SAFE WAVE

STREAMLINING THE ASSESSMENT OF ENVIRONMENTAL EFFECTS OF WAVE ENERGY

CAN RISK-BASED APPROACHES BENEFIT FUTURE OFFSHORE RENEWABLE ENERGY DEPLOYMENT, PLANNING AND CONSENTING?

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Project Final Event November 28th 2024

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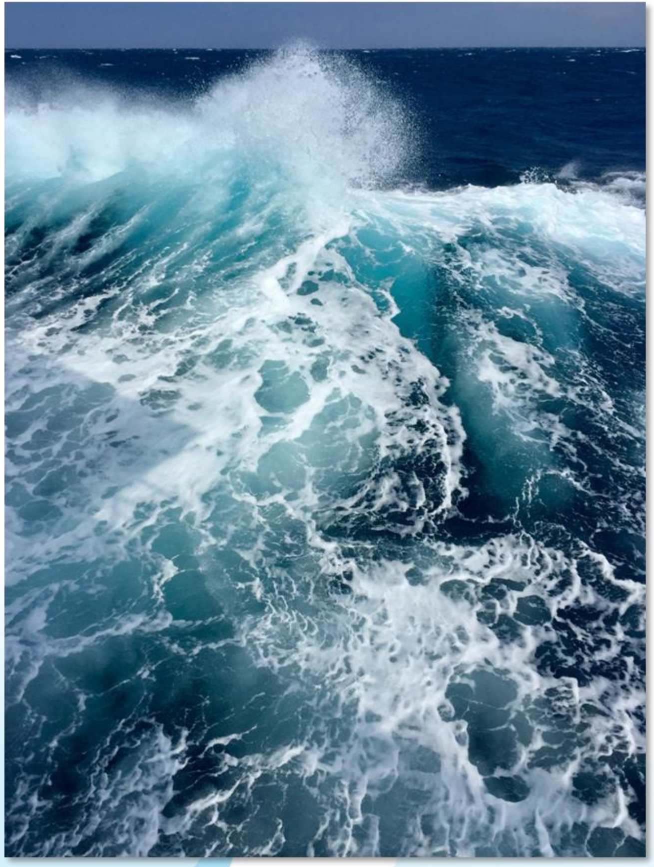
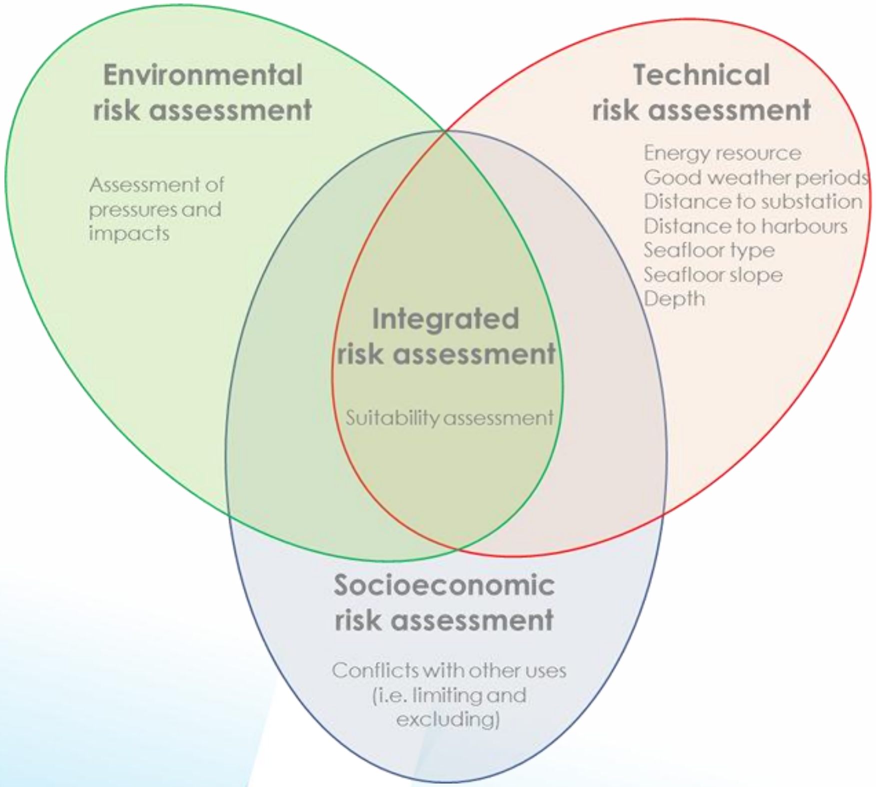
Development of Wave Energy Converters farms



