

Adaptive Management in the Wind Energy Industry

November 16, 2016

<https://tethys.pnnl.gov/about-wren>



WREN Webinars Held to Date

- This is WREN's 9th webinar.
- Each offers perspectives from multiple nations on research, monitoring, methodologies, and results of wind energy and wildlife interactions.
- If you are not on the webinar mailing list, simply send a blank email to **join-wind-webinars@lyris.pnnl.gov**

All webinars and associated presentations are archived on the WREN Hub at: <https://tethys.pnnl.gov>.



Today's Webinar

Adaptive Management in the Wind Energy Industry

Presenters:

Dr. Andrea Copping, Pacific Northwest National Laboratory, USA

Andrea is a senior scientist with Pacific Northwest National Laboratory, working across scientific disciplines to determine implications of human stressors on marine resources and ecosystems processes, works with stakeholder groups and managers to ensure that scientific information is accessible. Dr. Copping serves as the research lead for environmental effects of offshore wind development, on behalf of the US Department of Energy, and co-leads the international WREN initiative on environmental effects of wind energy under the IEA Wind committee. Dr. Copping is a Distinguished Faculty Fellow in the School of Marine and Environmental Affairs at the University of Washington, Associate Editor of the Coastal Management Journal, and on the Editorial Board of the International Journal of Marine Energy.

Finlay Bennet, Marine Scotland Science

Finlay is group leader of the marine renewables and environmental advice group within Marine Scotland Science. His group provides scientific advice to Marine Scotland colleagues and Scottish Ministers regarding the environmental assessment of both plans and projects. This advice relates to both emerging new technologies in the wave and tidal sectors as well as full commercial scale offshore wind. His special interest is working to reduce the scientific uncertainties associated with the environmental impacts of these activities, particularly on habitats and species afforded statutory protection under national and EU law. Finlay has been working in this field since graduating from the University of Edinburgh in the early 1990s.



The Value of Adaptive Management in Resolving Wind Energy and Wildlife Conflicts

ANDREA COPPING, PACIFIC NORTHWEST NATIONAL LABORATORY

FINLAY BENNET, MARINE SCOTLAND SCIENCE

WREN Webinar
November 16th 2016

- ▶ Introduction to WREN white paper, value of AM in resolving wind and wildlife conflicts
- ▶ Background on AM and wind energy
- ▶ Application of AM in wind energy development in US
- ▶ Examples of AM principles in other WREN nations
- ▶ The UK perspective on AM and wind energy
- ▶ Next steps and discussion points



WREN – Working Together to Resolve Environmental Effects of Wind Energy - An International Collaborative Under IEA Wind

Karin Sinclair, National Renewable Energy Laboratory
Andrea Copping, Pacific Northwest National Laboratory
Jocelyn Brown-Saracino, U.S. Department of Energy



Credit: Bjørn Iuell, Statkraft. Smøla Wind Facility, Norway

- Facilitate international understanding of environmental effects of offshore and land-based wind energy development
- Nine nations participating, lead by US
- Develop white papers (adaptive management; individual to population effects...), short science summaries, webinars, etc.
- WREN Hub
(<http://tethys.pnnl.gov/about-wren>)

Wind and Wildlife Conflicts: Could AM Provide some Insight and Relief?

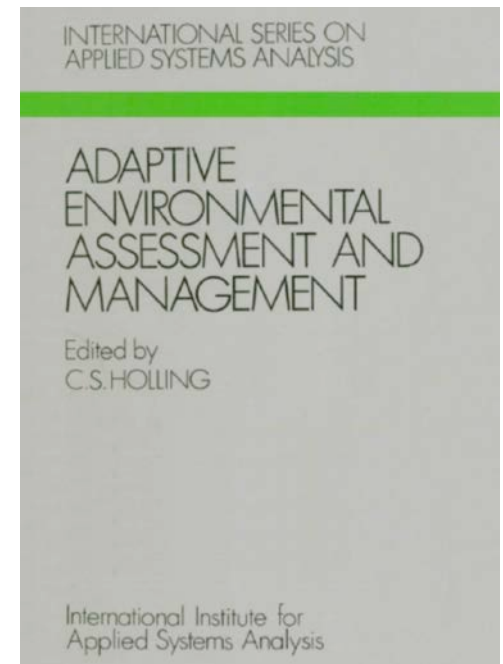
- ▶ Land-based and offshore wind face controversy: potential threats to birds and bats.
 - Siting of LBW increasingly difficult
 - OSW still at early stages of siting in many nations.
- ▶ Scale of threats do not match scale of wind farm.
- ▶ BUT permitting decisions made at single farm level.

