Nord Stream
The new gas supply route for Europe

Permitting, Construction, Operation
Environmental Management System
2006-2013

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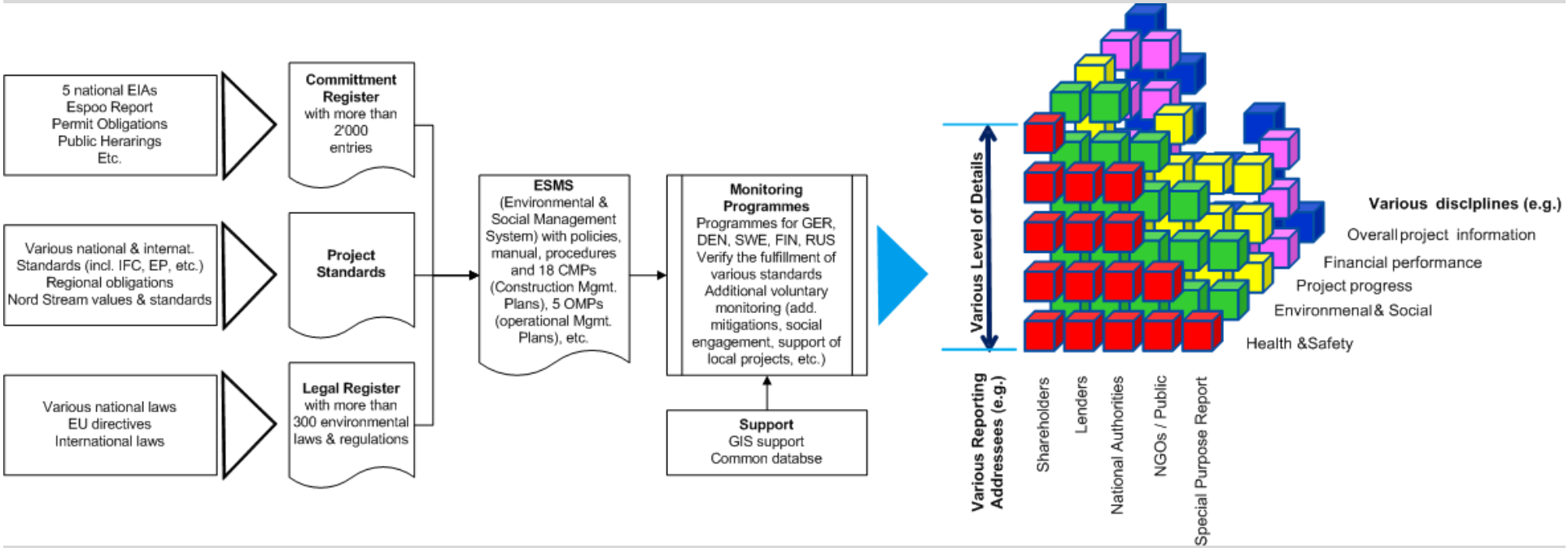
Environmental and Social Management System (ESMS)



