



From Science to Consenting: Environmental Effects of Marine Renewable Energy

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PAMEC

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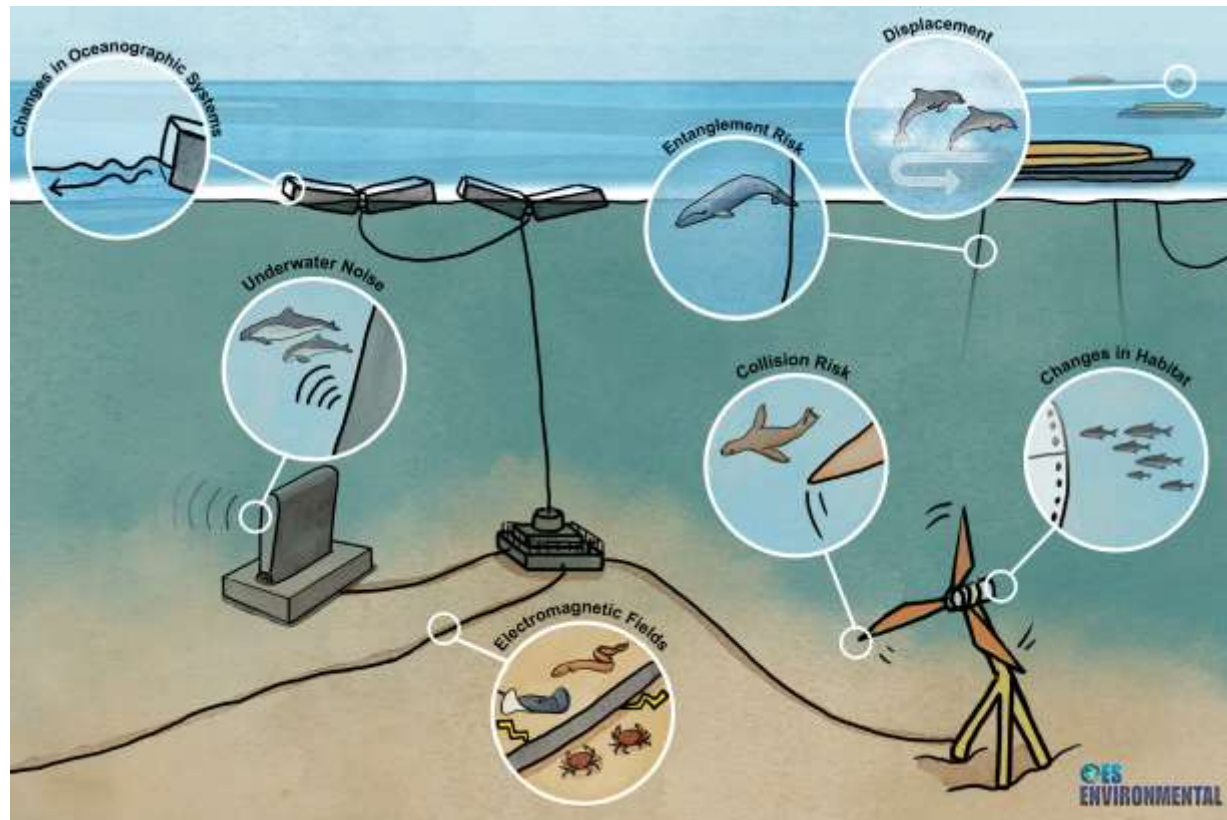


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Marine Renewable Energy (MRE)

- Early stages of development, deployment, and commercialization
- Environmental concerns continue to slow consenting/permitting worldwide
- OES-Environmental international initiative examines environmental effects of MRE to advance the industry in a responsible manner



Key stressor-receptor interactions:

- | | | | |
|---|------------------------------|---|----------------------------------|
|  | Collision risk |  | Entanglement |
|  | Underwater noise |  | Changes in oceanographic systems |
|  | Electromagnetic fields (EMF) |  | Displacement |
|  | Habitat changes | | |

