Pacific Northwest NATIONAL LABORATORY

ES ENVIRONMENTAL

Environmental Effects of Marine Renewable Energy: Risk Retirement

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U.S. DEPARTMENT of ENERGY BATTELLE

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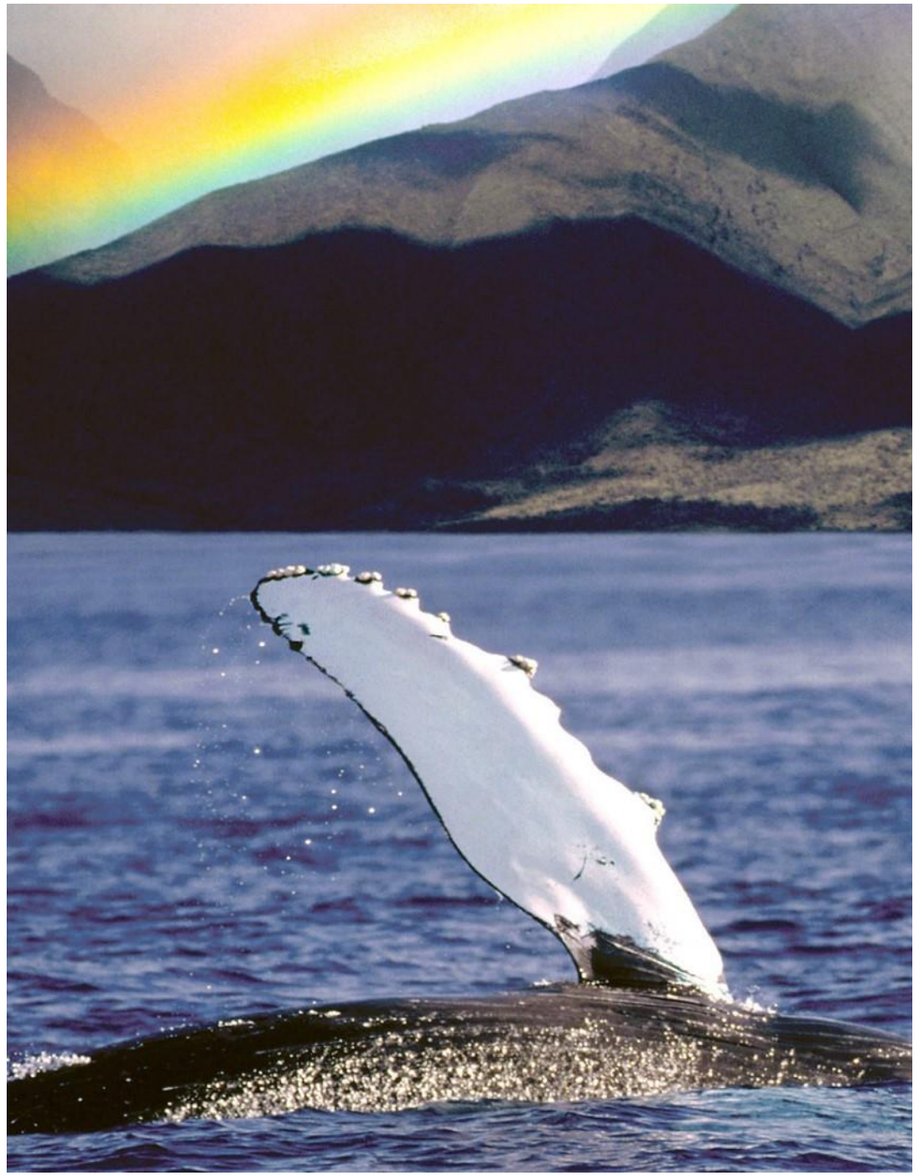
Today's Expert Forum

- Introduction
  - OES-Environmental overview
  - Purpose of the workshop
- Risk Retirement
  - Pathway for retiring risk
  - Data transferability process
  - Tools and resources

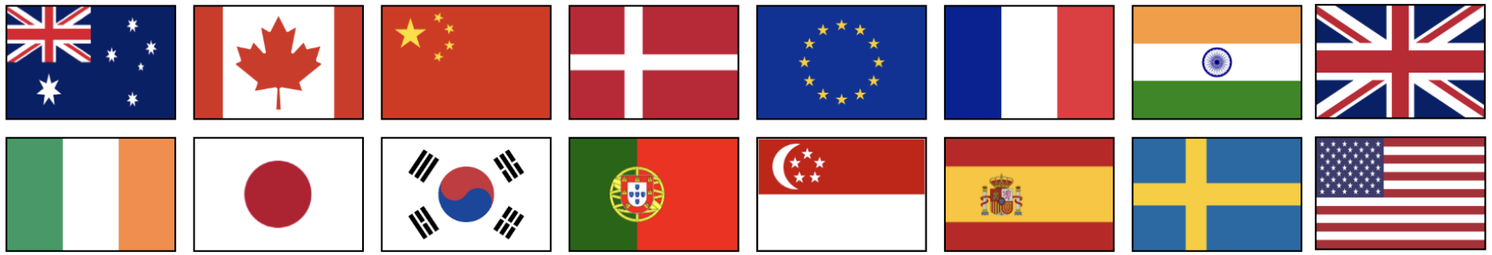
  Feedback poll and discussion
- Best Management Practices
  - Overview

  Discussion and feedback
- Next Steps



OES-Environmental

- Established by the International Energy Agency-Ocean Energy Systems in 2010
- Examines environmental effects of marine renewable energy (MRE) development to advance the industry in a responsible manner
- Led by the U.S. Department of Energy Water Power Technologies Office and implemented by Pacific Northwest National Laboratory
- Phase 5 (2024-2028): 15 countries and the European Commission



https://tethys.pnnl.gov/about-oes-environmental

2024 State of the Science Report

- Highlights the current state of knowledge on environmental effects of MRE
  - Stressor-receptor interactions (Chapter 3)
  - Social and economic effects (Chapter 4)
  - Strategies to facilitate consenting (Chapter 6)
  - System-wide approaches, like scaling up (Chapter 9)
  - And more!

Access the full report and other resources:

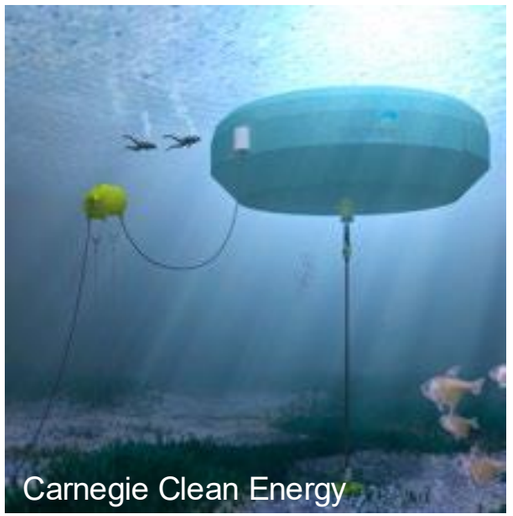
- Executive summary in 8 languages
- Short science summaries
- Overview webinar recording

https://tethys.pnnl.gov/2024-sos

Why Study Environmental Effects of MRE?

