisinal fisheries not agreed across Europe Fisheries products may also be used for other uses than food, e.g. medecine, diet supplements
Sustainable fisheries	Account for the three pillars of sustainability, including the role of humans. Economies of scale, often small scale fishery is promoted as more sustainable, but this may not be true if viewing impacts by kg of fish. What is a sustainable gear?

Management	Outdated management measures
MPA	The fishing industry is being displaced because of windfarms and Natura2000 areas. Seagrass is beneficial as protected habitats. Restoration should be looked at. Reefs have potential to restore ecological balance.
Market	

5.3.2 North Sea

Ecological topics	Description
Species interactions/Trophic relations	also non-fish, feeding, growth, dying
Climate/Climate threats/Change	Fish move as the system changes, may move out of management areas, reference points will change or may be impossible to reach. Abundance may change, decrease can be caused by climate or fishing, important to know which one
MPAs/Essential fish habitat/Sensitive habitats/Protect spawning areas	impact on the amount of fish that can be fished
Balanced harvesting	looking for trade off between harvesting different species, links to species interaction or to attaining most nutritional value
Bycatch	of commercial, non-commercial fish, non-fish incl. Invertebrate and sensitive species
Food web impacts	
Plankton/pelagic productivity	
Impacts of wind farms and dredging	on fishing grounds and fishermen/ or on effects on circulation of water which may impact the ecosystem
Noise from windfarms	construction and running and Seismic activities and effects on life stages of fish
New species	coming into the area, can be climate or other impacting ecosystem and fisheries, not regulated at first
Rising sea	higher dykes/need for more dredging
Windfarms/access	Effects on juvenile and adult habitat of fish and brown shrimp. Construction effects on fish, effects of cables/electromagnetic. 25% of the North Sea covered gives a big effect. Risk/opportunities, how do they impact the ecosystem as a whole, abiotic effects (currents, stratification, primary production, reduced wind/wake effect)
MPAs/Closed areas	Access for fishers, what are you protecting and is it working, climate change effects on protective effectiveness, passive restoration (leave the area alone),
Nature restoration habitat/species	Active restoration (establish reefs, oyster banks), can be either where there is historical evidence of a habitat (restoration) or in other places (creating new habitat, bordering nature design)

Multispecies/Species interaction Cormorants/seals	Climate change may affect predation patterns in the sea, having some stocks large may impact other stocks, especially for fish eating other fish, some species may be important food of other species impacting productivity. Analysing the effects of large seal stocks.
MSFD implementation/conservation/ Monitoring/Ecological carrying capacity	MSFD is there to make ecosystem perspectives work in management. Need for better indicators. What are we moving towards/thresholds. International monitoring is important, also of MPAs to determine impacts of management
Reference points	link from climate and ecosystem change to fisheries management reference points, are these even possible at present conditions
Cummulative effects	the need to look at all aspects together, also of intended change in windfarms, important to know the balance between different sources of impact
Trawling/oxygen depletion	trawling may improve oxygen deficient areas?

Fisheries and social topics	**Description**
Public perception of fishing industry	Public impression that fisheries harm the ecosystem and overexploit the sea (seaspiracy) rather than stewards of the sea, collecting data and caring for the ecosystem. Inhibits recruitment of fishers and facilitates legislation which is not thought through
Market tools	Well managed fisheries often give fishers a fair share of the profit and fishers with fair wages are more open to being sustainable
Ecological transition	Giving the right incentives to be stewards of the sea/be sustainable or transitioning to other areas
Diversification/Coastal community resilience	Supplement fishing with other activities in times of low fishing opportunity e.g. tourism for small scale fishers
Food security	stable supply of protein/healthy food from the sea
Labour standards	Contributes to the public perception of the industry, negative perceptions make it difficult to recruit new fishers. Highlight benefits of fishing. Work conditions are often poor in some fisheries
Recruitment of fishers	wages and work conditions, need for alternative/supplementary income or stability in income/parents advice children not to be fishers
Loss of jobs	Brexit limits fishing opportunities and means job losses, also land based
Energy consumption/Co2 emmission	need to reduce fuel
MPAs	Loss of fishing grounds, unsure what this will mean to regulation, many different MPAs are possible, evaluate the specific one rather than one size fits all
Brexit	changes in fishing opportunity (level and where), uncertainty about future beyond 2025. Concern about possibility to access fishing areas
Windfarms	
Dredging	