- ▶ Definition of Adaptive Management

- ▶ Potential for Adaptive Management to help wind energy development

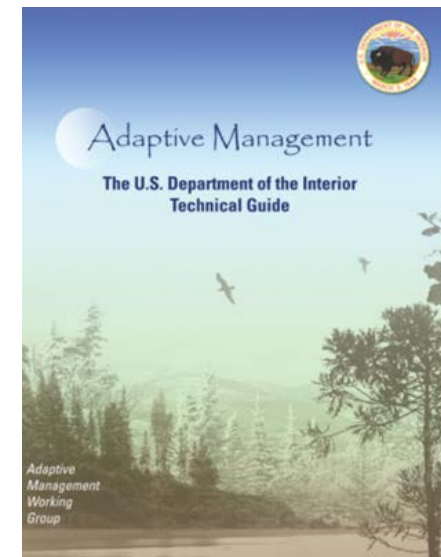
The need for adaptive management

- inertia and paralysis
- is qualitative discourse really informative?
- gap between science and society
- natural resilience

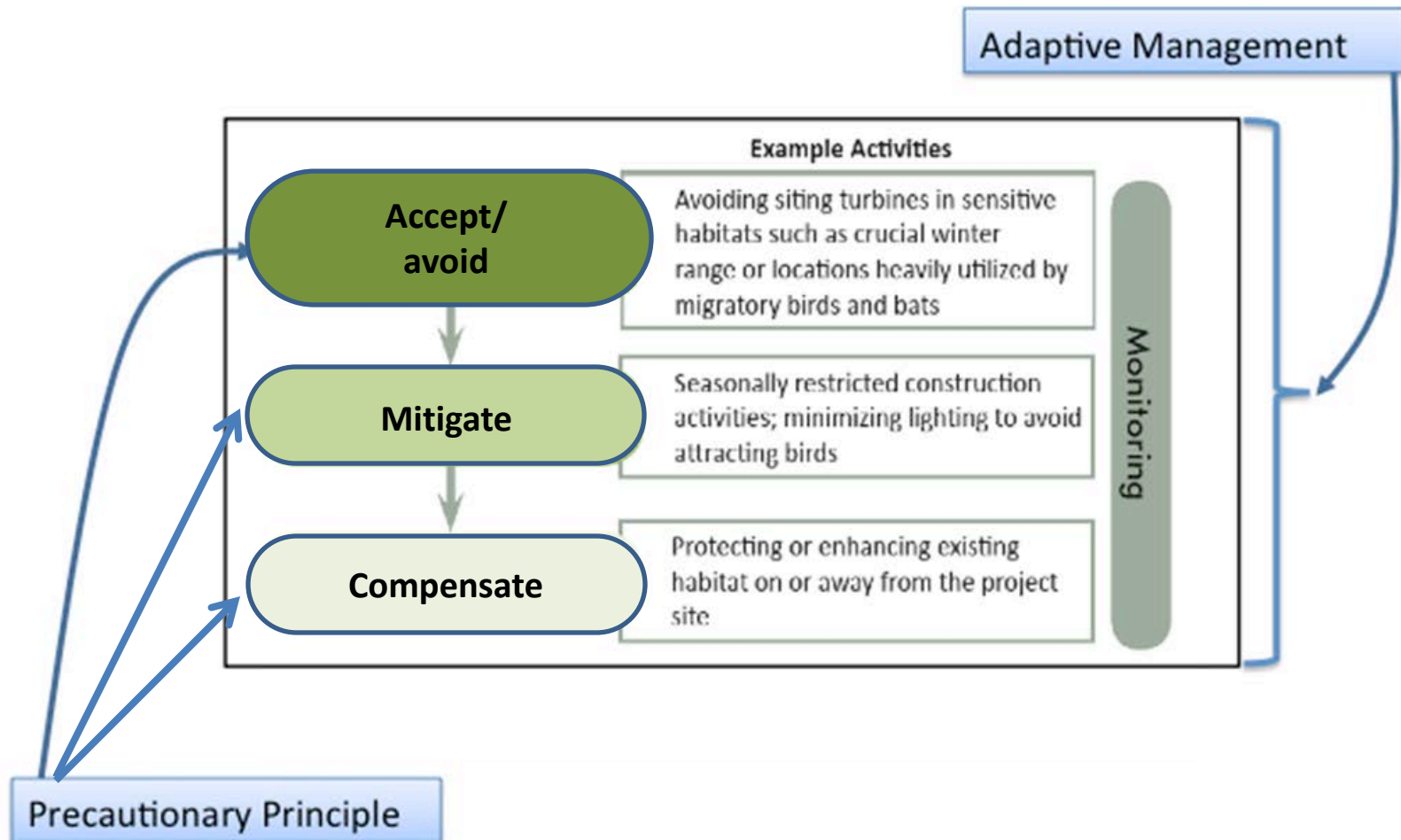


What is adaptive management?