Main non-technological barriers:

- The uncertainties regarding environmental impacts and the risks of wave farms.
- Potential competition and conflicts with other marine users.
- Complexity of the consenting processes

Identification of suitable areas for wave energy projects considering technical, environmental and socio-economic risks



(spatial) management, Strategic Environmental Assessment, decision making, consenting, MSP

Collated data:

Environmental components: 6 (fish, cephalopods, sea mammals, reptiles, birds, sensitive habitats)

Technical components: 7 (seafloor type, wave power, depth, slope, distance to port, distance to electrical substations, weather windows)

Human activities: 15 (cables, dredging, aggregate extraction areas, ports, ocean energy facilities, oil and gas, pipelines, dredge spoil dumping, dumped munitions, urban wastewater discharge, bathing waters, aquaculture, maritime traffic, fishing effort, protected areas)

Galparsoro, I. *et al*., 2021. Gathering, editing and management of relevant information for identifying suitable areas for the development of wave energy projects. http://dx.doi.org/10.13140/RG.2.2.10179.48169
Galparsoro, I. *et al*., 2022. Development of a model for the identification of suitable areas for the development of wave energy projects in the European Atlantic region in the context of maritime spatial planning and its implementation into a Decision Support Tool. http://dx.doi.org/10.13140/RG.2.2.29874.07360

Identification of suitable areas for wave energy projects considering technical, environmental and socio-economic risks

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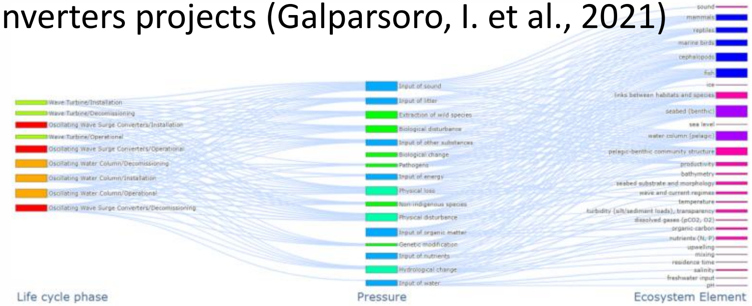
Previous works

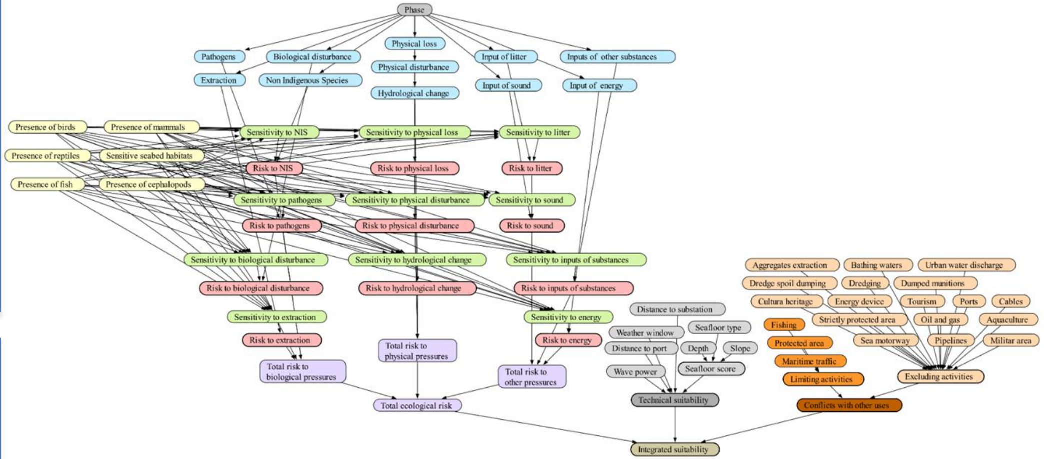
Ecological risk assessment tool for wave energy converters projects (Galparsoro, I. et al., 2021)