Moving from Science to Consenting

Available data and information



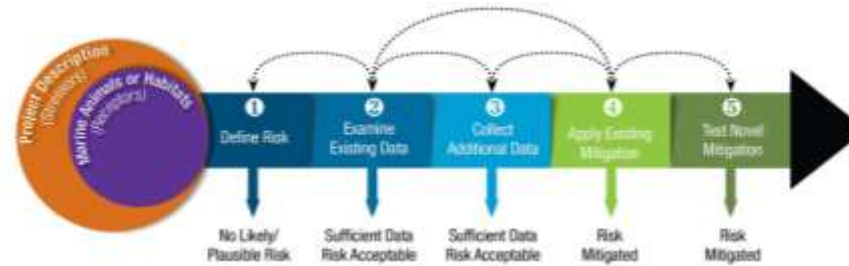
Evidence bases



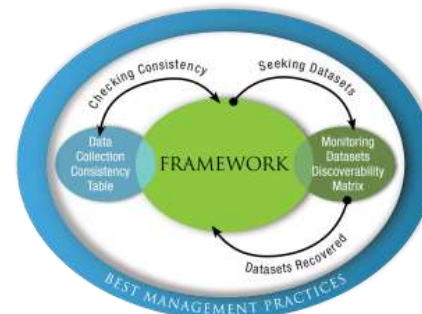
Guidance documents



Risk retirement



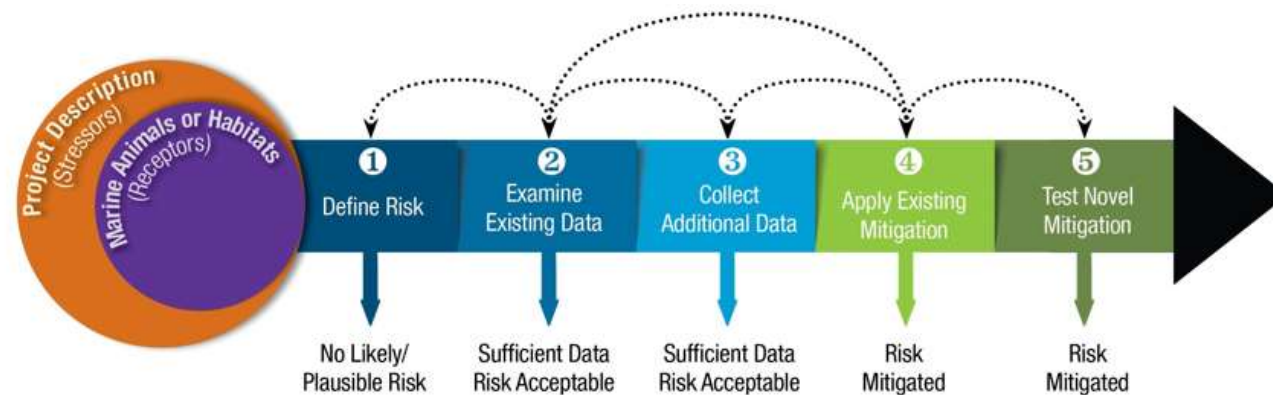
Data transferability



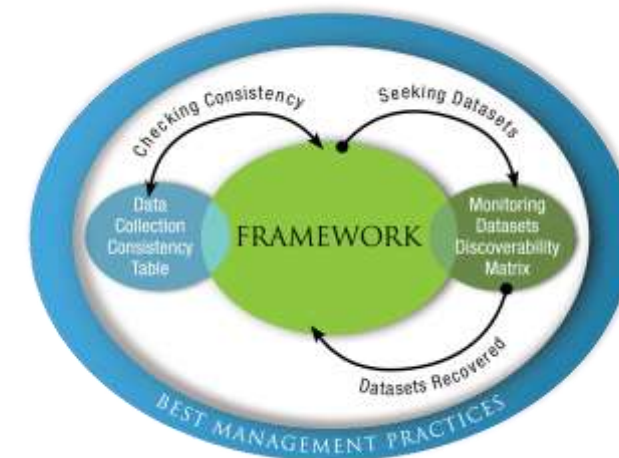
Feedback from MRE community

Risk Retirement and Data Transferability

- For certain interactions, potential risks need not be fully investigated for every project (risk retirement)
- New MRE projects informed by what is already known (data transferability)
- Important notes:
 - Does not replace/contradict regulatory processes
 - Site-specific data may be needed for new projects
 - A retired risk can be reexamined in the future