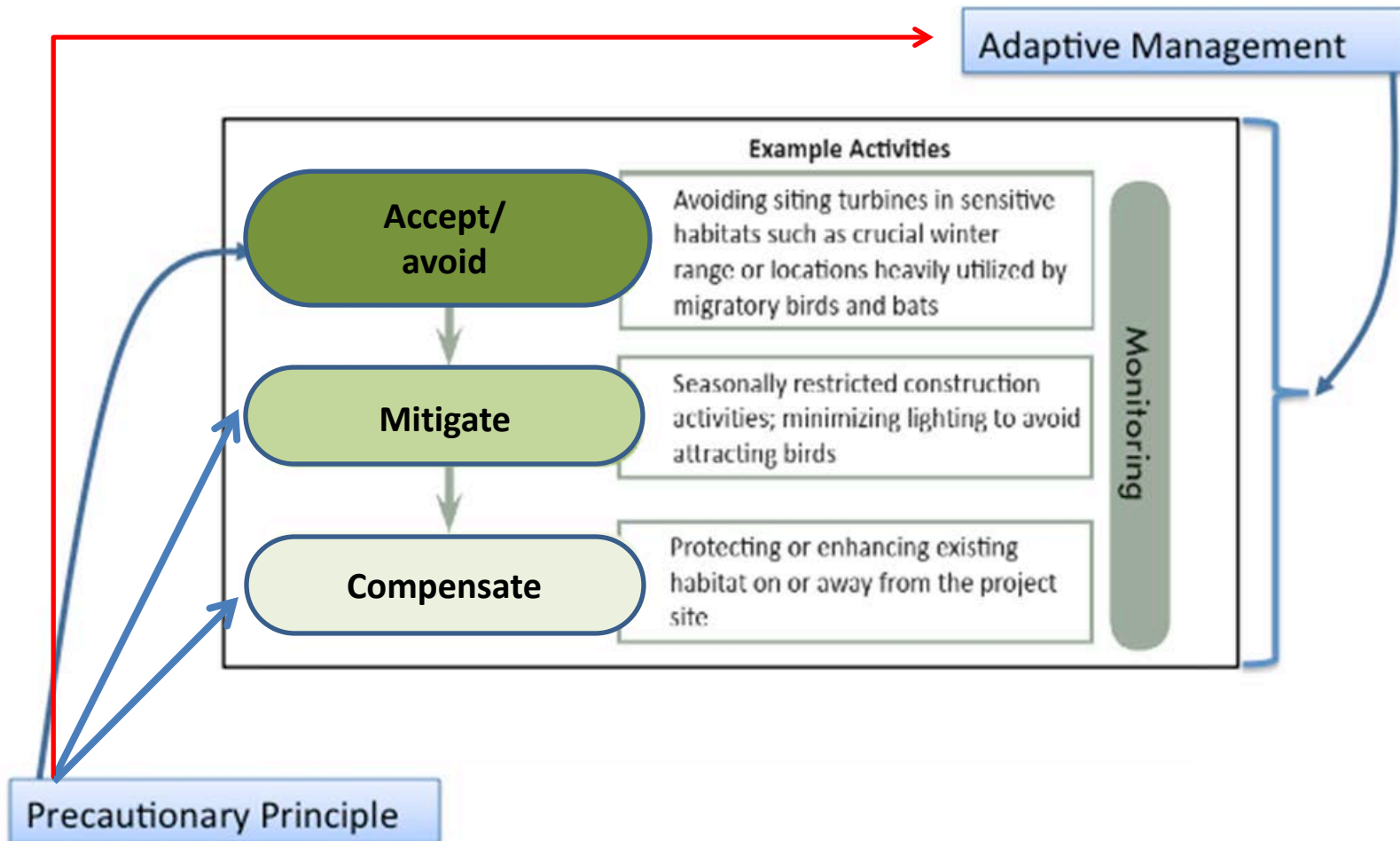
- reducing uncertainty
- improving confidence in models
- tolerance thresholds of (modelled) impact
- avoid DRIPy monitoring
- affordable