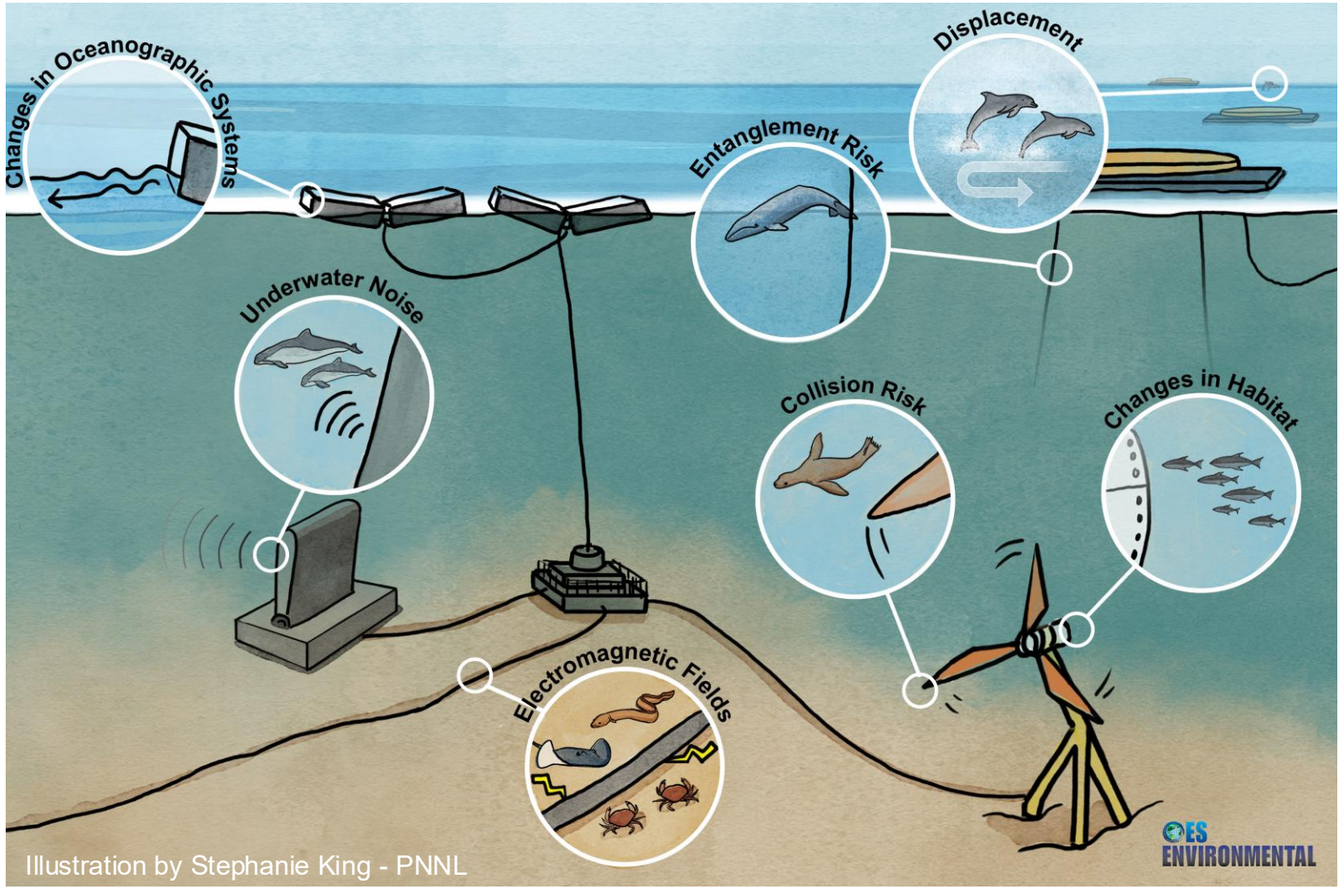
- Challenges for the MRE industry:
  - Uncertainty or limited knowledge on environmental effects
    - ✓ Concerns from stakeholders and regulators
  - Long permitting/consenting timelines
  - In-depth data collection and monitoring requirements that are costly to industry

- Collecting, synthesizing, and sharing information is key to increase understanding on environmental effects and progress MRE responsibly



Environmental Effects of MRE

- Stressor-receptor interactions:
  - Stressors – MRE devices, systems that may cause harm
  - Receptors – Marine animals, habitats, ecosystem processes



Purpose of the Workshop

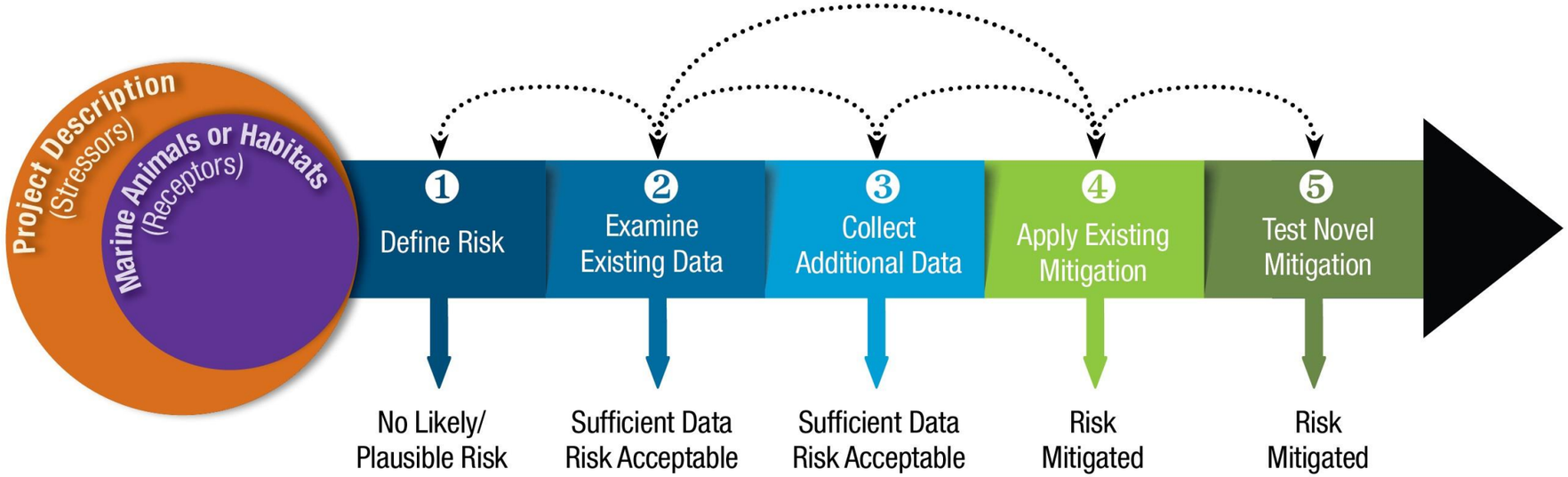
1. Share OES-Environmental's risk retirement process, including data transferability, and associated resources and tools to set the stage for today and help implement during consenting

2. Share the Best Management Practices (BMPs) for risk retirement developed to help apply risk retirement to projects during planning and consenting

3. Discuss the BMPs to receive feedback on their applicability and potential improvements

Risk Retirement

- For certain stressor-receptor interactions, potential risks need not be fully investigated for every project
- New MRE projects informed by what is already known from consented projects, research, and analogous industries
- Aimed for use during consenting processes by regulators, advisors, developers, and consultants