WEC-ERA tool: (https://aztidata.es/wec-era)

A Bayesian Network model to identify suitable areas for offshore wave energy farms, in the framework of an ecosystem approach to marine spatial planning (Maldonado, A. D. et al., 2022)

A modelling approach



Bayesian belief network

Galparsoro, I. et al., 2021. A new framework and tool for ecological risk assessment of wave energy converters projects. Renewable and Sustainable Energy Reviews, 151: 111539 https://doi.org/10.1016/j.rser.2021.111539
Maldonado, A. D., I. Galparsoro, G. Mandiola, I. de Santiago, R. Garnier, S. Pouso, Á. Borja, I. Menchaca, D. Marina, L. Zubiate, J. Bald, 2022. A Bayesian Network model to identify suitable areas for offshore wave energy farms, in the framework of ecosystem approach to marine spatial planning. Science of The Total Environment, 838: 156037 https://doi.org/10.1016/j.scitotenv.2022.156037
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Identification of suitable areas for wave energy projects considering technical, environmental and socio-economic risks

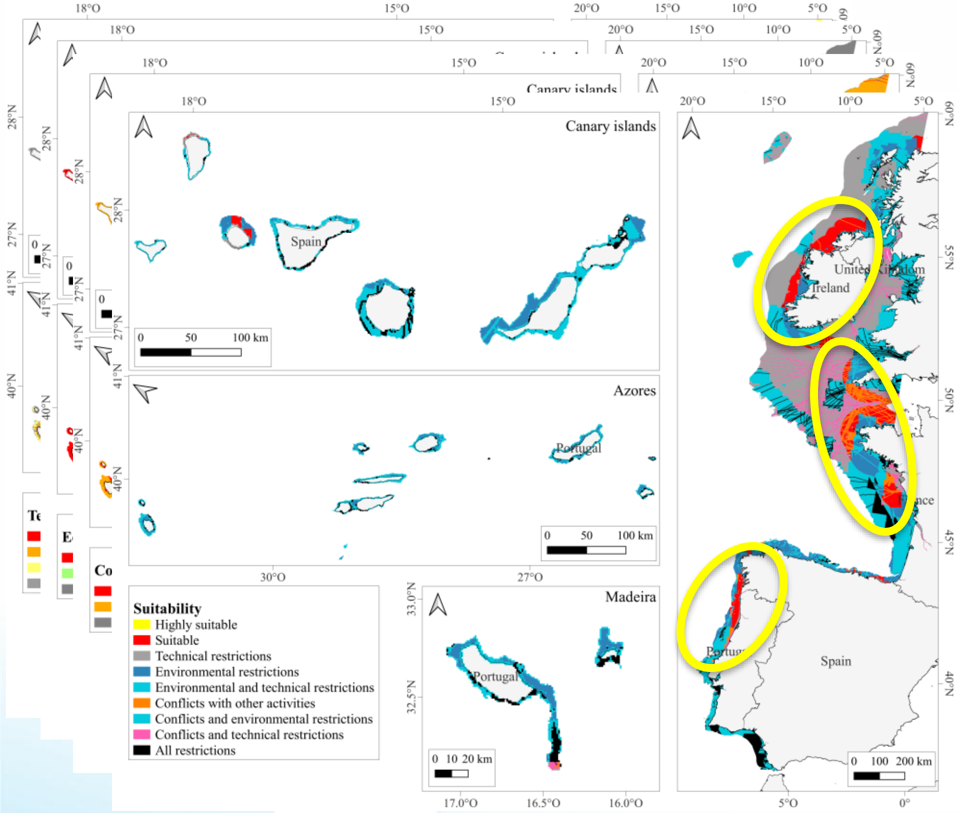
Decision support tool: Identification of suitable areas for offshore energy projects