Precautionary principle & adaptive management

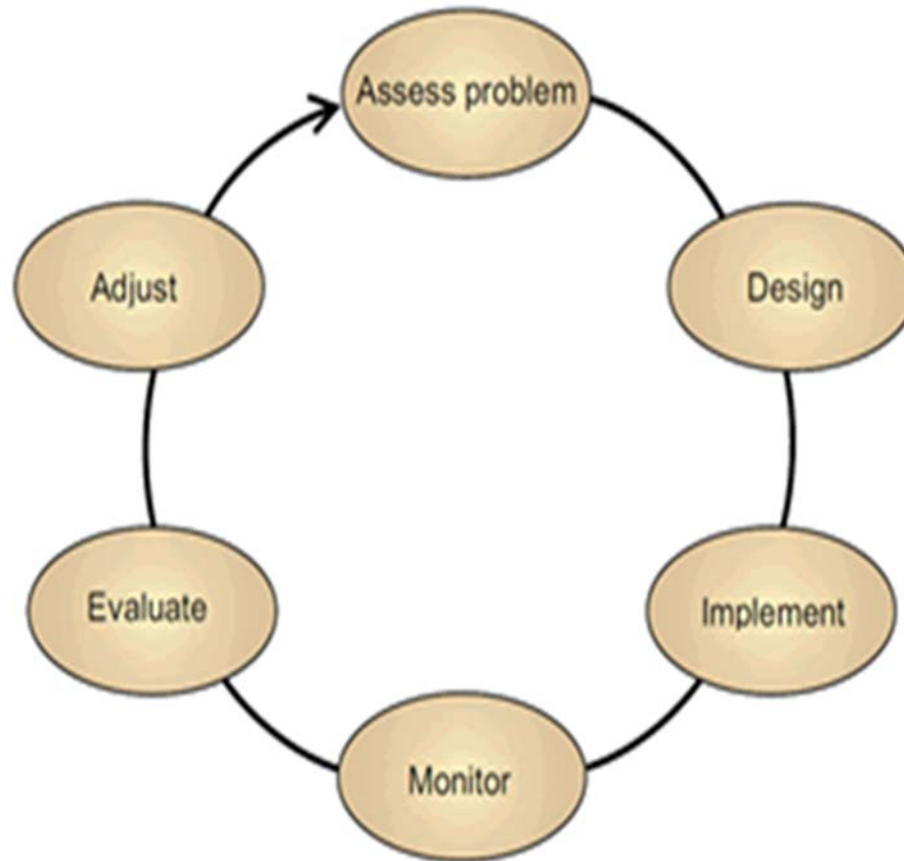


Precautionary principle & adaptive management



