

A circular economy and ecosystem service approach to offshore windfarms

Examination of current
practices and future potentials

SEPTEMBER 26, 2017

Background & Introduction

A circular economy and ecosystem service approach to offshore windfarms (OWF's)

NIRAS' team

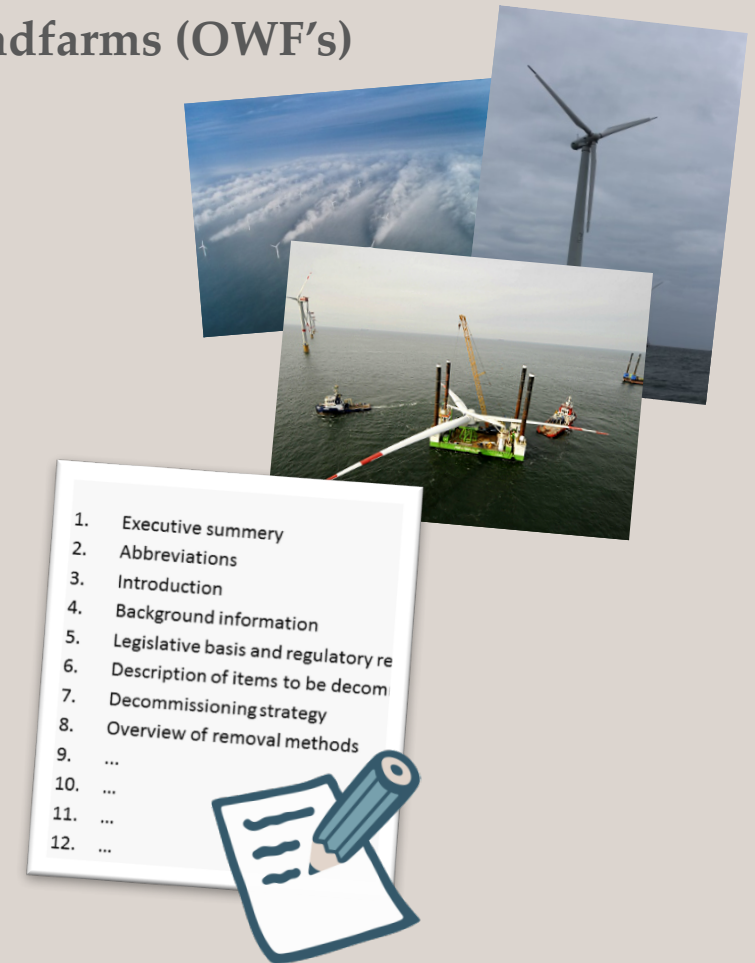
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Relevant expertise

Natural resource management
Environmental economy
Experts in decommissioning of OWF's

NIRAS' Innovation Project:

- ***Developed a best practice for decommissioning***
- ***Recommended content for a decommissioning plan***



Best practice for decommissioning management

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Why do we need to manage decommissioning?

- Avoid future unexpected costs (environmental regulation, HSE etc.)

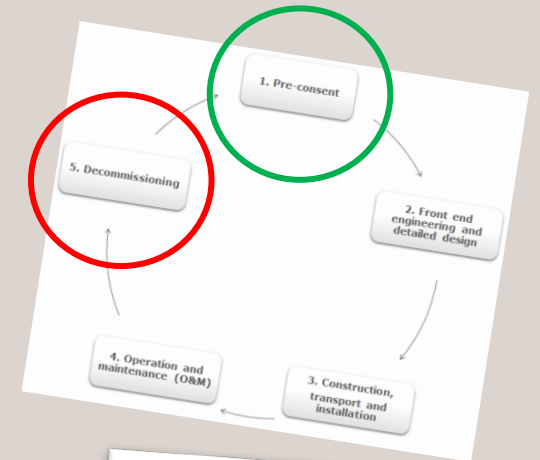
"Early is in time, late is too late..."

- Design phase
- Update plan and cost model (earmark \$)
- Only viable techniques and methods

Data gathering

- What is relevant to know in the future?
- Inventory of materials
- Database (drawings, designs, service schemes etc.)