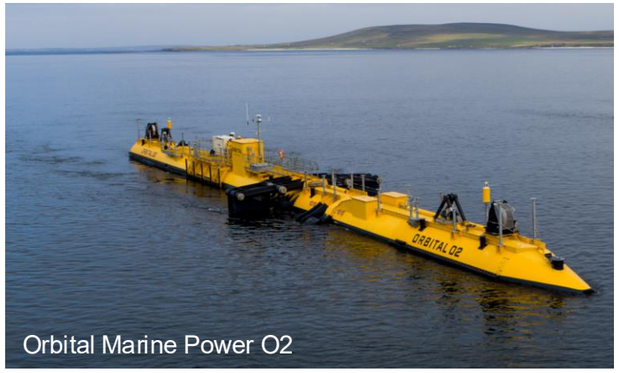


https://tethys.pnnl.gov/risk-retirement

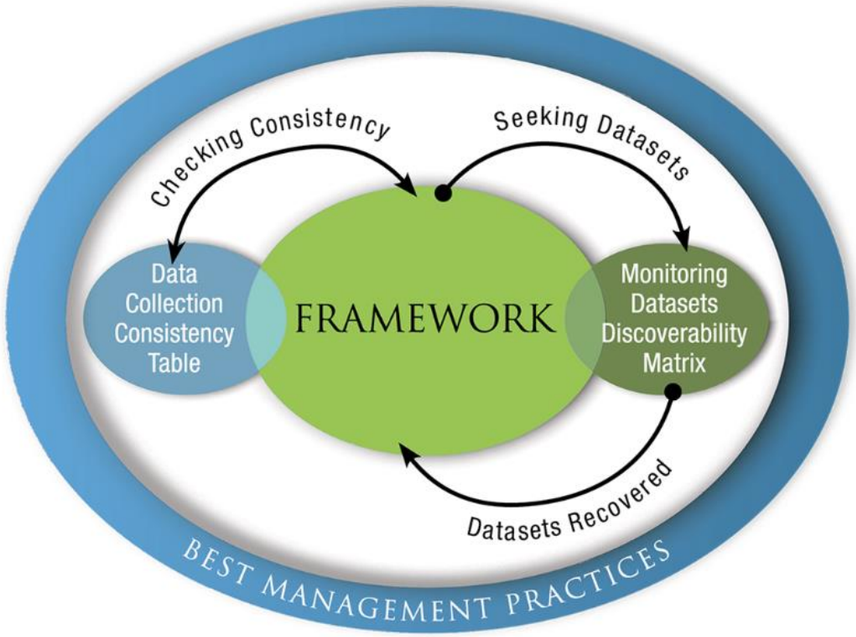
Data Transferability

- Data/information collected through research studies and monitoring from other projects should inform new projects
  - Site specific data will be needed for all new projects
  - But may reduce data collection needs
- Guidelines to enable transfer of datasets from one project/location to inform future projects


Wedge Global W1



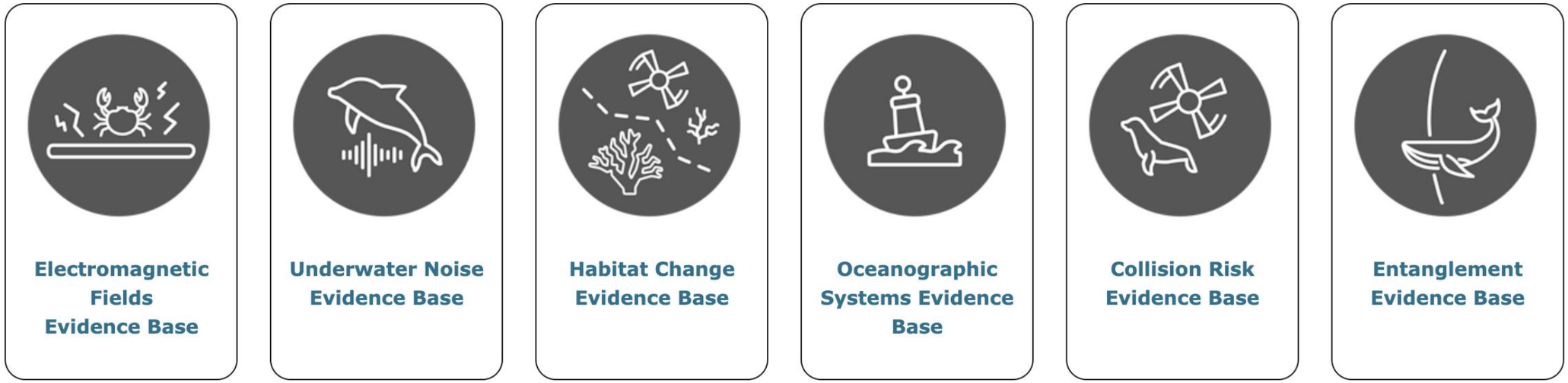
Orbital Marine Power O2



https://tethys.pnnl.gov/data-transferability

Evidence Bases

- Key research papers and monitoring reports for each stressor-receptor interaction that informs risk retirement



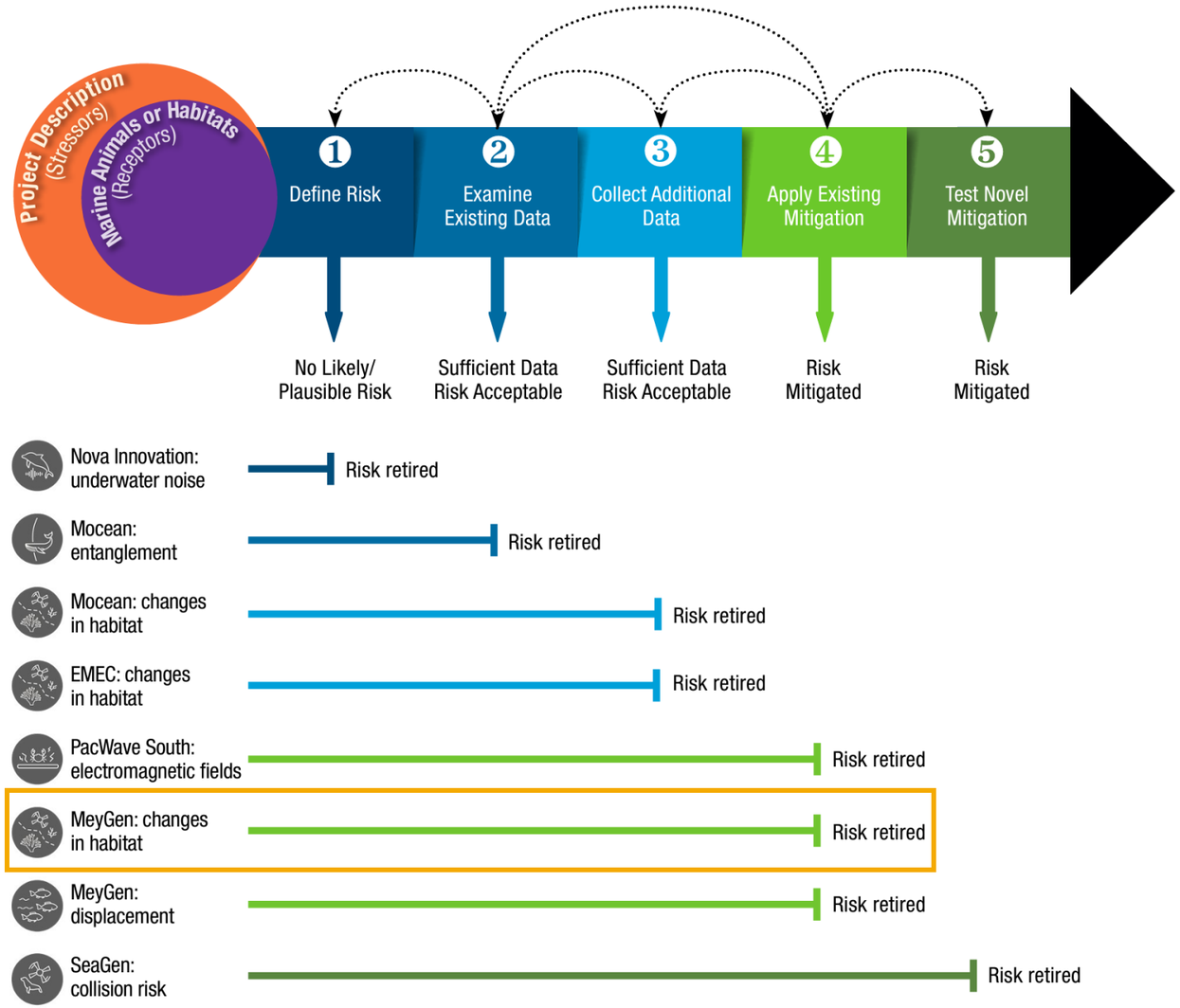
https://tethys.pnnl.gov/risk-retirement-evidence-bases