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



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

Evidence Bases

- Key research papers, monitoring reports, and documents to inform risk retirement for small numbers of MRE devices
- Reviewed and discussed by experts
- Addressed by stressor-receptor interaction:



Collision risk – *66 documents*



Habitat change – *60 documents*



Underwater noise – *29 documents*



Entanglement – *11 documents*










EMF – *16 documents*



Changes in oceanographic systems – *23 documents*

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

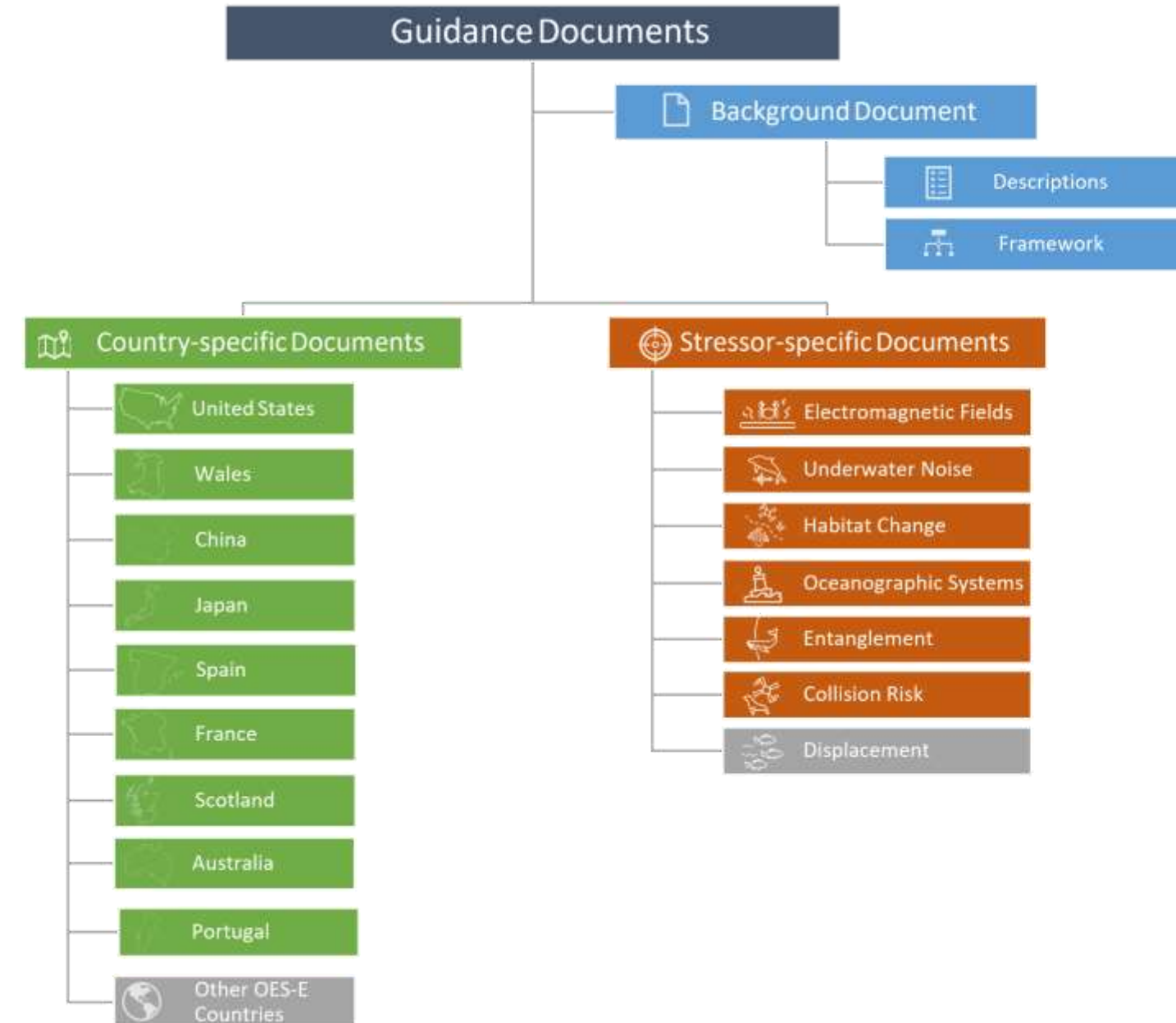
Status of Risks

Interaction	Readiness for risk retirement
 Collision	Need more information as level of risk is uncertain. No fatal collisions have been observed to date.
