	Characteristic	SCIENCE NEED: Description	Term YRS	Action(s) needed to address knowledge gap	PRIORITY	Additional comments
Theme I. CLEAN AND HEALTHY SEA	**Litter**	What are sources of microplastics: cosmetics (primary) and of degradation of macroplastics (secondary) and others?	1	To be defined (DGMI).	Major data gap with significant impact on ecosystem health; required for MSFD 2018 assessment	
		Effects of microplastics (physical, as a substrate/carrier for hazardous substances)	3	To be defined. Based on assessment of ongoing research	Required for MSFD 2018 reporting	
		Development of (monitoring and) assessment tools for riverine litter inputs into sea	3 to 4	follow up Deltares research	High policy interest; Required for MSFD 2018 assessment; New issue: lack of tools and data hampers assessment of relative contribution via rivers to total input to the seas.	
		OSPAR priority candididate indicators: • Litter on the sea floor • Fulmar litter ingestion (impact and floating litter)	3	Litter on the seafloor: further development into operational indicator Fulmar: has been tested as an EcoQO. Science needs to be defined.	High policy interest; Required for MSFD 2018 assessment; New issue: lack of assessment tools.	No OSPAR lead country defined, hence no immediate progress expected.
	Noise	What is the distribution in time and space of all impulsive noise sources?	1	Organise and set-up of registering system for impulsive noise sources, leading to a regional sea registry	Required for MSFD assessment of GES and target setting (2018-2021); monitoring to start up 2014	Monitoring requirement based on Commission Decision 2010
		What are the ambient noise levels and trends?	1	Design and implement noise monitoring system for ambient noise, including data gathering and measurements, leading to regional sea noise maps	Required for MSFD assessment of GES and target setting (2018-2021);); monitoring to start up 2014	Monitoring requirement based on Commission Decision 2010
		What is the most effective method for ambient noise characterization	1	Evaluate and develop sound modelling tools, including evaluation of data sources (e.g. shipping data).	Required for MSFD assessment of GES and target setting (2018-2021); most MS have not been able to set concrete targets for ambient noise because of effects of ambient noise are unknown	Should be based on knowledge generated in ZKO, development of mapping tools for cost-effective monitoring AN
		Development of register and mapping system, inclusive accessibility	2	Developing of a standardised system for storage and analysis of data, that will enable access to by stakeholders	Required for MSFD assessment of GES and target setting (2018-2021);	
		Development of standardized sound exposure methodology (partly addressed in VUM)	2	Partly addressed in Masterplan Wind Energy (VUM)	Required for MSFD assessment of GES and target setting (2018-2021); Data gap that may preclude development of wind-energy since uncertainty about ecological effects may be objection to licensing;	Standardized sound mapping prescription and tool, needed for licensing process but also verification of achieved results.
		Seismic survey effects review	1	Review of available knowledge of effects of seismic surveys, can largely be done by literature study; follow on of Arcadis seismic report, and (recently published) results of UK Moray Firth Study	Required for MSFD assessment of GES and target setting (2018-2021); short term need to enable harmonization of rules for noise generating activities (seismic survey)	
		Determination of hearing damage threshold of sea mammals, especially Harbour porpoise, for loud impulsive sounds	2	Includes determining TTS growth at high exposure levels.	Urgent information need for licensing authority	Opportunity for international cooperation/US Navy research interest
	Contaminants and Eutrophication	Improved understanding of pathways and accumulation of contaminants through food webs.	3 to 5	Risk assessment of impacts of contaminants at higher trophic levels in relation to ecosystem health	Required for MSFD 2018 reporting (D8 assessment)	
		Need for **ecotoxicity data** for priority contaminants to which large uncertainty factors apply	3 to 5	Methods available, but need for new toxicity tests with substances and organisms that are relevant to the marine environment.	Required for MSFD 2018 reporting; current lack of good assessment criteria hampers meaningful assessment of GES.	Lack of data increases the uncertainty with regard to their risk assessment and the derivation of environmental standards (EQSs in EU, EACs in OSPAR)
	Artificial hard substrate – a.o. ship wrecks	Contribution of artificial hard substrate, notably ship wrecks, to biodiversity of the Dutch Continental Shelf? Including: - importance of large fish on wrecks for D3 targets. – importance of wrecks to re-establishment of flat oyster beds.	3	Planned project (2014). Folow-up depending on outcome	Priority setting depending on outcomes of planned project	
		Biodiversity present on ship wrecks on DCS. Parameters: number of species, species density and age/size distribution	1	Survey under way (2013). Follow-up depending on outcome.	Priority setting depending on outcomes of ongoing survey	
		Rates of species establishment on different artificial hard substrate materials? Relative importance of biodiversity on different artificial hard substrate (quality, quantity)	1	Partly known, eg. wind turbines and artificial reefs. Priorities for further research to be defined.	Priorities for further research to be defined.	