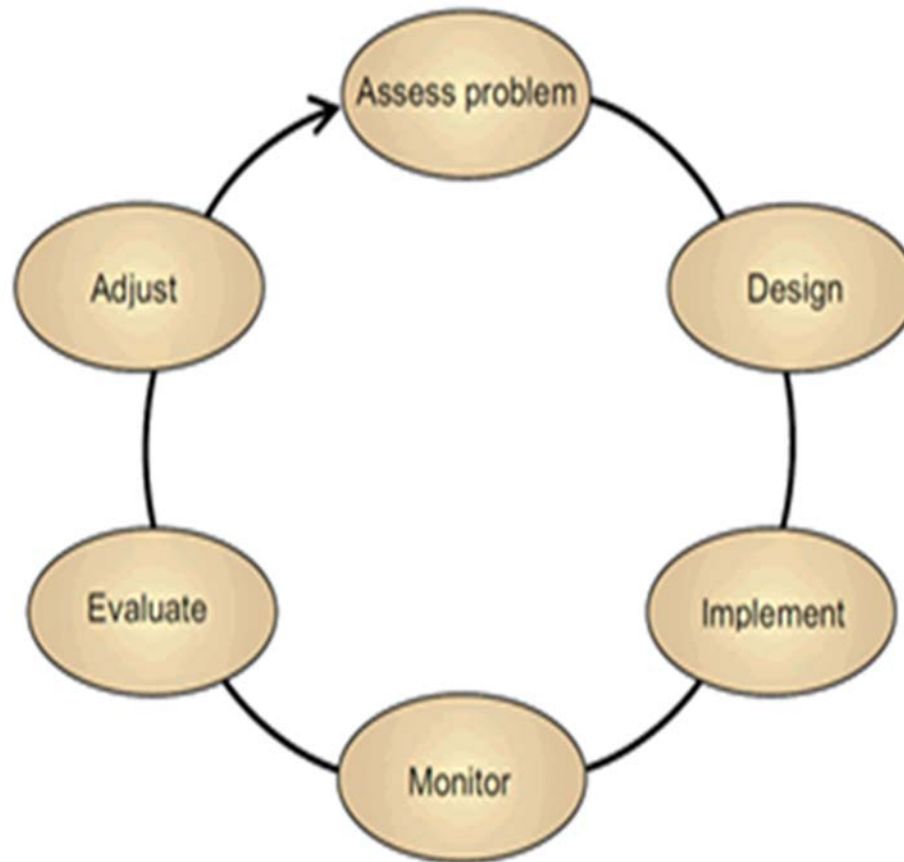
Learning by doing

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Learning by doing

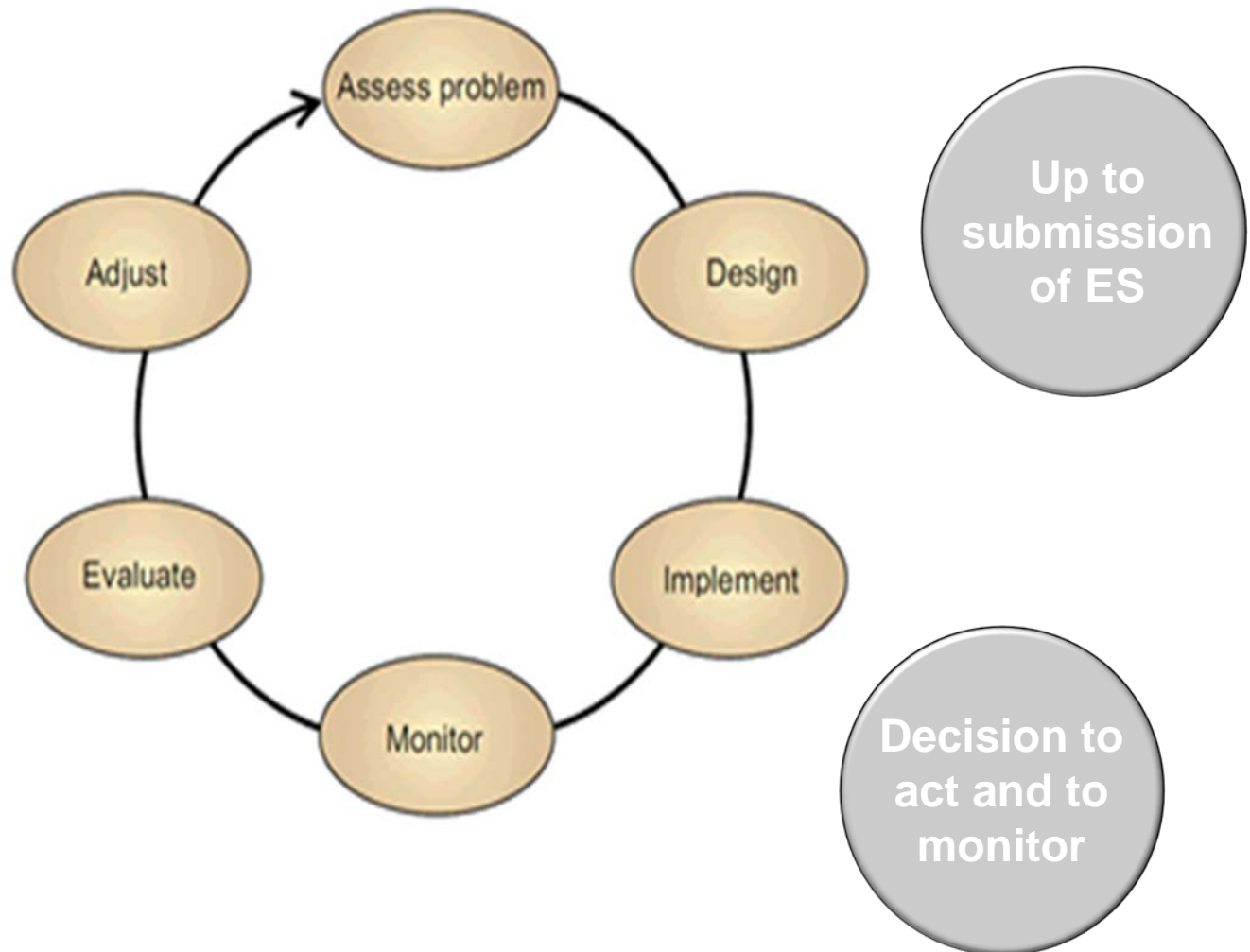