 Underwater noise	Retired for small numbers of devices. The International Electrotechnical Commission has established standards for measurement. Regulatory thresholds and guidance for noise exist in the United States.
 Electromagnetic fields	Retired for small numbers of devices. Electromagnetic fields emitted from MRE power export cables are much lower than offshore wind or other subsea cables.
 Habitat change	Retired for small numbers of devices. Proper siting is key to minimize impacts.
 Oceanographic systems	Retired for small numbers of devices. No measurable impacts detected from small numbers of devices compared to natural variability.
 Entanglement	Need more information as the industry scales up to arrays.
 Displacement	Need more information as the industry scales up to arrays.

Guidance Documents

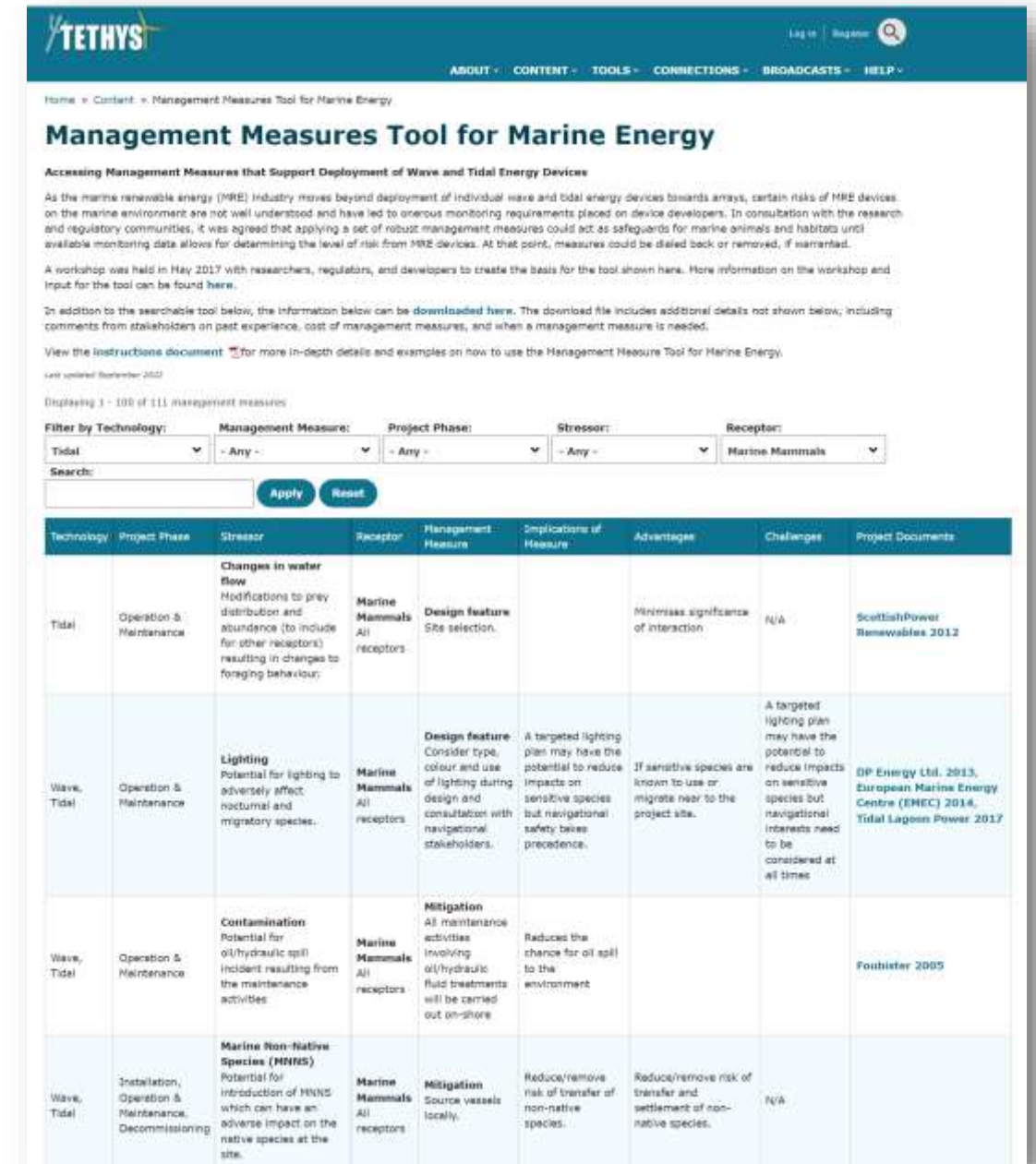
- Guidance documents developed to:
 - Bridge from scientific evidence to regulatory use
 - Make information accessible