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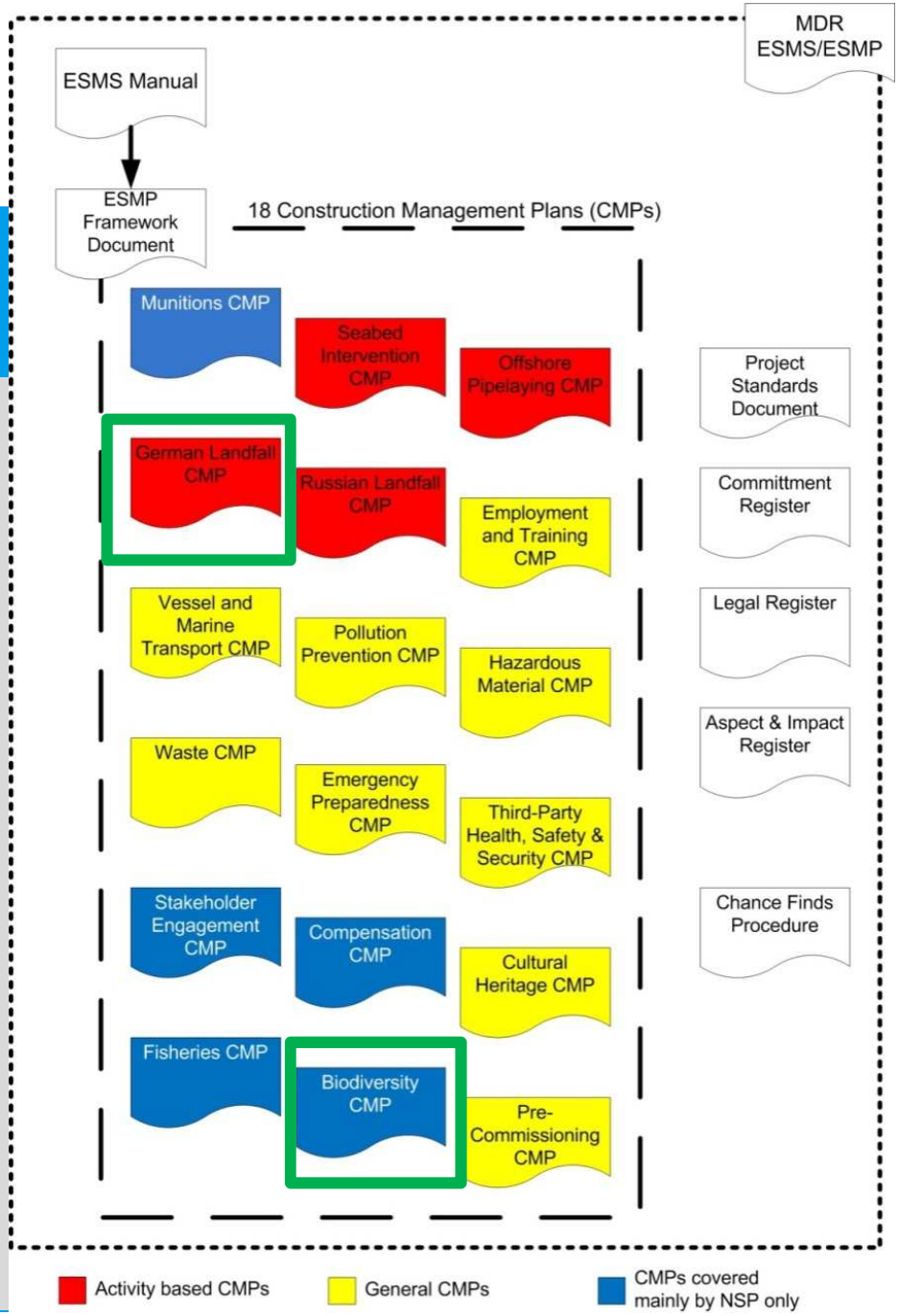
ESMS as a Management Framework

- For the management of construction and operation activities to be in line with Nord Stream's commitments (i.e. permit obligations)
- For stakeholder engagement
- For environmental and social monitoring
- For information and grievance coordination
- For all reporting activities



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Environmental and Social Monitoring: targets, objectives, tasks

- Emissions
  vessel traffic, noise, turbidity, anodes, cooling gas
- Immissions
  pollutants, noise
- Mitigations
  threshold control (noise, turbidity)
- Displacement effects
  marine mammals, seabirds
- Long-term habitat changes
  seabed interventions, artificial reef, hydrographic blocking effects
- Recovery processes
  before-after-comparison, trend analysis
- Social targets
  cultural heritage, munitions, fishery

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Environmental and Social Monitoring: major spatial target & task diversity

http://www.nord-stream.com/press-info/library/?q=&type=5&category=&country

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Environmental and Social Monitoring: national *versus* project related approach

Legal requirement:
Five tailored national environmental monitoring programmes

Consequence:
little degree of cross-country method consistency

	RUS	FIN	SWE	DEN	GER
Physical and chemical environment					
Water quality	+	+/+	+	+	+
Seabed sediment	+	+/+	+	+	+/+
Hydrography and seabed topography	+	+	+/+	+/+	+
Onshore soil	+				
Landscape and topography	+				+
Air quality	+				
Noise	+	+			+
Biological environment					
Fish	+/+		+/+	+/+	+/+
Birds	+/+				+/+
Marine mammals	+				+
Benthic flora and fauna	+	+/+	+/+	+/+	+/+
Terrestial flora and fauna	+				+
Socioeconomic environment					
Fisheries		+/+	+/+		
Cultural heritage	+	+	+	+/+	+
Monitoring and clearance of munitions					
Conventional munitions	+	+	+		+
Chemical munitions				+	