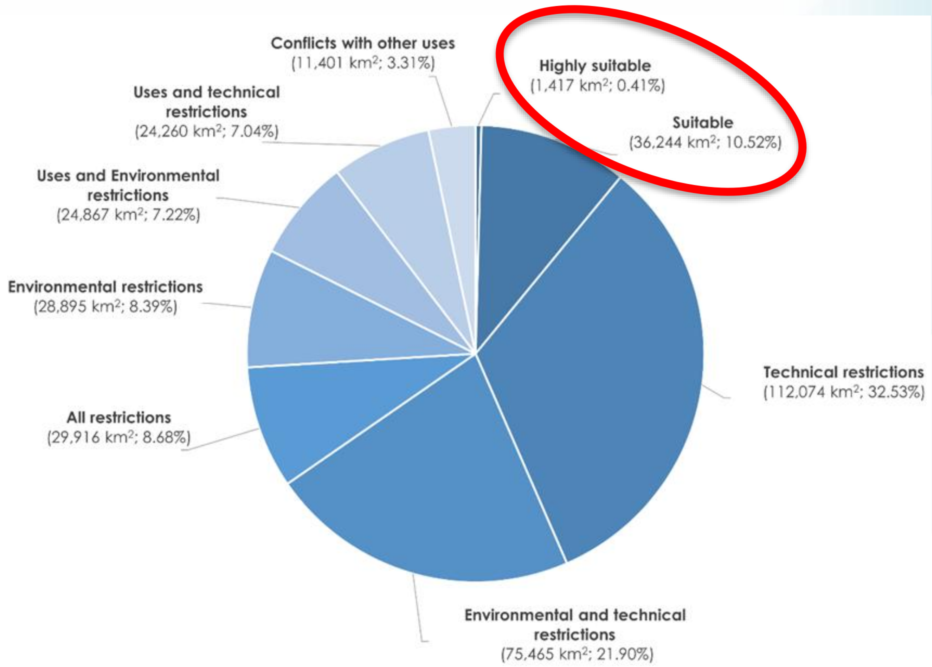
- Inteface between complex models and GIS layers
- Free access, publicly available
- Software licenses are not needed

https://aztidata.es/vapem

Galparsoro, I. *et al.*, 2021. Gathering, editing and management of relevant information for identifying suitable areas for the development of wave energy projects. http://dx.doi.org/10.13140/RG.2.2.10179.48169
Galparsoro, I. *et al.*, 2022. Development of a model for the identification of suitable areas for the development of wave energy projects in the European Atlantic region in the context of maritime spatial planning and its implementation into a Decision Support Tool. http://dx.doi.org/10.13140/RG.2.2.29874.07360

Identification of suitable areas for wave energy projects considering technical, environmental and socio-economic aspects





Percentage of European Atlantic sea space, suitable for developing wave energy projects and main restrictions.

Mandiola *et al.*, *under prep*. Wave energy farm site selection on the European Atlantic coast: A holistic approach

Final remarks

First integrated assessment to identify suitable areas in the European Atlantic region, for the development of wave energy projects based on technical (and economic) economic factors, environmental risks and potential conflicts with maritime activities and infrastructures.

The approach implemented and the maps produced, can serve to identify the most suitable areas, but it should be acknowledged that the **final selection of areas should be based on a more detailed assessment and with higher resolution information layers**.

The **potential energy power production capacity** has been incorporated into the assessment in close cooperation with the industrial partners. In addition, other factors such as the distance to port, and operable weather window have been considered, which helps to obtain realistic results.

Galparsoro; I. *et al.*, 2023. Identifying suitable areas for developing wave energy projects in the European Atlantic region. https://doi.org/10.13140/RG.2.2.14963.09761

Final remarks

Reduction of uncertainty in environmental risk assessment requires the incorporation of a further quantitative assessment of environmental impacts based on monitoring plans in existing WECs testing sites

More detailed information is needed to predict **socioeconomic implications and outcomes**.