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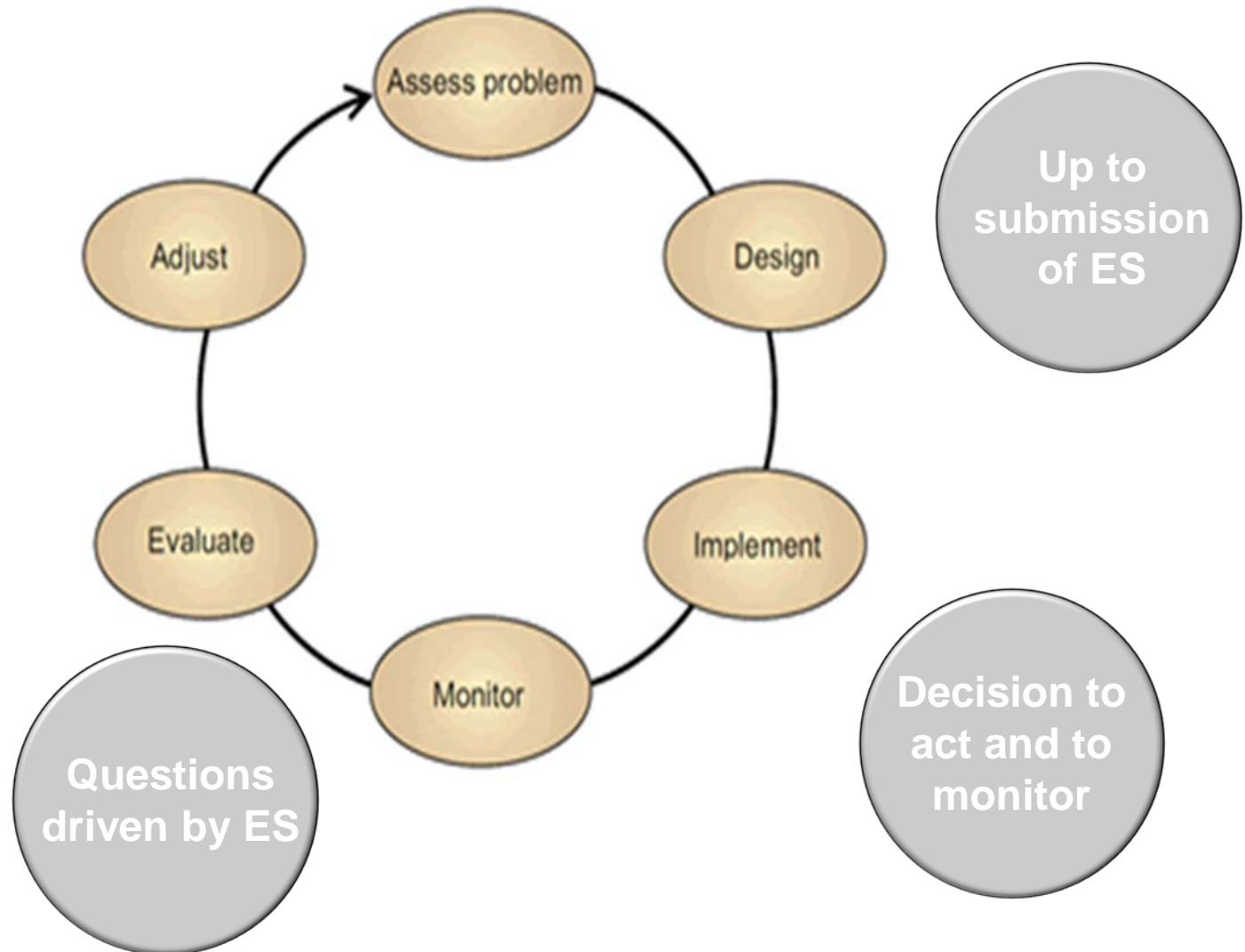
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