- Organization of the guidance documents:
 - Scheme for categories of regulation
 - Overview flowchart
 - 3 types of guidance documents:
 - ✓ Background
 - ✓ Country-specific
 - ✓ Stressor-specific



Management Measures Tool

- Certain environmental risks from MRE devices not well understood → leads to onerous monitoring requirements
- Tool provides a reference to help manage potential risk before they can be retired
 - Help projects to move forward in the face of uncertainty, or until a risk can be retired
- Online tool collates measures used and tried for current and previous MRE projects



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Management Measures Tool for Marine Energy

Accessing Management Measures that Support Deployment of Wave and Tidal Energy Devices

As the marine renewable energy (MRE) industry moves beyond deployment of individual wave and tidal energy devices towards arrays, certain risks of MRE devices on the marine environment are not well understood and have led to onerous monitoring requirements placed on device developers. In consultation with the research and regulatory communities, it was agreed that applying a set of robust management measures could act as safeguards for marine animals and habitats until available monitoring data allows for determining the level of risk from MRE devices. At that point, measures could be dialed back or removed, if warranted.

A workshop was held in May 2017 with researchers, regulators, and developers to create the basis for the tool shown here. Here information on the workshop and input for the tool can be found here.

In addition to the searchable tool below, the information below can be downloaded here. The download file includes additional details not shown below, including comments from stakeholders on past experience, cost of management measures, and when a management measure is needed.

View the instructions document for more in-depth details and examples on how to use the Management Measure Tool for Marine Energy.