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Environmental Monitoring Germany: Emissions

Parameter	Method	Standard/Reference
vessel traffic	AIS (general vessel traffic) GPS logger (Nord Stream fleet)	IMO
underwater noise	stationary hydrophones	StUK 3
turbidity	stationary optical backscatter sensors compact airborne spectrographic imager mobile ADCP	none none German Shipping Authority
cooling gas	stationary temperature lances	none
anodes (Zn/Al)	contaminants in epifauna (heavy metals in Blue Mussels)	EU Water Framework Directive (regional monitoring)

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Environmental Monitoring Germany: Immissions

Parameter	Method	Standard/Reference
contaminants	analysis of sediment chemistry	GÜBAK, LAGA
airborne noise	stationary microphones	AVV Baulärm

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Environmental Monitoring Germany: Animal displacement during construction

Parameter	Method	Standard/Reference
Grey Seal	haul-out site counts	none
Harbour Porpoise	stationary PODs (hydrophones)	StUK 3 (for survey method, but none for analysis)
Seabirds	line-transect aerial surveys	StUK 3 (for survey method, but none for analysis)

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Environmental Monitoring Germany: Recovery after construction (1)

Parameter	Method	Standard/Reference
seabed	multi-beam (bathymetry) Side Scan Sonar & underwater video (surface substrate) sediment parameter (loss on ignition, grain size distribution)	high-end operational technical survey requirements DIN 4022, DIN 18123
Macrozoobenthos soft sediment	Van Veen grab & box corer sampling	HELCOM/StUK 3 (minor add-ons)
Macrozoobenthos epifauna reefs	underwater video (ROV) scratch sampling by scuba divers	StUK 3
Macrozoobenthos exposed pipeline	underwater video (ROV) scratch sampling by scuba divers	StUK 3

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Environmental Monitoring Germany: Recovery after construction (2)

Parameter	Method	Standard/Reference
macrophyte beds	frame sampling by scuba divers aerial photography	none
small/young fish in macrophyte beds	beach seine sampling (small hand-operated trawl net)	none
Seabirds	line-transect ship survey (offshore) aerial day-time roost counts (coastal bay)	StUK 3 (based on ESAS) none