Status of Risk Retirement

- OES-Environmental has explored the ability to retire risk for key stressor-receptor interactions for small number of devices (1-6)
- Based on evidence bases of the most relevant studies and data, and engaging with subject matter experts around the world

	STRESSOR-RECEPTOR INTERACTION	READINESS FOR RISK RETIREMENT
	Collision risk	Need more information.
	Underwater noise	Retired for small numbers of devices. May need to revisit as the industry moves to larger-scale arrays.
	Electromagnetic fields	Retired for small numbers of devices. May need to revisit as the industry moves to larger-scale arrays.
	Changes in habitat	Retired for small numbers of devices. May need to revisit as the industry moves to larger-scale arrays.
	Oceanographic systems	Retired for small numbers of devices. May need to revisit as the industry moves to larger-scale arrays.
	Entanglement	Need more information as the industry moves to larger-scale arrays.
	Displacement	Need more information as the industry moves to larger-scale arrays.

Risk Retirement Case Study



MeyGen Tidal Energy Project
Changes in Habitat

DEFINE RISK

- Potential risk of impact to benthic habitats and the animals that reside within that habitat.

EXAMINE EXISTING DATA

- Existing benthic habitat data were examined as part of the EIA process.

COLLECT ADDITIONAL DATA

- Benthic seabed surveys were carried out to determine the benthic habitats and species present and the biotope classification. These data were then examined during the EIA, the conclusions of which informed the development of the PEMP.
- Monitoring of benthic habitats and species was not required for the operational stage.

APPLY EXISTING MITIGATION

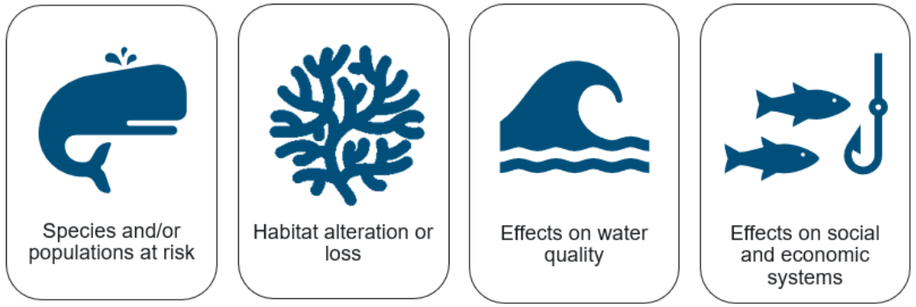
- No mitigation required during the operational stage.
- Design features and mitigation measures for the construction stage were built into the project to mitigate potential impacts.

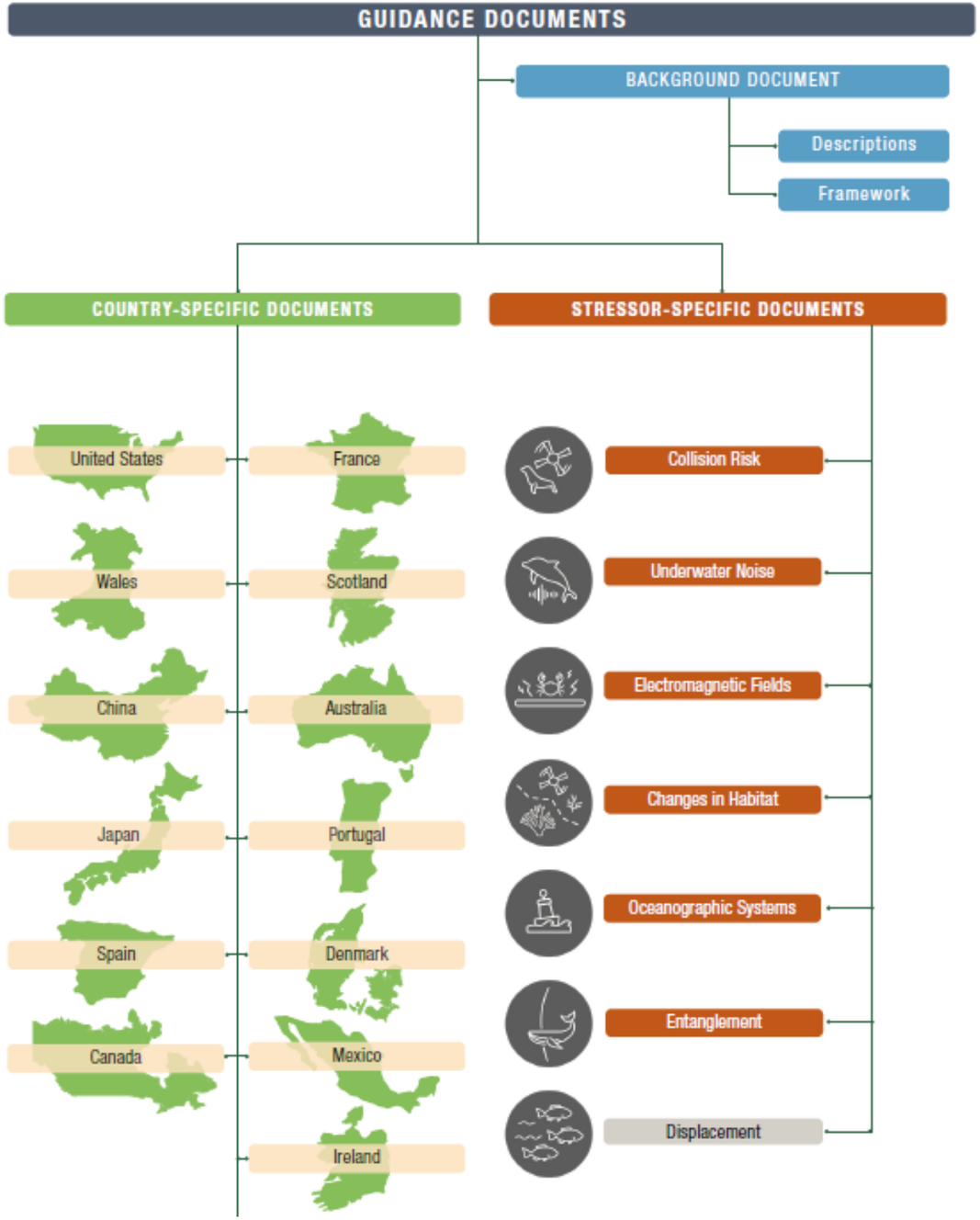
Guidance Documents

- Developed to:
  - Bridge from scientific evidence to regulatory use
  - Make information accessible