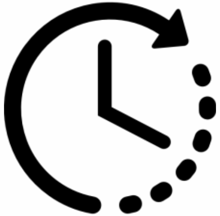
The results obtained indicate that there is **enough space** in the European Atlantic region to develop new wave energy farms for the achievement of predefined **objectives of 1 GW** estimated by the (European Commission, 2020).

If the space is planned properly and with caution, those developments would **fulfil industrial requirements**, and in areas with the **lowest environmental risks and limited or no conflicts with other activities**.

Galparsoro; I. *et al*., 2023. Identifying suitable areas for developing wave energy projects in the European Atlantic region. https://doi.org/10.13140/RG.2.2.14963.09761

Consenting

Risk Based Approaches and Wave Energy



Consenting procedures for Wave Energy Converters are often long, **time-consuming processes**, demanding a lot of **time and data**. This is **delaying** the testing and deployment of novel WECs

Due to uncertainty around environmental impacts, an **Adaptive Management** approach (learning by doing) is needed that allows **progress** to be made faster but in a robust way that **protects the environment**

Much research exists into Risk-based Approaches, but these are **complex**, **multiple approaches** have been developed and are often embedded in scientific literature. This means they **aren’t accessible** to non-scientific communities

Embedding a Risk Based Approach in Marine Renewable Energy Consenting Processes

WHY use a Risk-based Approach?

Can **speed up** decision making

Can work in **data-poor** situations

Suitable for different situations – part of an **Adaptive Management** process

Provides a **clear process** to follow and track

Consenting processes represent a **NON-TECHNOLOGICAL BARRIER** to progress in Wave Energy development

Overarching process followed for this work

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Examine existing RBAs – in a broad sense but with a focus on those most relevant to Wave Energy

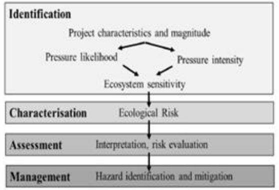
Summarise and simplify the most relevant RBAs, understand the relationships between these

Refinement and validation of a **step-wise risk-based** adaptive management approach

Guidance document on a risk based, adaptive management based consenting process for wave energy projects in France and Ireland

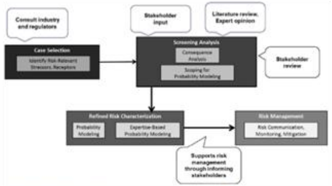
AIM: To remove complexity and make the Risk-based Approach MORE ACCESSIBLE

Identifying the relevant existing Risk-based Approaches



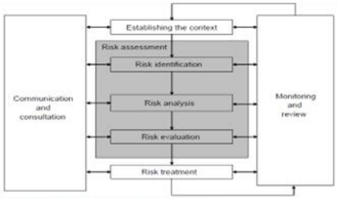
ERA Framework

Galparsoro et al., 2021



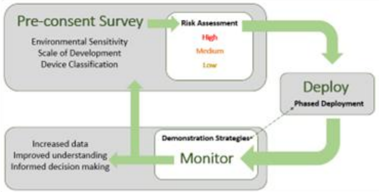
ERES Framework

Copping et al., 2015



ISO Standards

ISO, 2009



Survey-Deploy-Monitor

Marine Scotland, 2016

Risk Retirement

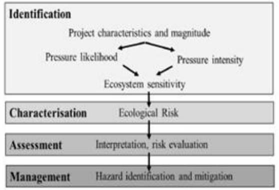
Copping et al., 2020

See SafeWAVE Deliverable 5.2

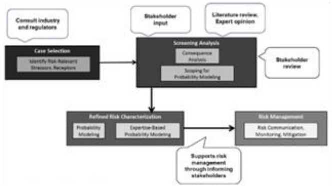
- The **International Standards Organisation** (ISO) (ISO, 2009, 2018) has published both a series of guidelines for risk management and a standard for risk management
- The **Survey-Deploy-Monitor** guidance (Marine Scotland, 2016) was developed to provide regulators and developers with an efficient risk-based approach for taking forward wave and tidal energy proposals
- An **Environmental Risk Evaluation System** (ERES) (Copping et al., 2015) was designed to allow preliminary assessments of risks associated with MRE devices
- The **Risk Retirement** approach (Copping et al., 2020) is based on the principle that once the risk associated with a stressor-receptor interaction is considered sufficiently low, then that risk can be 'retired'
- The **Ecological Risk Assessment Framework** (Galparsoro et al., 2021) uses expert judgement, literature review and a web tool to capture the interactions between a wave farm and the marine environment