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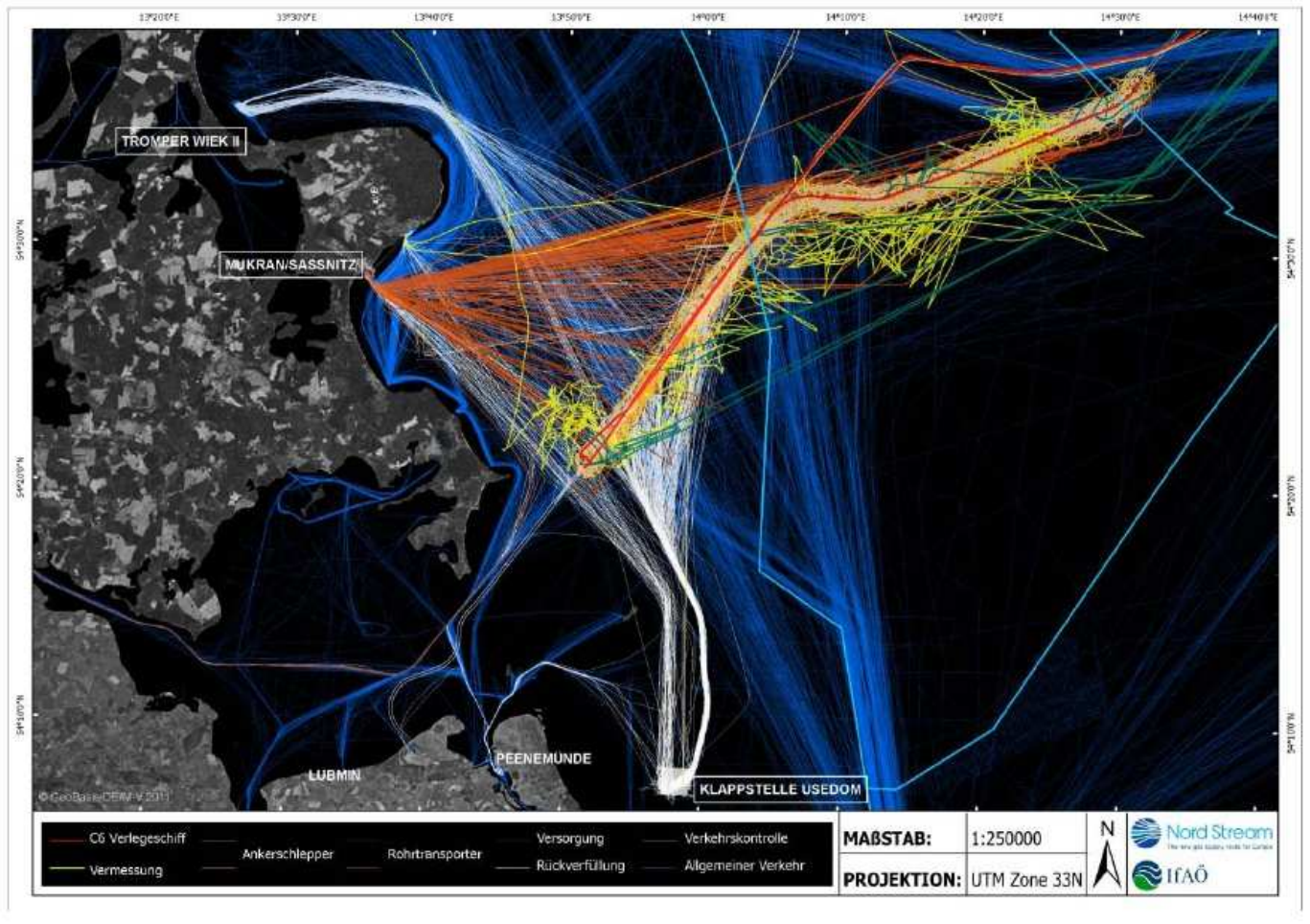
Environmental Monitoring Germany: vessel traffic



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Environmental Monitoring Germany: high analytic value of precise vessel traffic data

- Underwater noise
  estimation of vessel specific sound pressure levels at source

- Displacement effect harbour porpoise
  relationship between simultaneous porpoise detection rate and vessel presence
  relationship between background pressure (general traffic) and project-related pressure

- Displacement effect seabirds
  relationship between simultaneous seabird distribution pattern and vessel distribution pattern
  relationship between background pressure (general traffic) and project-related pressure