Stressor-receptor interactions

Regulatory categories

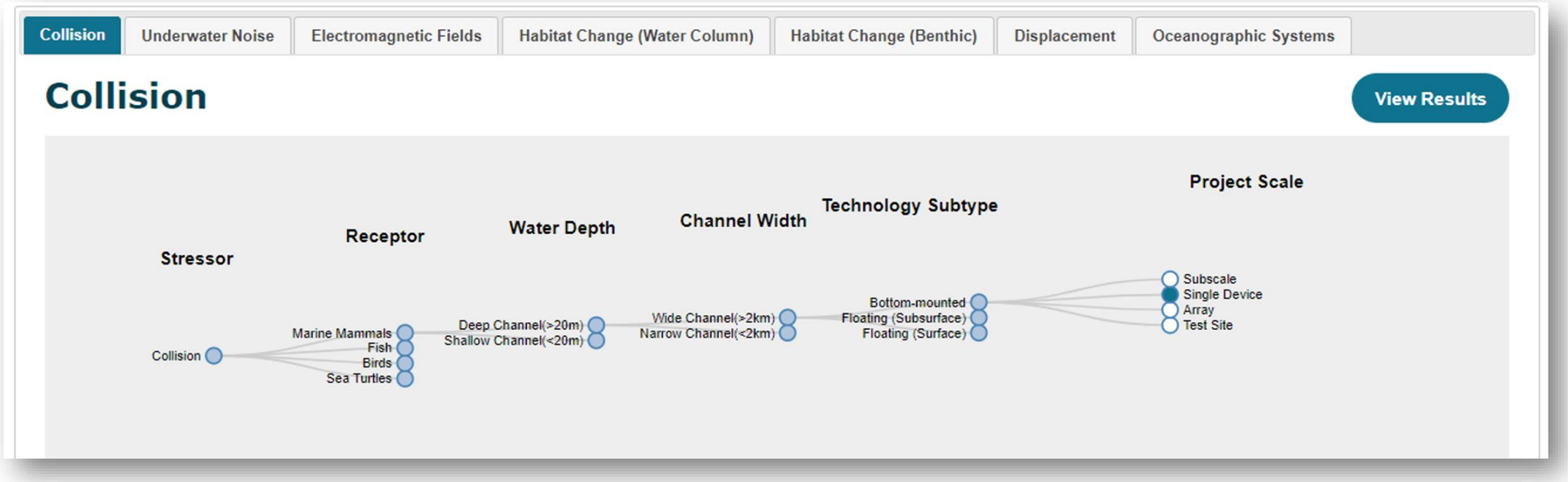




https://tethys.pnnl.gov/guidance-documents

Monitoring Datasets Discoverability Matrix

- Interactive tool for easily finding datasets from already consented projects

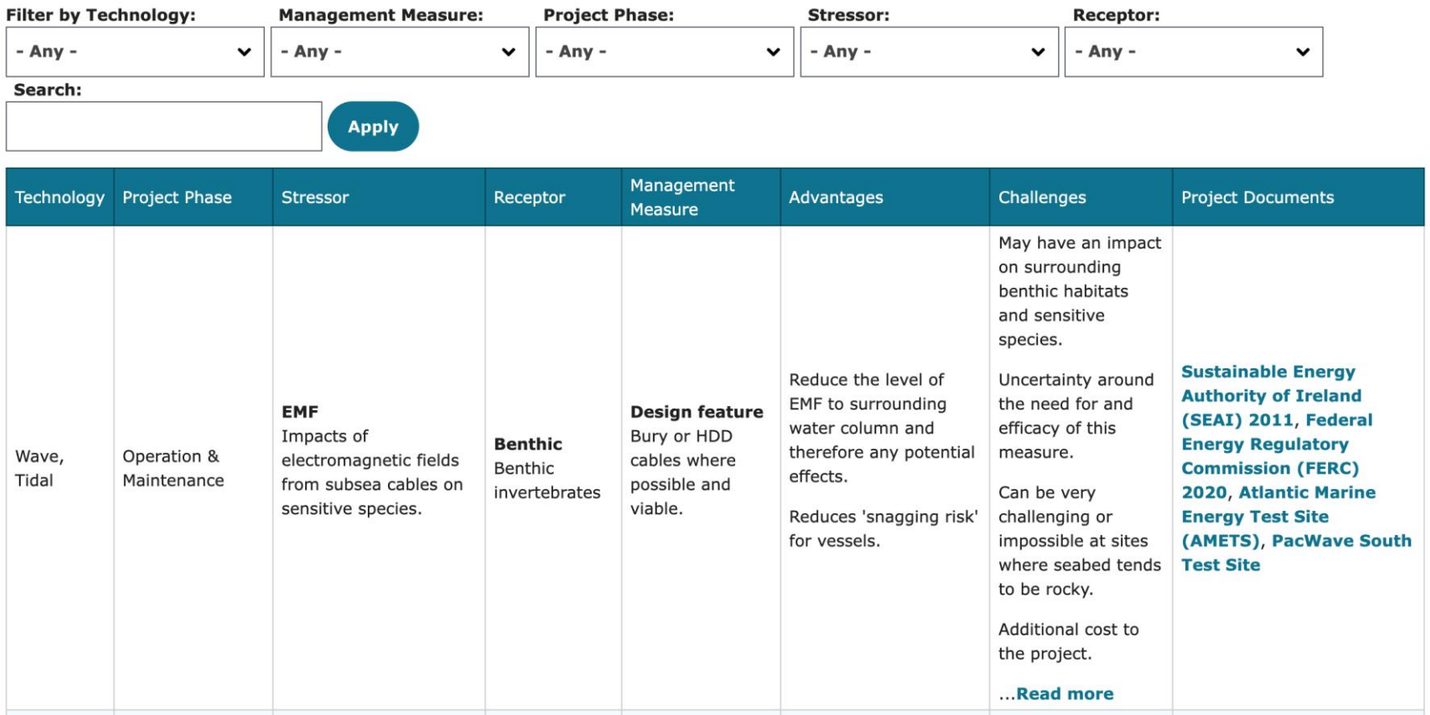


- Allows users to sort through the stressor-receptor interactions and characteristics to retrieve relevant datasets for future projects
- Makes datasets from existing projects accessible

https://tethys.pnnl.gov/monitoring-datasets-discoverability-matrix

Management Measures Tool

- Searchable tool of environmental monitoring and mitigation efforts from past and present marine energy projects
- Provides a reference to help manage potential risks and allow projects to move forward in the face of uncertainty



Filter by Technology: - Any - | **Management Measure:** - Any - | **Project Phase:** - Any - | **Stressor:** - Any - | **Receptor:** - Any -