Analysing existing Risk-based Approaches

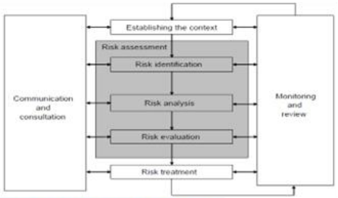
Finding **commonalities** and **differences** between the existing Risk-based approach (alluvial diagram)



ERA Framework
Galparsoro et al., 2021



ERES Framework
Copping et al., 2015



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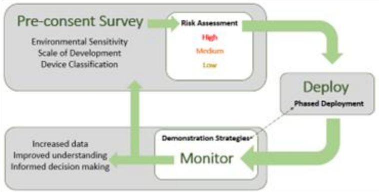
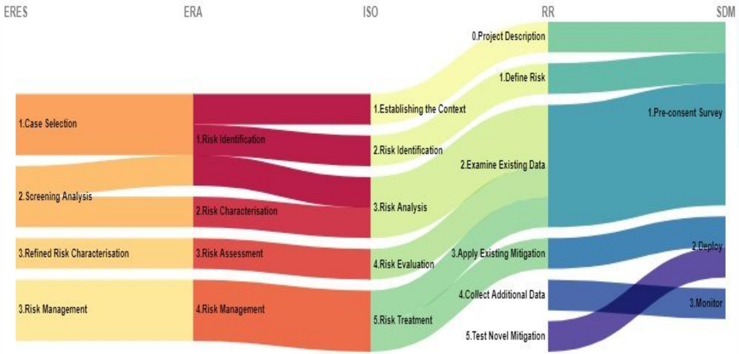