Last updated: September 2022

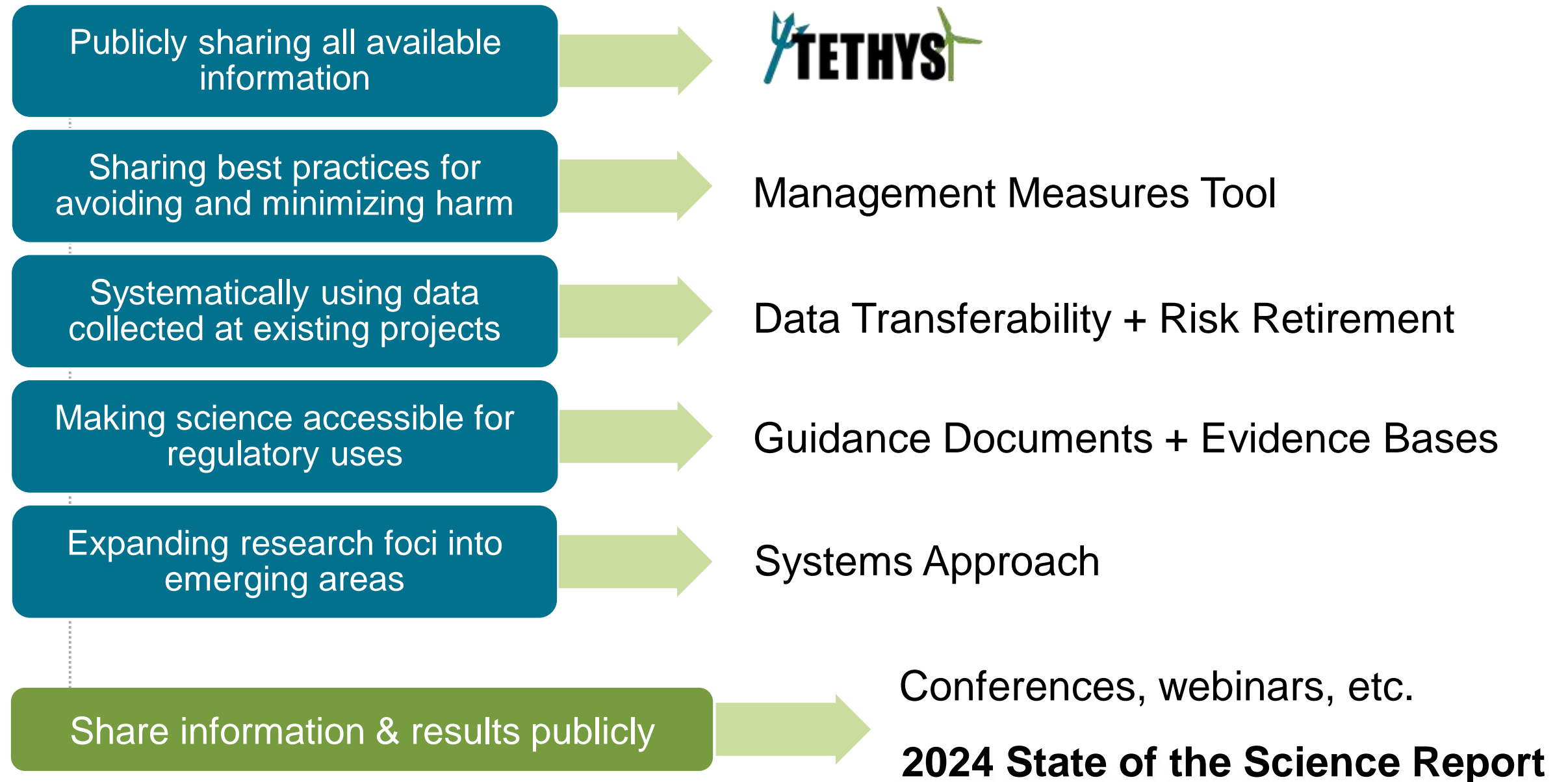
Displaying 1 - 100 of 111 management measures

Filter by Technology: Tidal Management Measure: - Any - Project Phase: - Any - Stressor: - Any - Receptor: Marine Mammals

Search: [] [Apply] [Reset]

Technology	Project Phase	Stressor	Receptor	Management Measure	Implications of Measure	Advantage	Challenge	Project Documents
Tidal	Operation & Maintenance	Changes in water flow Modifications to prey distribution and abundance (to include for other receptors) resulting in changes to foraging behaviour.	Marine Mammals All receptors	Design feature Site selection.		Minimises significance of interaction	N/A	ScottishPower Renewables 2012
Wave, Tidal	Operation & Maintenance	Lighting Potential for lighting to adversely affect nocturnal and migratory species.	Marine Mammals All receptors	Design feature Consider type, colour and use of lighting during design and consultation with navigational stakeholders.	A targeted lighting plan may have the potential to reduce impacts on sensitive species but navigational safety takes precedence.	If sensitive species are known to use or migrate near to the project site.	A targeted lighting plan may have the potential to reduce impacts on sensitive species but navigational interests need to be considered at all times	DP Energy Ltd. 2013, European Marine Energy Centre (EMEC) 2014, Tidal Lagoon Power 2017
Wave, Tidal	Operation & Maintenance	Contamination Potential for oil/hydraulic spill incident resulting from the maintenance activities	Marine Mammals All receptors	Mitigation All maintenance activities involving oil/hydraulic fluid treatments will be carried out on-shore	Reduces the chance for oil spill to the environment			Foxtiester 2005
Wave, Tidal	Installation, Operation & Maintenance, Decommissioning	Marine Non-Native Species (MNNS) Potential for introduction of MNNS which can have an adverse impact on the native species at the site.	Marine Mammals All receptors	Mitigation Source vessels locally.	Reduce/remove risk of transfer of non-native species.	Reduce/remove risk of transfer and settlement of non-native species.	N/A	

Moving Beyond Barriers





Thank you!

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