Search: Apply

Technology	Project Phase	Stressor	Receptor	Management Measure	Advantages	Challenges	Project Documents
Wave, Tidal	Operation & Maintenance	**EMF** Impacts of electromagnetic fields from subsea cables on sensitive species.	**Benthic** Benthic invertebrates	**Design feature** Bury or HDD cables where possible and viable.	Reduce the level of EMF to surrounding water column and therefore any potential effects. Reduces 'snagging risk' for vessels.	May have an impact on surrounding benthic habitats and sensitive species. Uncertainty around the need for and efficacy of this measure. Can be very challenging or impossible at sites where seabed tends to be rocky. Additional cost to the project. ...**Read more**	**Sustainable Energy Authority of Ireland (SEAI) 2011**, **Federal Energy Regulatory Commission (FERC) 2020**, **Atlantic Marine Energy Test Site (AMETS)**, **PacWave South Test Site**

https://tethys.pnnl.gov/management-measures

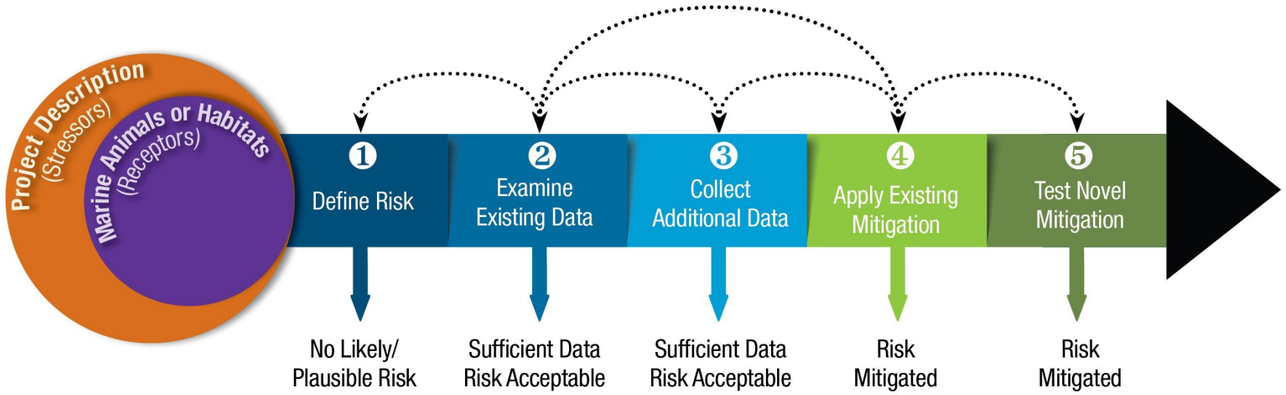
Feedback Poll + Discussion

PollEv.com/tethyspnnl296

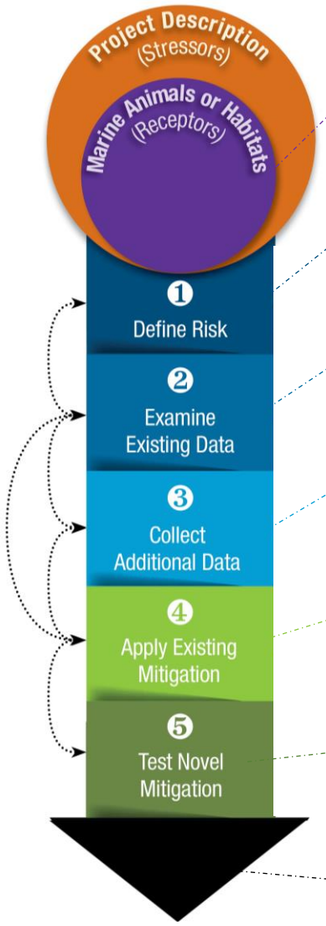
- Have you been able to retire a risk during permitting/consenting for a project?
  - For what stressor-receptor interaction?
- How have you transferred data from one project to inform permitting/consenting for a new project?

Best Management Practices (BMPs) for Risk Retirement

- Aim to assist with implementing the risk retirement process
- Drafted a series of succinct statements that describe the optimal means to apply the risk retirement methods
  - Include:
    - ✓ A description of each step of the risk retirement pathway
    - ✓ The Best Management Practice
    - ✓ “Off ramps” or ways to exit the pathway and retire risks
- Aim to be accessible and actionable for the MRE industry, regulators and advisors, and other stakeholders



Risk Retirement BMPs



Initiation Steps: Stressors | Receptors

Define project characteristics (site characteristics, number of devices, mooring type, cable configuration, etc.) and marine animals or habitats (stressors and receptors).

Step 1: Define risk

Identify all stressor-receptor interactions and determine the potential level of risk for each interaction.

→ *No likely/plausible risk*

Step 2: Examine existing data

Examine existing data/models using good management practices for data transferability.

→ *Sufficient data, risk acceptable*

Step 3: Collect additional data

Collect data consistent with industry standards (e.g., IEC TC 114) or scientific practice (data collection consistency table) to allow for comparison deployments.

→ *Sufficient data, risk acceptable*

Step 4: Apply existing mitigation

Examine existing mitigation measures to determine if they can mitigate project risks; develop detailed plans to document how mitigation measures will be implemented throughout project.

→ *Risk mitigated*

Step 5: Test novel mitigation

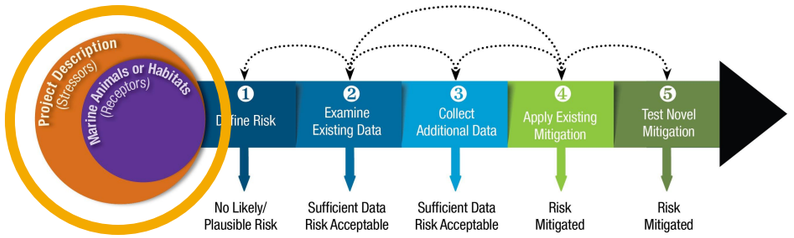
Collaborate with regulators to determine if novel mitigation is satisfactory and develop reporting requirements; document efforts and share widely to add to community knowledge.

→ *Risk mitigated*

Risk unacceptable or unmitigated

Investigate alternatives to reduce risk and environmental impacts including redesign or relocation; if these are not viable, assess other options or consider abandoning the project.

Initiation Step: Stressors



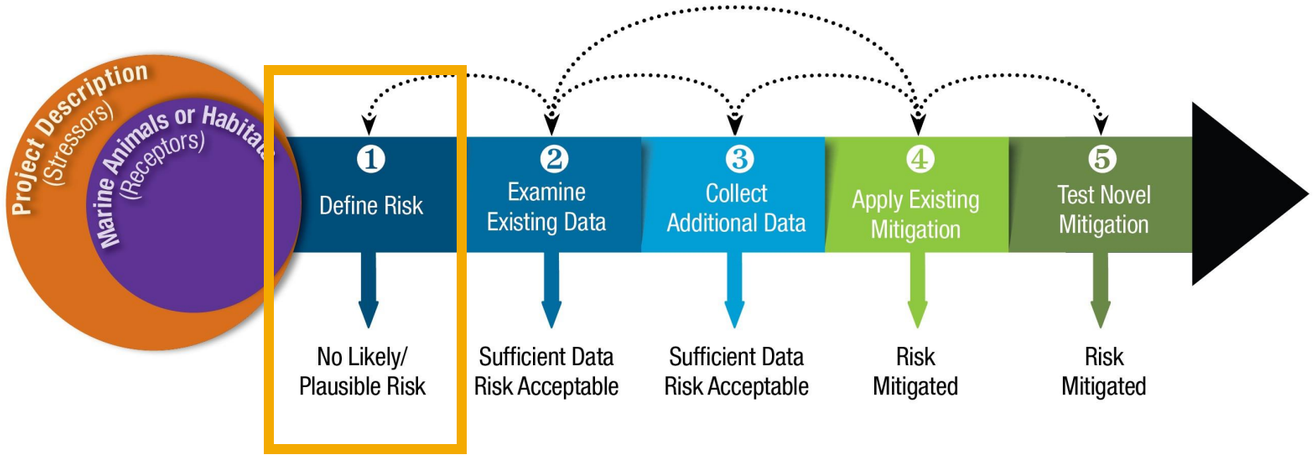
- Comprehensively define project characteristics to identify relevant environmental stressors
  - Type of MRE device will determine which environmental stressors are more likely
  - Additional characteristics: number and size of device(s), mooring type, cable configuration, power take-off, end user, site characteristics