Survey-Deploy-Monitor
Marine Scotland, 2016

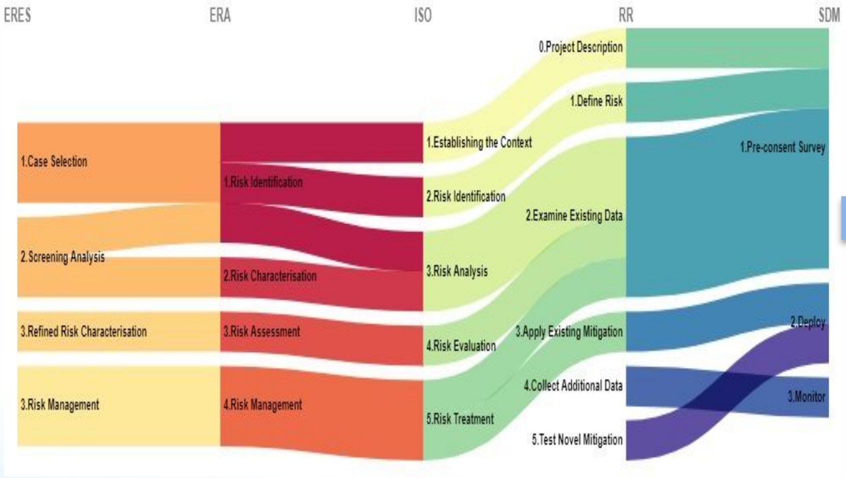
Risk Retirement
Copping et al., 2020

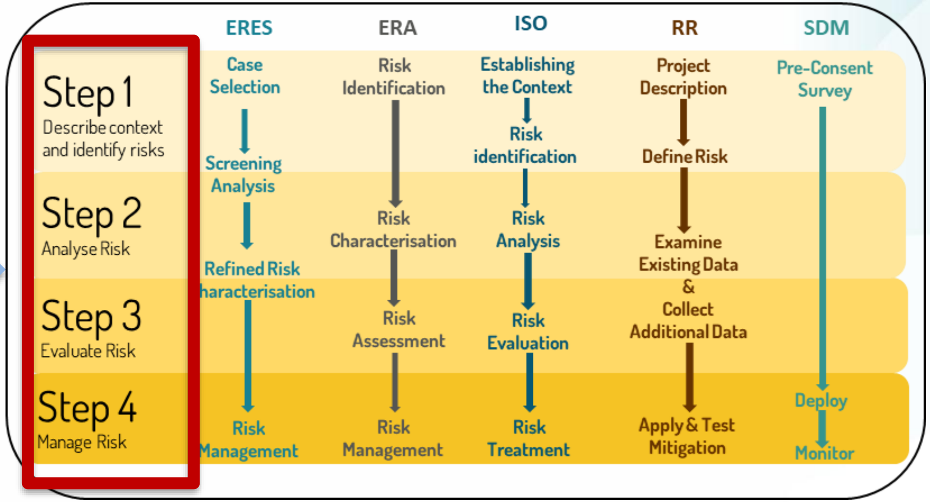


See SafeWAVE Deliverable 5.2

Existing Risk-based Approaches

Creating one graphic to show the **relationship** between all the different approaches