Marine litter	does litter/microplastic/polution impact productivity/food safety?
Underwater noise	
Marine strategy framework	impacts of adding new objectives on fisheries impact
Climate change mitigation	role of marine organisms as carbon sinks. Blue carbon storage in the sea, is it necessary to protect certain areas
Control and enforcement/Other effective Control measures	Closed areas/are they impacted still by fishing/can be very effective in combination with VMS/AIS, how to control with measures that have an impact? in areas designed to protect marine mammals, how to control the effect and compliance
Landing obligation	effects on board, effects on fish/ecosystem as a whole
Sustainable food transition/food production	Fish are a CO2-low protein for human consumption, how do we make fisheries more sustainable, can we get the same food with less impact through e.g. aquaculture
Marine spatial planning	Access to fish, larger areas that cannot be fished increases impact in fished areas. Where to place different activities. also includes shipping, aquaculture, military
True socioeconomics/socioeconomic sustainability/Ecosystem services/effects on society/Socio-ecological scenarios/Local communities	Comparable values for coastal tourisms and fisheries (turnover, income, first sales, export differs in value from internal use). CFP requires social/economic sustainability as well as ecological sustainability, all three are important. Impacts on society as a whole are important, including local communities
Innovation and readiness	Management and fishers have to be ready to implement new innovations
Management framework/Legal thresholds	Current ecological situation does not really match management, pragmatic adaptive management/policy how do we get it
Willingness to invest/Impact on the fishermen/Recruitment/Lifelihood/Fisheries sector attractiveness/jobs	The need for fishers to make day to day decisions based on expectation to the future. More things that are negative/risky for expectations make willingness to invest less as does large changes in fishing opportunties.
Stakeholder analysis/involvement/Public cooperation/consultation	Definitions and joint visions: Speaking the same language is important and a common idea on where to go from stakeholders including policy makers (scientists likely not included). Could be through scenarios
Pollution	eutrophication, toxic substances, plastic

5.3.3 Baltic Sea

Ecological topics	Description
Environmental impact	Temperature, abiotics and biotic interactions, species, food web, things that directly impact fish species

Multispecies management/Multispecies interactions/Species interactions/Multispecies/food web/food webs	How do species interact and how do you manage extraction when this affects other species in the ecosystem/other fisheries/other activities. What are the effects of plankton
Human impacts	other human activities than fisheries
Land-sea interactions	Human impacts on land affect the sea through e.g. run off, nutrients, the Baltic cannot be managed without thinking about the land.
Pollution	Nutrients, toxins, marine litter/waste/plastic.
Cause of decline of cod	Even without fishery, the stock is likely to decline, the cause of this is unclear at present and would be good to know in relation to management objectives. Can it be reverted? If not, should we still limit other activities to protect it
Seals and cormorants/cormorant predation/seals	There is suspicion that the cormorants are partly responsible for declines in western Baltic cod through vey local predation on recruiting yearclasses. Predation is also part of species interaction. Growing populations of cormorants and grey seals give high predation on fish. Parasites from seals enter cod, the impact on the recovery of the stocks needs to be investigated

Social topics	**Description**
Climate effect on management objectives	Climate change affects reference points and thereby management objectives, this effect should be incorporated, example of Baltic cod
Precautionary approach	How does this look in a changing climate where we don't really know what will happen
Co2 footprint	How much fuel will be consumed during fishing and thereby the CO2 contribution from fishing. Depends on TACs, etc., catching more species together may lower this. Gear also affects this, what can be done to improve this.
Small scale fishery	Local fisheries often with passive gears is often not addressed directly in advice which tends to focus on larger trawl fisheries as they have more data. Even where log book data are not used, they may target local stocks without advice. Also intended to be coastal fisheries without the ability to travel far.
Food production	Contribution of fish to food production is important, limiting catches limits food production.
Food supply/Cultural heritage/Low impact fisheries/Local food	Local food supply, getting food close to you, may give a smaller transportation imprint, also local commercial fishing. You eat what is produced close to you. Impact of fishing compared to other forms of fish production (soy vs fish). Price benefits by cutting length of the supply chain for both consumers and fishers.

Ecosystem services/Recreation	Recreational fishing, boat trips, also economic dimensions and employment and the effect of recreational fishing on health of people.
	same explanation as previous list
Impact on fishers	Economic impacts of fishing, regulatory impacts on fishers, often this is ignored in discussions/decisions
Participation/Multi-stakeholder approach/Balanced people planet prosperity	Need to look at both environment and people. User of the sea are impacted by management decisions and the users should have a say in decision making. Highly disregarded at present.
Share of sea by different activities/Reconciling multi use of the sea	Marine spatial planning, different human activities impact each other with conflicting aims
Stability of stocks	stable catch opportunities are important for planning and investment
Proportionality/Cost benefits	Management measures have to be proportional to expected impact
Coastal development	Spawning in freshwater may be impacted by changing freshwater habitat
Different fishing gears	Often closures and regulations do not differentiate between impacts of different gears, this information would be useful
Renewable energy at sea	Windmills
Seafloor	Impact of activities on the seafloor as a basis for many ecosystem processes, e.g. windmill effects
Noise/Underwater noise	Not well known what the effects are but an upcomming worrying factor