Initiation Step: Receptors

- Comprehensively define marine animals, habitats, or ecosystem processes that may be affected by the different stressors
  - Marine mammals, fish, seabirds, invertebrates, benthic or pelagic habitats, marine plants, and human systems

Step 1: Define risk

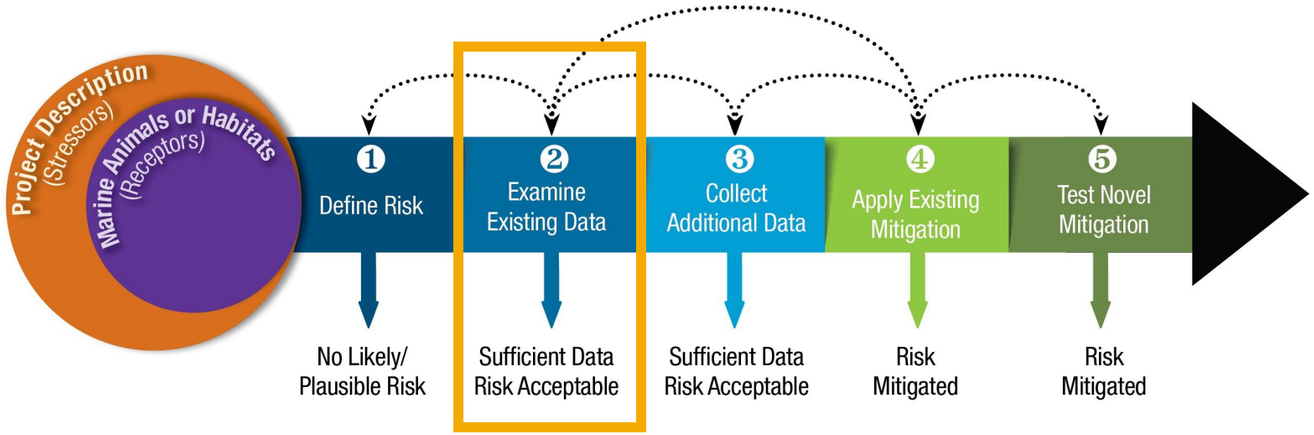
- **BMP:** identify all stressor-receptor interactions and determine the potential level of risk for each interaction
- **Off ramp:** if no plausible or likely risk exists for a particular interaction, the interaction can be removed from further consideration



Step 2: Examine existing data

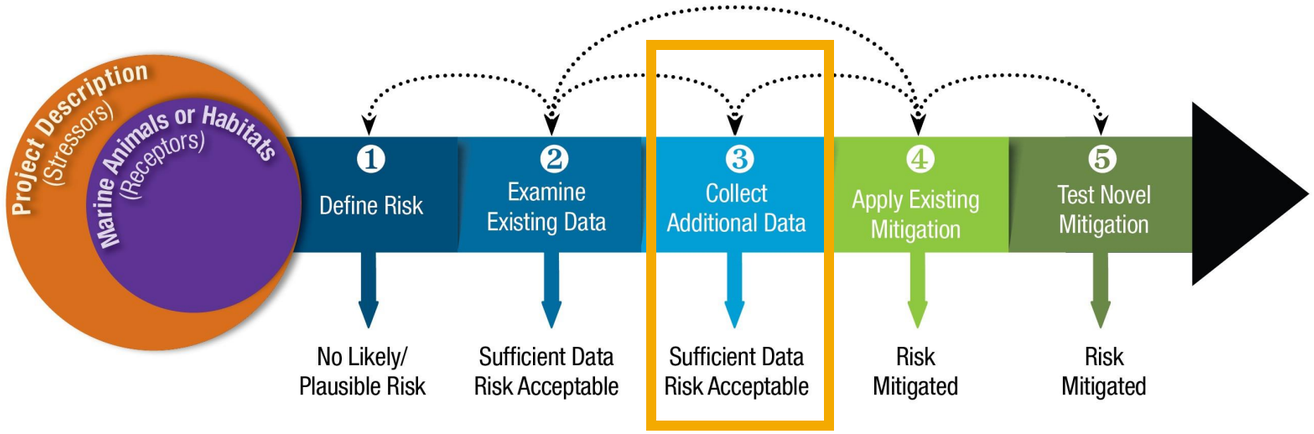
- **BMP:** examine existing data/models and information using the best management practices for data transferability

- **Off ramp:** if existing data from previous MRE projects and analogous industries/activities are available and can determine the risk is acceptable, the risk can be retired



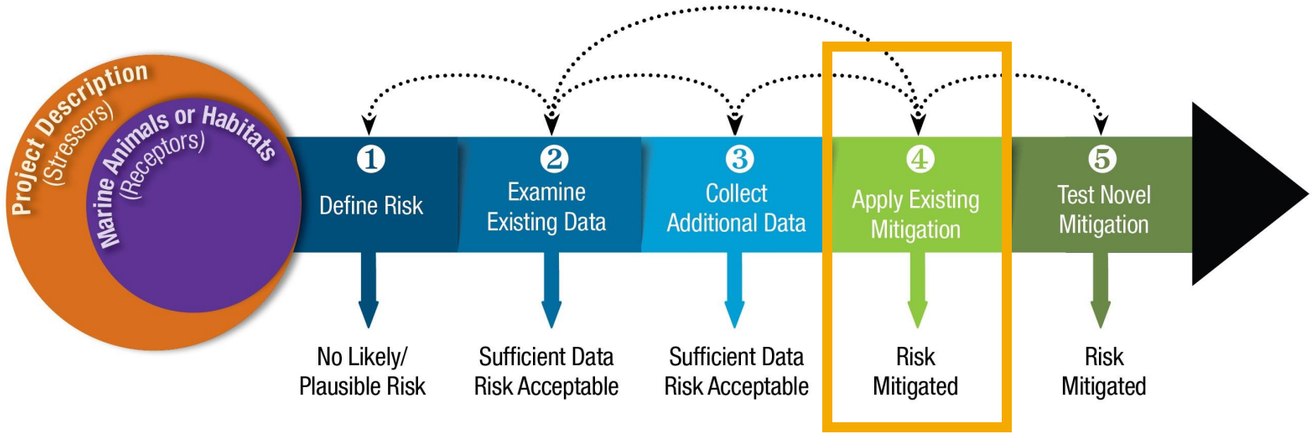
Step 3: Collect additional data

- **BMP:** collect data consistent with industry standards or scientific practice to allow for comparison with other MRE projects
- **Off ramp:** if additional data determine that the risk is acceptable, the risk can be retired



