

SURVEY DEPLOY & MONITOR POLICY COMBINATION OF RISK FACTORS

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Overall Principles of SDM Policy

- For wave and tidal stream projects, in absence of empirical data
- Discrimination of **relative risk** of proposed projects
 - To **guide** survey and testing requirements for consent
 - Streamline consenting for 'low risk' projects
 - Safeguard environment for 'high risk' projects
 - A 'Risk Assessment Framework'
- Quick and easy to apply at project outset
- Insofar as possible, objective
- Only ever **indicative**, not prescriptive
 - Specific requirements still determined on case by case basis

COMBINATION OF RISK FACTORS

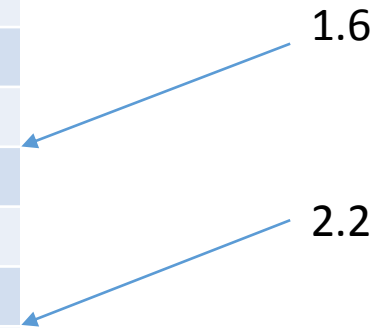
- Intuitively, 3 key factors contributing to overall risk
 - Environmental sensitivity of location (L/M/H)
 - Array size (S/M/L)
 - Nature of technology (L/M/H)
- Given **equal weighting**
- To enable combination, risk factors converted to numbers (L or S / M / L => 1 / 2 / 3)
- Mean calculated: **Geometric mean** preferred to arithmetic mean
- Consistent with approach for deriving technology risk (10 factors)

Combining Risk Factors

POTENTIAL COMBINATIONS OF MARKS			ARITH. MEAN	GEOM. MEAN
1	1	1	1	1
1	1	2	1.33	1.26
1	1	3	1.67	1.44
1	2	2	1.67	1.59
1	2	3	2	1.82
2	2	2	2	2
1	3	3	2.33	2.08
2	2	3	2.33	2.29
2	3	3	2.67	2.62
3	3	3	3	3

Combining Risk Factors

POTENTIAL COMBINATIONS OF MARKS			ARITH. MEAN	GEOM. MEAN	ESTIMATED OVERALL RISK
1	1	1	1	1	L
1	1	2	1.33	1.26	L
1	1	3	1.67	1.44	L
1	2	2	1.67	1.59	L
1	2	3	2	1.82	M
2	2	2	2	2	M
1	3	3	2.33	2.08	M
2	2	3	2.33	2.29	H
2	3	3	2.67	2.62	H
3	3	3	3	3	H



- Provides **greater spread of outcomes** and **greater scope for discrimination of relative risk**
- Thresholds set at 1.6 and 2.2, to separate out Lowest and Highest risk projects
 - 'arbitrary' and could be changed in future
- Not, and never intended to be, a rigorous assessment process
 - As before: indicative not prescriptive

NRW's approach to assessing wave & tidal project 'riskiness'



From:

Sparling C, Smith K, Benjamins S, Wilson B, Gordon J, Stringell T, Morris C, Hastie G, Thompson D & Pomeroy P (2015). Guidance to inform marine mammal site characterisation requirements at wave and tidal stream energy sites in Wales. NRW Evidence Report Number 82.

Available to download at:

<http://www.naturalresources.wales/our-evidence-and-reports/guidance-to-inform-marine-mammal-site-characterisation-requirements-at-wave-and-tidal-stream-energy-sites-in-wales/?lang=en>

Dr Kate Smith: kate.smith@naturalresourceswales.gov.uk



General Points

- **Specific to marine mammals**
- **More targeted** than SDM, considering specific species, specific impact pathways and specific data needs
- Risk estimation based on 4 criteria, equally weighted:
 - Population sensitivity (for species of interest)
 - Location sensitivity (relative importance for species)
 - Technology risk (including array size)
 - **Project duration**
- Combination of risks based on matrix approach
- Guidance provided on specific survey approaches but, again, recommendations **indicative**, not prescriptive

Staged matrix-based

- Classifies factors for **ecological sensitivity** and **technology risk**.
- Combines in 6 stage process to give overall project riskiness (H/M/L).

Receptor / location sensitivity + **technology risk** + **project duration** = **Overall project risk**

Stage	Details	Based on...	
1	Population sensitivity (pre-determined)	Population size, distribution, status, demographics	
2	Location sensitivity	Connectivity with protected sites, mammal distribution, functional importance of site	
3	Combines stages 1 and 2 to give overall ecological sensitivity		
4	Technology risk	Judgement based on guiding principles. Separate assessment for collision risk, disturbance and barrier effects	
5	Combines Stage 4 with project duration	Categories of duration (≤ 3 years, 3-10 years, > 10 years)	
6	Combines Stages 3 and 5 to give overall project risk		

Feedback loop for additional evidence

Survey

Mitigation

Monitoring

Matrix Approach to Risk Combination

Table 4. Overall Sensitivity based on the outputs from stages 1 and 2.

		Sensitivity of population (output from stage 1)		
		Low	Medium	High
Importance of location (output from stage 2)	Low	Low	Low	Medium
	Medium	Low	Medium	High
	High	Medium	High	High





Table 8. Project risk, combining the technology risk (from Stage 4) with project duration. This assessment is carried out separately for each impact pathway

		Technology Risk (defined at stage 4 above for each impact pathway)		
		Low	Medium	High
Duration of project	Low (1-3 years)	Low	Low	Medium
	Medium (3-10 years)	Low	Medium	High
	High (>10 years)	Medium	High	High

Table 9. Overall risk, combining the project risk (from Stage 5) with sensitivity (stage 3). This assessment is carried out separately for each impact pathway

		Project Risk (defined at stage 5)		
		Low	Medium	High
Overall sensitivity (defined at stage 3)	Low	Low	Low	Medium
	Medium	Low	Medium	High
	High	Medium	High	High

Welsh staged matrix and Scottish survey, deploy & monitor

Survey, Deploy & Monitor 	Staged matrix 
Single risk assessment for project covering all receptors	Tailored for receptor specific risk assessment
Single assessment for all impact pathways	Tailored for impact pathways of key concern
No explicit consideration for impact pathway / receptors of concern: minimal additional data needs	Need to identify key receptors and impact pathways up front to allow assessment
Combines risk factors mathematically (geometric mean)	Combines risk factors using principles-based judgement
More transparent	More flexible?
Simpler, more straightforward?	More complicated, but informs decisions about survey needs and data collection