6. Comparison of scoping results

The ecological topics identified as key varied to some degree between the regions and between groups and consultation methods (tables 5.1 and 5.2). 10 out of 13 combinations of region and consultation method identified climate change in top 5. No other ecological word was as widespread. On social key words, MPAs was the most widely mentioned with 11 out of 13 combinations followed by windfarms with 9, employment with 7 and small scale fisheries with 6. These five words were consistently identified as important by stakeholders and SEAwise scientists alike. The remaining words often were identified only by one of the groups.

Table 5.1. Top 5 occurring ecological topics in the consultation results. Note that the number of words in the top 5 can be greater than 5 if two or more words share the same rank and less than 5 if the word appeared less than 3 times.

Region	Top 5 SEAwise scientists	Top 5 stakeholders
Mediterranean		
Individual	Benthic habitats, commercial fish/shellfish, litter, turtles, hake	commercial fish/shellfish, climate change, invasive species, pollution, litter
Workshop clouds	climate change, food webs, benthic habitats, biodiversity	

Western waters		
Individual	Climate, benthic habitats, marine mammals, climate change	Seabirds, climate, marine mammals
Workshop clouds	Biodiversity, climate change, bycatch, climate, ecosystem resilience, fish, multispecies relationship	Climate change, plankton, species interactions, bycatch, cod, seabass
North Sea		
Individual	Benthic habitats, climate change, shrimps, sole	Cod, herring, seabirds, climate change, global warming, marine mammals, sharks, sandeel
Workshop clouds	Climate change, food webs, habitat degradation, benthic habitats, eutrophication, interactions	Climate change, sensitive species, species interactions, pollution
Baltic Sea		
Individual	Cod, herring, sprat, benthic habitats, global warming/ climate change, salinity, temperature	
Workshop clouds	Fish stocks, climate change, habitat quality, nutrients	Cod, environment, species interactions, seals, foodweb

Table 5.2. Top 5 occurring fisheries and social topics in the consultation results. Note that the number of words in the top 5 can be greater than 5 if two or more words share the same rank and less than 5 if the word appeared less than 3 times.

Region	Top 5 SEAwise scientists	Top 5 stakeholders
Mediterranean		
Individual	MPAs, fishing, local communities, small-scale fisheries, food supply	local communities, small-scale fisheries, jobs, MPAs, profit
Workshop clouds	Trawling, fisheries, employment, fisher behaviour, health, management measures, MPAs, trade-offs	
Western waters		
Individual	MPAs, windfarms, fishing, small-scale fisheries, spatial management	Windfarms, economics, employment, pollution, coastal communities

Workshop clouds	MPAs, employment, windfarms, coastal economics, fisheries revenues, fishing	Windfarms, MPAs, employment, TAC, pollution
North Sea		
Individual	Windfarms, MPAs, fishing, employment, small-scale fisheries, large-scale fisheries, spatial management	Windfarms, food supply, MPAs employment, small-scale fisheries, large-scale fisheries
Workshop clouds	Brexit, windfarms, MPAs, employment, marine spatial planning, fisher behaviour, gear selectivity	Windfarms, MPAs
Baltic Sea		
Individual	Windfarms, large-scale fisheries, local communities, MPAs, small-scale fisheries	
Workshop clouds	tourism, demersal fisheries, health, sediment extraction	Recreation, noise, land-sea interactions, technical measures, culling, food production, multispecies management, other users than fishing

7. Discussion and conclusion

Six issues were identified consistently across regions and participants: climate change, MPAs, windfarms, employment and small scale fisheries. The remaining words often were identified mainly by either SEAwise scientists or stakeholders and there were frequent instances where one of these group identified a word in the top 10 whereas the other group did not. This highlights the importance of scoping the key topics beyond the scientists participating in the project. The differences between the different scoping methods demonstrate the need to consider the consultation methods thoroughly. Moving forward in SEAwise, the individual scoping results will be used to identify issues which interested users may first search for and the workshop cloud scoping together with the individual scoping results to identify key topics for advice. The differences between SEAwise participant and stakeholder key topics will be used in the project to raise awareness of the need to talk to end users about the advice produced in advance.

8. Document Information

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Work Package	N°	1	Title	Knowledge exchange
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