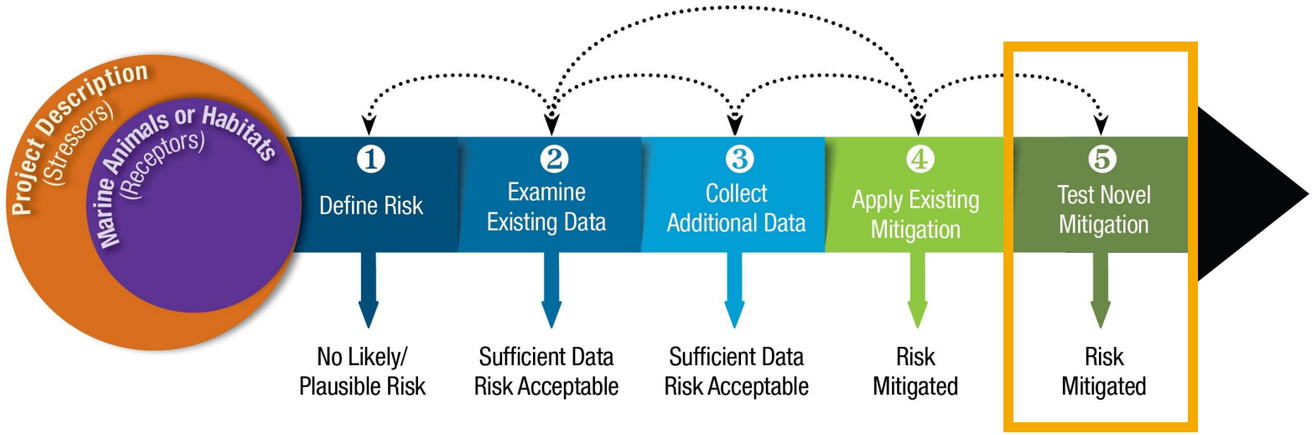
Step 4: Apply existing mitigation

- **BMP:** examine existing mitigation measures from MRE or analogous industries to determine if they are proven to mitigate project risks; develop detailed plans to document how mitigation measures will be implemented during various project phases
- **Off ramp:** if existing mitigation measures can be applied to reduce, minimize, or mitigate the risk to an acceptable level, the risk can be retired



Step 5: Test novel mitigation

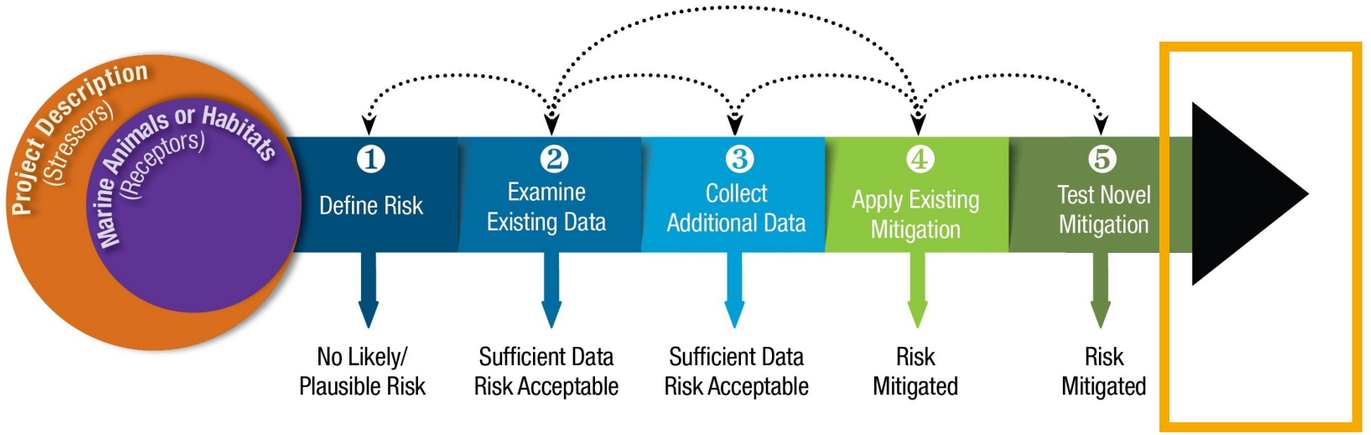
- **BMP:** collaborate with regulators and researchers to determine if novel mitigation is satisfactory and develop reporting requirements; document efforts and share widely to add to community knowledge
- **Off ramp:** if novel measures can be applied to reduce, minimize, or mitigate the risk, the risk can be retired



Risk unacceptable or unmitigated

- If a risk cannot be retired or mitigated, the project may require significant changes.

- **BMP:** investigate other avenues to reduce project risk and environmental impacts including redesigning the technology or relocating the project
  - If neither redesign nor relocation are viable, assess any remaining options or consider abandoning the project

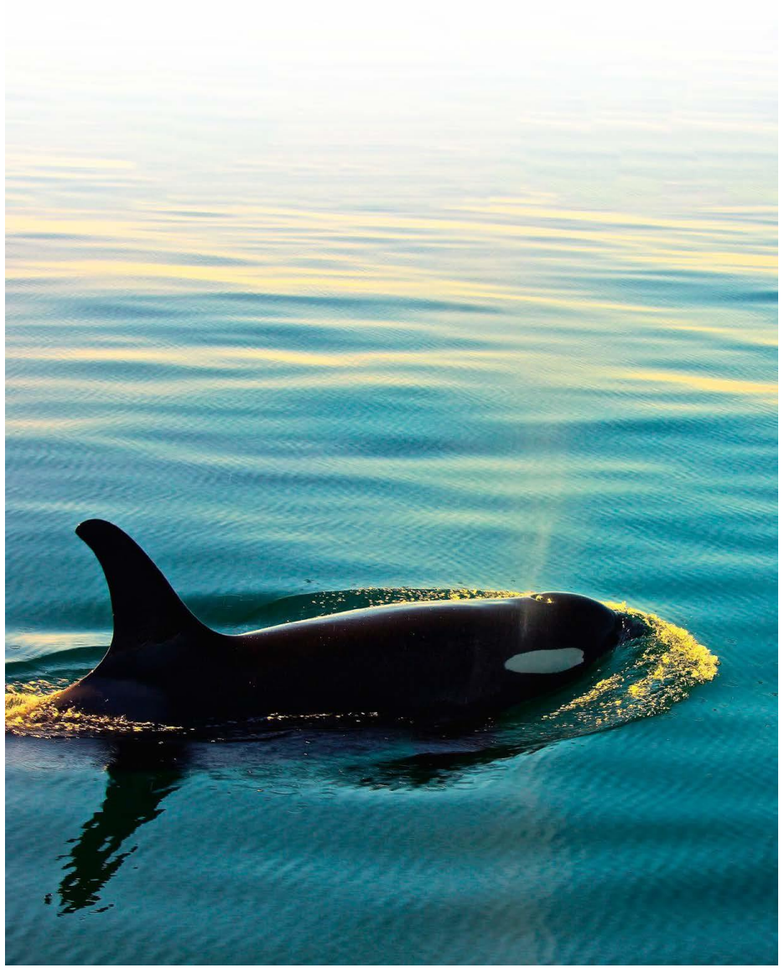


Discussion and Feedback

- Do you have any questions or feedback about the BMPs?
- How would you envision applying the BMPs and risk retirement to your projects?
- What else is needed?

Canva Whiteboard

Getting to Success with Risk Retirement



- Regulators and advisors
  - Willing to accept premise of risk retirement and data transferability
  - Apply the principles of risk retirement and data transferability to evaluate consenting applications
- Device/project developers and consultants
  - Recognize the value of risk retirement and data transferability, and apply these processes during consenting
  - Commit to collecting/providing data that will best fit the data transferability framework and guidelines for collection consistency, quality assurance, and trustworthiness
  - Share examples of risk retirement and data transferability with the MRE community
- Researchers
  - Awareness of risk retirement and data transferability
  - Produce research and associated data that can inform future projects and be used to fill current knowledge gaps and retire risks

Next Steps

- Use the feedback received today to update the BMPs for risk retirement
- Finalize BMPs for risk retirement document as part of the broader guidance documents
  - Aim to be a cohesive set of documents that guides the application of risk retirement, providing resources and linking to available data and information
- Share on Tethys, and through Tethys Blast and other channels

Thank you

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