		Which NIS (invasive, easily detectable species) are present on ship wrecks?	1	Part of NIS monitoring programme.	Priorities for further research to be defined.	
	Fish (commercially exploited fish and shellfish)	Establishment of B_{pa} or B_{MSY} for commercial stocks that have no established limit levels; **a**ssess the status of GES3 and other GES when MSY is reached	3	Under development in CFP. (Dutch) policy focus on specific stocks would help	Required for MSFD 2018 reporting;	

		Relation between indicators for population structure, especially healthy age and size structure, and indicators for MSY (FMSY and SSBMSY). Fisheries management steers on MSY and it is not certain whether healthy age and size are being achieved.	3	To invest in development of indicators for population structure.	Required for MSFD 2018 reporting; ICES research provides a basis for answering this question, next steps dependent on financing	
		Establishment of reliable MSY (Fmsy and Bmsy) for commercial stocks that have no MSY.	3 to 5	Need to collect data for these species. difficult to gather sufficient information. Also intrinsic difficulty to establish multi species MSY, because of interactions between stocks.	Research in progress in ICES. Currently working on proxies for MSY; partly required by the of the reformed CFP	
		Impact evaluation of discard ban	4	Analyse the potential effects of a discard ban and propose additional measures to ensure effective implementation	Required by the reformed CFP.	

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Theme II. SMART MONITORING	**Ecosystem understanding and implementation of monitoring**	Which gaps in ecosystem understanding hamper optimization of monitoring ? No lack from science but lack cooperation of countries of QA monitoring platforms, see OSPAR ICG EUT: testing indicators for eutrophication using various monitoring platforms	3?	Research priorities to be defined.	Check link with ongoing EU tender: Towards Joint Monitoring (RWS lead)	
	Ecosystem understanding and implementation of monitoring	How can anthropogenic ecosystem changes be distinguished from 'natural' causes?	3?	Research priorities to be defined		
	(cost) Effective organisation of monitoring	Further integration (between themes, between countries) of monitoring programmes, to increase output and decrease costs	2	Follow up of EU project JMP NS/CS. Sea going pilot project through JPI Oceans? **And see OSPAR ICG EUT work**		
THEME III. SUSTAINABLE & PROFITABLE USE	**Cumulative impacts**	Exploration of cumulative impacts of HAs under different policy scenarios: **comparison of various cumulative effect assessment methods for recommending OSPAR procedure (see RWS ZD and CEFAS)**	3	Follow up of OSPAR ICG-C work (comparison of approaches to map human activities/impacts and assess cumulative effects)	Joint Assessment and Monitoring Programme 2010-2014; Cumulative impacts/opportunities for synergies between climate related changes; renewable energy, aquaculture; conservation	
THEME IV. MARINE SPATIAL PLANNING	**Information needs arising from the "North Sea spatial agenda" (working title DGRW, RWS ZD)**	information needs arising from the " North Sea spatial agenda" (working title DGRW, RWS ZD)	4	further elboration by policy/.watermanagement (DGRW/EZ and RWS ZD).	Needs to be checked by policy/watermanagement	
THEME V. CLIMATE CHANGE		acidification: see OSPAR ICG EUT/MIME work; yellyfish: early warning ; see information needs in separate mail by Wanda, 5 August.2013	4	through OSPAR agenda setting	ICES-OSPAR Study Group on Ocean Acidification (SGOA): paper for the OSPAR Commission expected in 2014 with outline of thematic Committees are doing with relevance to climate change, and also highlighting any potential gaps that need to be addressed	
VI. Science-Policy interface = governance		Analyse and learn from the current interactive governances processes to optimise future governance processes (effectiveness, transparency, stakeholder involvement etc)	4	Active participation of social scientist in the governance process		