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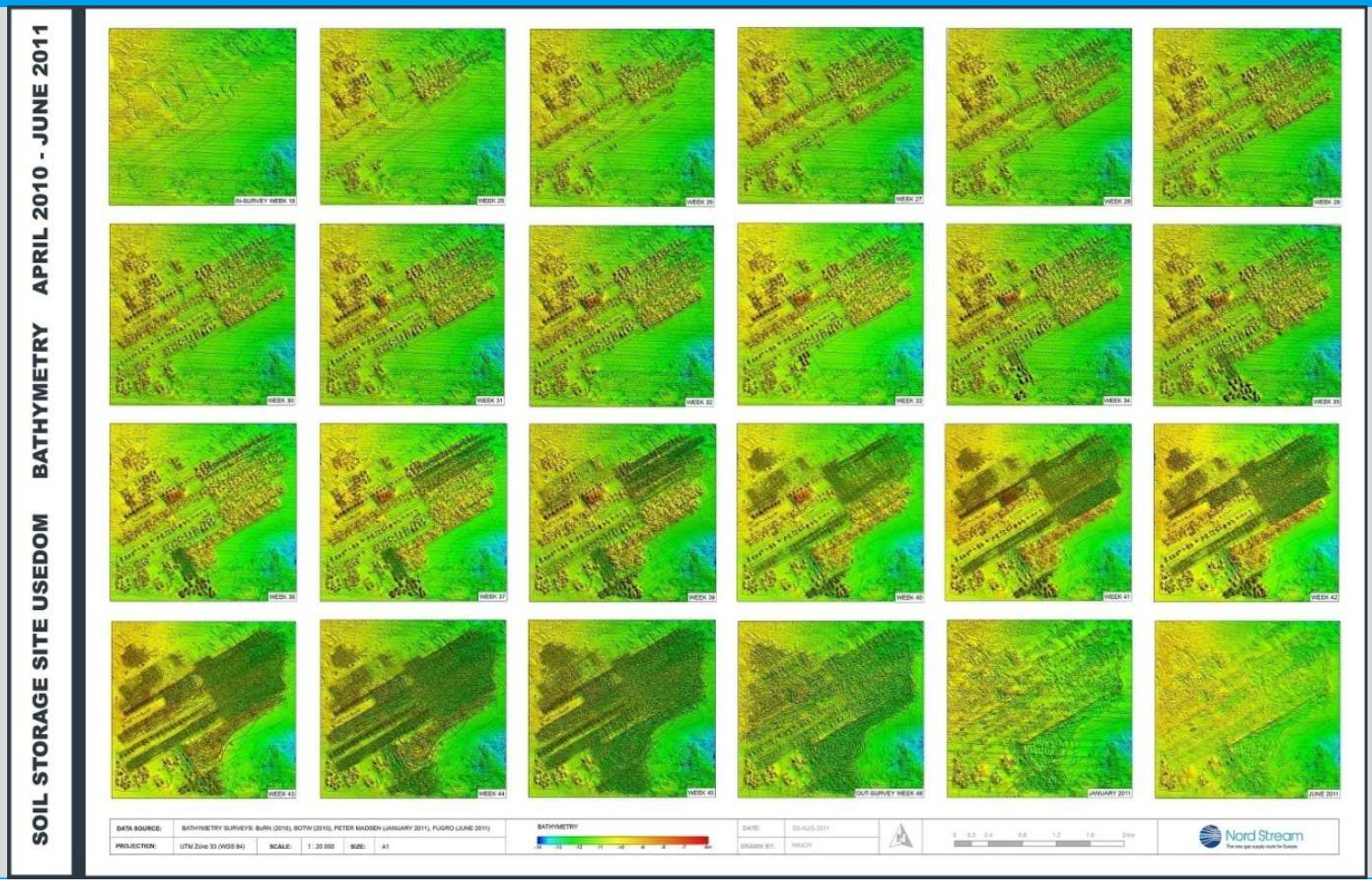
Environmental Monitoring Germany: repeatative seabed surveys



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Environmental Monitoring Germany: high analytic value of precise seabed data

- Quality control for seabed reinstatement
  bathymetry & geotechnical sediment parameter
- Stability verification for seabed reinstatement
  bathymetry & geotechnical sediment parameter, restored reefs
- Verification for scouring effects in vicinity of exposed pipeline
- Analysis of macrozoobenthos recovery
  community analysis *versus* sediment parameter

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Conclusions (1 – application phase)

- EIA baseline survey program Germany (based on StUK 3 and some add-ons) was appropriate for analysis of habitats and species
- EIA baseline survey program standards (i.e. StUK) require three add-ons:
  1) high-res seabed surveys (multi-beam/side scan sonar/geotechnical)
  2) stationary oceanographic long-term measurements (current regime, oxygen, optical backscatter)
  3) analysis of AIS (commercial traffic) & VMS (fishery traffic) data for description of existing pressure by vessel traffic and fishery
- Beside EIA, ESMS system set-up should take place at project developer/operating enterprise at a very early stage of the project, starting with project standards

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Conclusions (2 – construction & operation phases)

- EIA baseline investigations have to fulfill two tasks:
  1) evaluation of species and habitats in relation to legal/permitting requirements
  2) provision of data for later construction/operation monitoring (method adjustment has to start partly from the tail-end!)
- EIA baseline survey program shall consider logistic restrictions for construction & operation monitoring:
  1) later spatial access restrictions
  2) health and safety requirements in a “crowded sea”
- Construction monitoring standards (i.e. StUK) require three add-ons:
  1) high-res seabed surveys
  2) stationary oceanographic long-term measurements
  3) analysis of AIS & VMS data and project specific vessel activities
- Appropriate data management standards/quality are an essential pre-requisite for later monitoring and overall project transparency