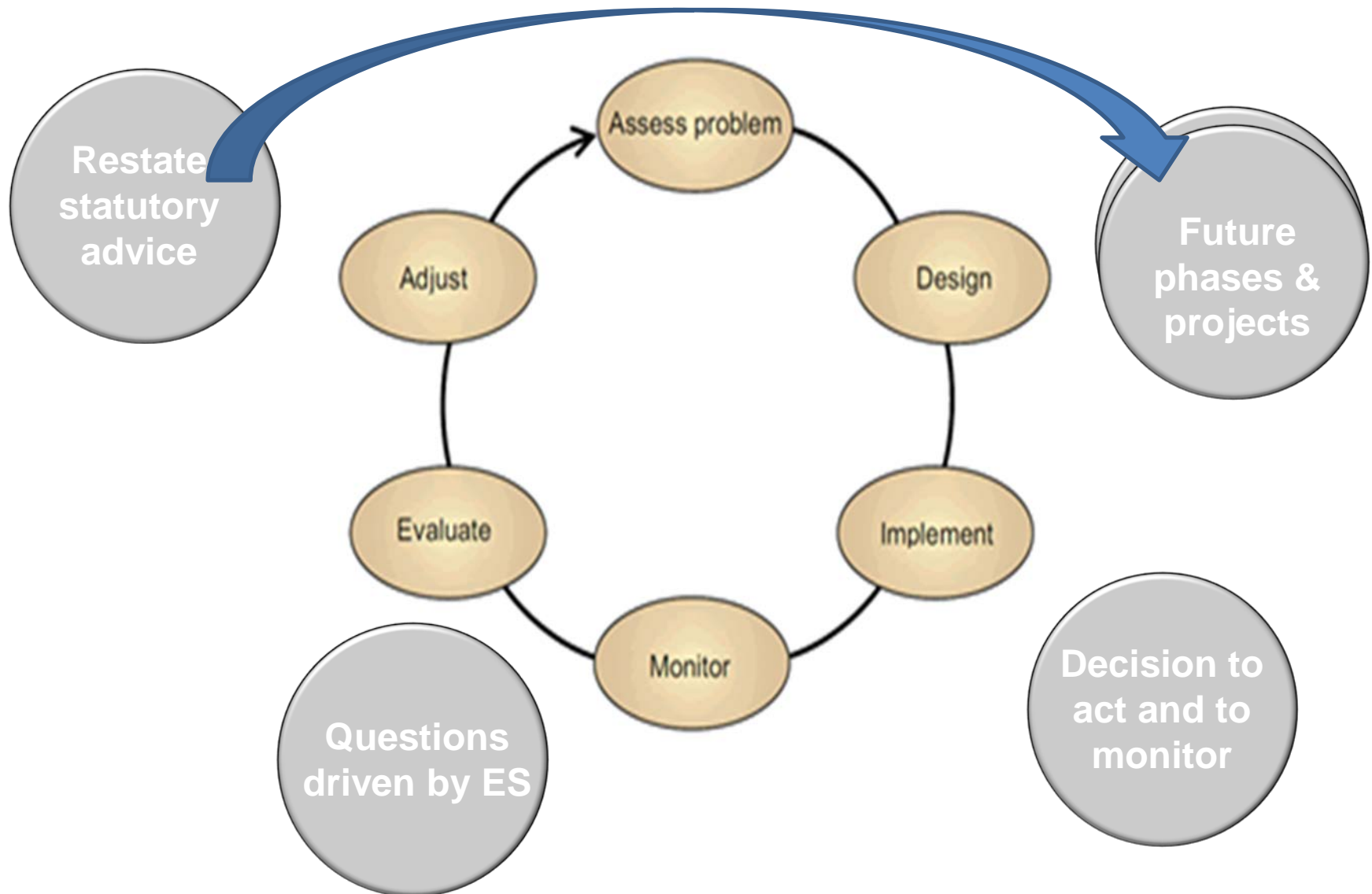
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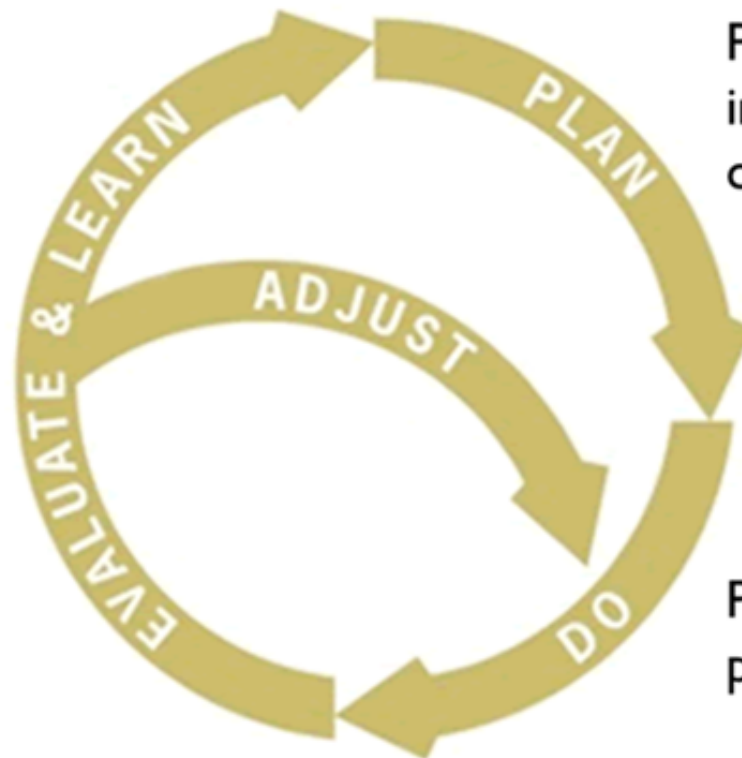