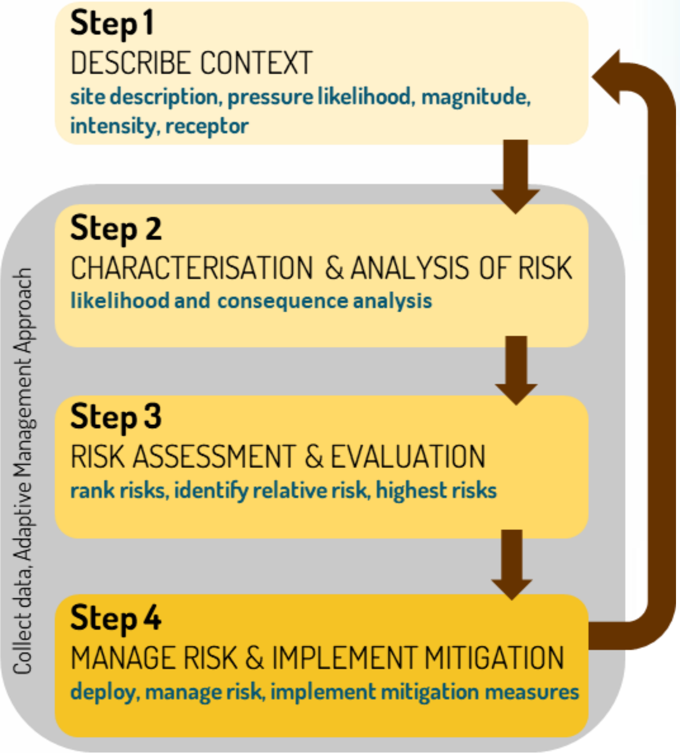


See SafeWAVE Deliverable 5.2

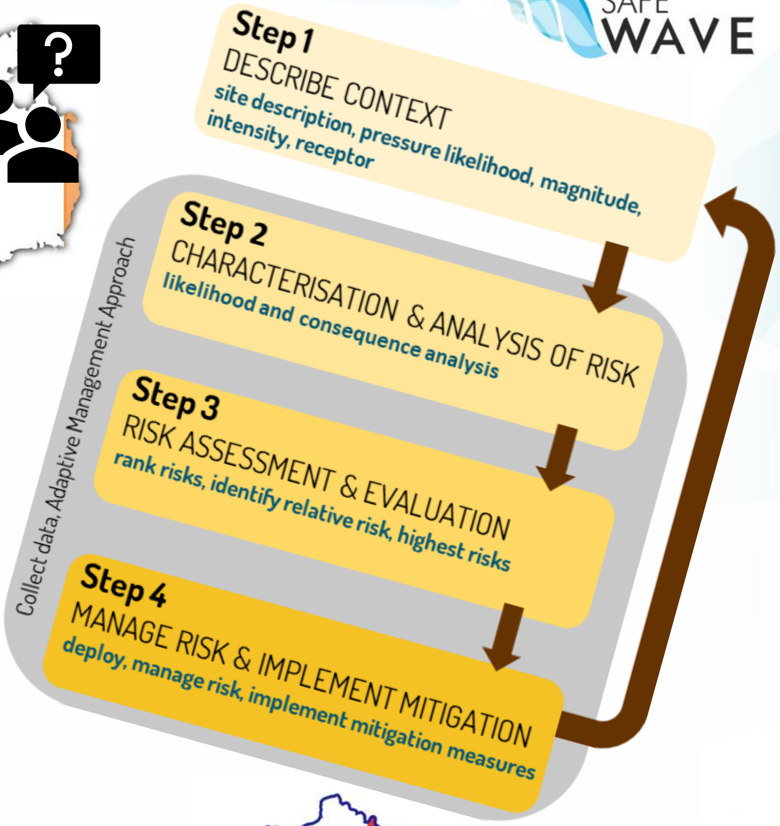
Existing Risk-based Approaches

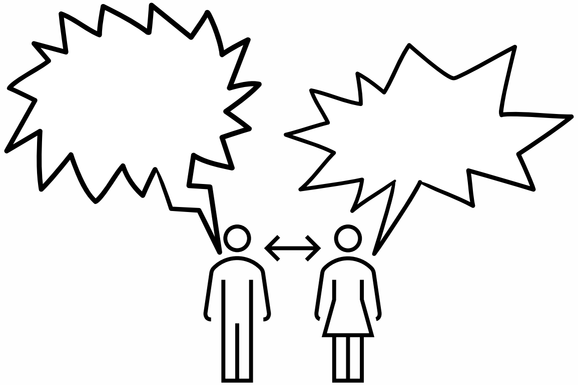
Creating a simple step-wise approach that is USER-FRIENDLY for wider use

See SafeWAVE Deliverable 5.3

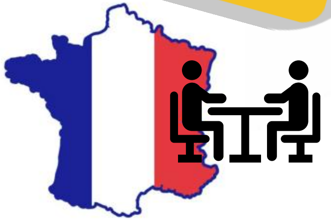


FEASABILITY OF RISK-BASED APPROACHES?





Meetings and Workshops with **regulators** to determine **operational feasibility** of RBA



Questions

1. Have you encountered risk-based approaches in your work?

2. Have you used (RBAs) in any Offshore Renewable Energy projects to date or do you plan to?

3. Which RBAs have you used, why? What worked and what did not?

4. Would you use RBAs again or would you like to see wider uptake?

5. Which environmental inputs would you consider to be most 'uncertain'?

6. If the use of RBAs was successfully streamlined and embedded in the processes of other countries, would this increase the likelihood of their use in your country?

7. Would a worked example of this process make it more understandable and assist in its future use?

Conclusions and future work

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1. None of the regulators or developers asked felt that they were using a formalized RBA in their work at present, but felt that they were using risk concepts in an informal way

2. Any incorporation of RBAs **must** take note of existing processes so as not to increase workload and complexity

3. There was a feeling that direct evidence of RBAs in action would be welcome (e.g. from RBAs in action in other countries or through worked examples) before regulators, developers and consultants feel confident that they can fully engage and understand the benefits and improvements RBA might offer.

4. Seeing RBAs working effectively in another jurisdiction would be an incentive to consider using the approach

5. Cumulative effects were seen as presenting significant difficulty in general to consenting processes and anything that could help with this would be welcome

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¡¡MANY THANKS FOR YOUR ATTENTION!!

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This Project is co-funded by the European Climate, Infrastructure and Environment Executive Agency (CINEA)

AZTI WavEC BiMEP CTN HIDROMOD UCC MaREI CENTRALE NANTES RTSYS CorPower Ocean GEPS TECHNO