Learning by doing

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The adaptive management cycle

Learning to either inform future plans or adjust measures at existing projects.



Pre-consent surveys,
impact assessment &
consent decision

Post-consent surveys,
planning & data collection

Adaptive Management in the US

- ▶ Few AM plans in use in the US: examined 16 plans
- ▶ Most plans focus on federally protected species
- ▶ Variability among plans:
 - Definition of AM
 - Overall perspective of AM role
- ▶ Mitigation measures vary:
 - Predetermined limits or boundaries versus
 - More flexible approach.

Supplemental Feedback on US AM Plans

- ▶ WREN surveyed small sample of wind energy practitioners in US.
- ▶ Major findings:
 - Variability among AM plans, due to:
 - Lack of consensus about concept and practice
 - Limited implementation tools
 - Differing appetite for risk among wind developers
 - Differing opinions about:
 - AM in use at single farm level is not real AM
 - Needs to be hypothesis-based
 - Usefulness of AM due to its adaptability
 - Financial risk associated with uncertainty is key concern for use of AM

Information also sought from all WREN countries

- ▶ Limited legislation applicable to AM in most nations
- ▶ No formal regulations found in any of 9 WREN countries for use of AM for wind energy permitting
- ▶ However, several countries are using conceptual attributes of AM to regulate wind energy development
- ▶ US and UK are using AM concepts to regulate wind farms



November 16, 2016

WREN Nations:

France

Ireland

Netherlands

Norway

Spain

Sweden

Switzerland

United Kingdom

United States

Use of AM in WREN Countries

Country	Status and Use	Legislation	Regulations Guidelines
Germany	No formal use; however conceptual attributes of AM are currently used to address wind/wildlife impacts.	No laws specific to AM; several natural resource protection laws provide a basis for wind/wildlife impact limits.	No formal regulations.
The Netherlands	No formal use; however conceptual attributes of AM are currently used to address wind/wildlife impacts.	No laws specific to AM.	No formal regulations.
Norway	No formal or informal use.	No laws specific to AM.	No formal regulations.
Portugal	No formal use; however conceptual attributes of AM are currently used to address wind/wildlife impacts.	No laws specific to AM.	No formal regulations.
Switzerland	No formal use; however conceptual attributes of AM are currently used to address wind/wildlife impacts.	No laws specific to AM.	No formal regulations.
United Kingdom	While the term AM has no formal status, attributes of the policy concept are widely recognized as having utility and are often incorporated into conditions attached to consent decisions.	No laws specific to AM; the conceptual attributes of AM are currently used to address wind/wildlife impacts.	No formal regulations.
United States	AM has been used for wind/wildlife impacts although it is not required; recent application aided by federal guidance documentation.	A portion of the Clean Water Act (section 404) requires developers to produce AM plans for wetland mitigation, but no laws are specific to wind energy AM.	No formal regulations.
Spain	No formal use; however conceptual attributes of AM are currently used to address wind/wildlife impacts.	No laws specific to AM.	No formal regulations.

Examples of AM application - Portugal

- ▶ No formal AM
- ▶ Wind farm in central Portugal
- ▶ Kestrel (*Falco tinnunculus*) most commonly killed species
- ▶ Monitoring program changed
- ▶ Developed site-specific mitigation program in cooperation with developers and regulators.



Examples of AM application - Norway

- ▶ AM not implemented in Norway
- ▶ Statkraft supports research and monitoring at the Smøla wind farm
- ▶ Mitigation for white-tailed eagles (*Haliaeetus albicilla*) to decrease scientific uncertainty effectiveness of mitigation measures.



Examples of AM application - Netherlands

- ▶ No formal use of AM in Netherlands
- ▶ AM principles used to adjust monitoring for offshore wind farm
- ▶ Resulted in:
 - Adding bat detectors
 - Modelling effects of pile driving on harbor porpoise
 - Studies on piling noise on juvenile fish and larvae.
- ▶ Plan to apply AM principles to 10 offshore wind farms



Examples of AM application - Germany

- ▶ No formal use of AM in Germany
- ▶ Wind farm in southwest Germany curtailed turbine operation to protect bats; curtailment methods adjusted after a year.
- ▶ Wind farm located in northern Germany shuts down turbines to mitigate for collision risk to red kites, focused on nearby cultivation



Examples of AM application - Switzerland

- ▶ No formal requirement for AM
- ▶ High altitude wind farm cannot expand until bird and bat impacts better known
- ▶ Monitoring data used to set curtailment requirements, differ seasonally.
- ▶ Stakeholders determine curtailment needs and reassess the project operation periodically.



Examples of AM application - Spain

- ▶ No formal implementation of AM
- ▶ Wind farms in southern Spain killing birds, including the Griffon vulture
- ▶ Monitor birds in flight, stop turbines, then restart after birds are gone.
- ▶ After 2 years, 50% decrease in bird mortality, 0.7% reduction in energy production.



Terrestrial implementation

marine scotland
science

Aims

- independent, scientific assessment
- Better sharing and dissemination
- Making available better data
- Quicker and more accurate consenting
- Reduced investment risk.
- Providing robust data
- Reducing the need for survey work



Marine implementation

UK experience of post consent monitoring

- MMO post-consent monitoring review (2014)
- DRIPy underpowered monitoring

- **Implementation seldom cost effective and unlikely to meaningfully reduce scientific uncertainty**

1. Scottish Offshore Renewables Research Forum
2. Regional Advisory Groups
3. Demonstration Projects

Remaining challenges

1. Use the Department of Interior's Technical Guidance
2. From DRIPy monitoring to a "question led approach"
3. Accepting the costs of a risk-based approach



Next Steps and Discussion Points

- ▶ Final AM white paper will be publically available for download in early December. Will be posted on *Tethys*.
- ▶ Presentation on findings at NWCC in Colorado in November/December
- ▶ Also implications for international workshop at NWCC
- ▶ Discussion points and questions



Thank You!

For questions or to provide ideas for future webinars, please contact one of the members of the WREN Operating Agent team:

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