→ ***A project-life cycle perspective in line with a circular economy***



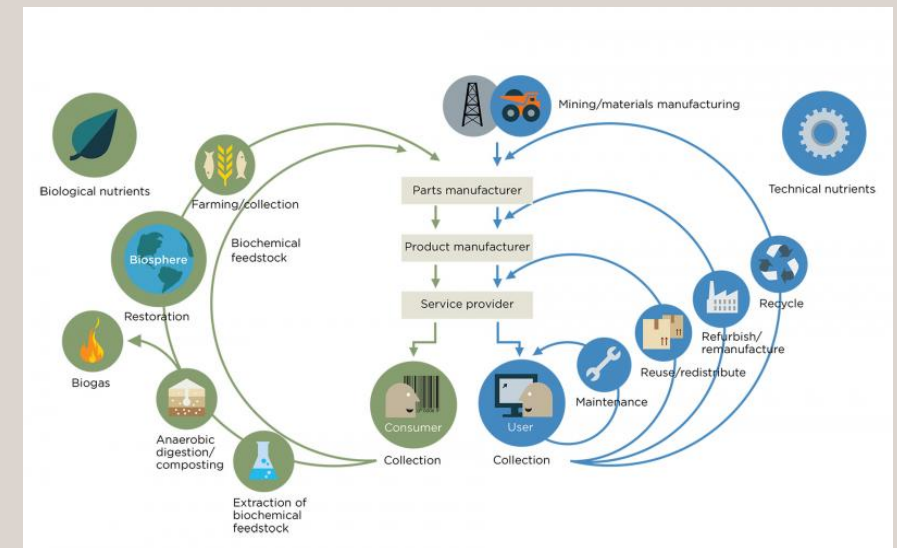
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1. Executive summary
 2. Abbreviations
 3. Introduction
 4. Background information
 5. Legislative basis and regulatory re
 6. Description of items to be decom
 7. Decommissioning strategy
 8. Overview of removal methods
 9. ...
 10. ...
 11. ...
 12. ...

Conceptual background – Circular Economy (CE)

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- **Circular economy: "Reduce, reuse, recycle"**
- **Retain resources in the economy**
- **Eco-design (life cycle perspective)**
- **Circular business models**

***Value proposition throughout the product life cycle
→ Combine environmental and business opportunities***



Conceptual background – Ecosystem Services (ESS)

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Contributions from ecosystems to human wellbeing

1. **Provisioning services:** fish, fresh water, wood etc.
2. **Regulating services** groundwater recharge, climate regulation...
3. **Cultural services:** cultural and recreational value

Supporting Services: primary production, nutrient recycling etc.

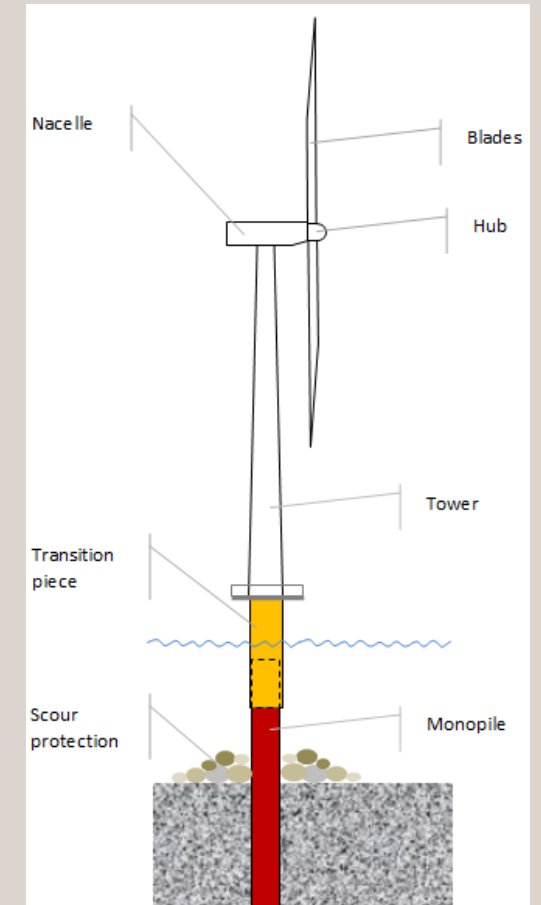


What we did

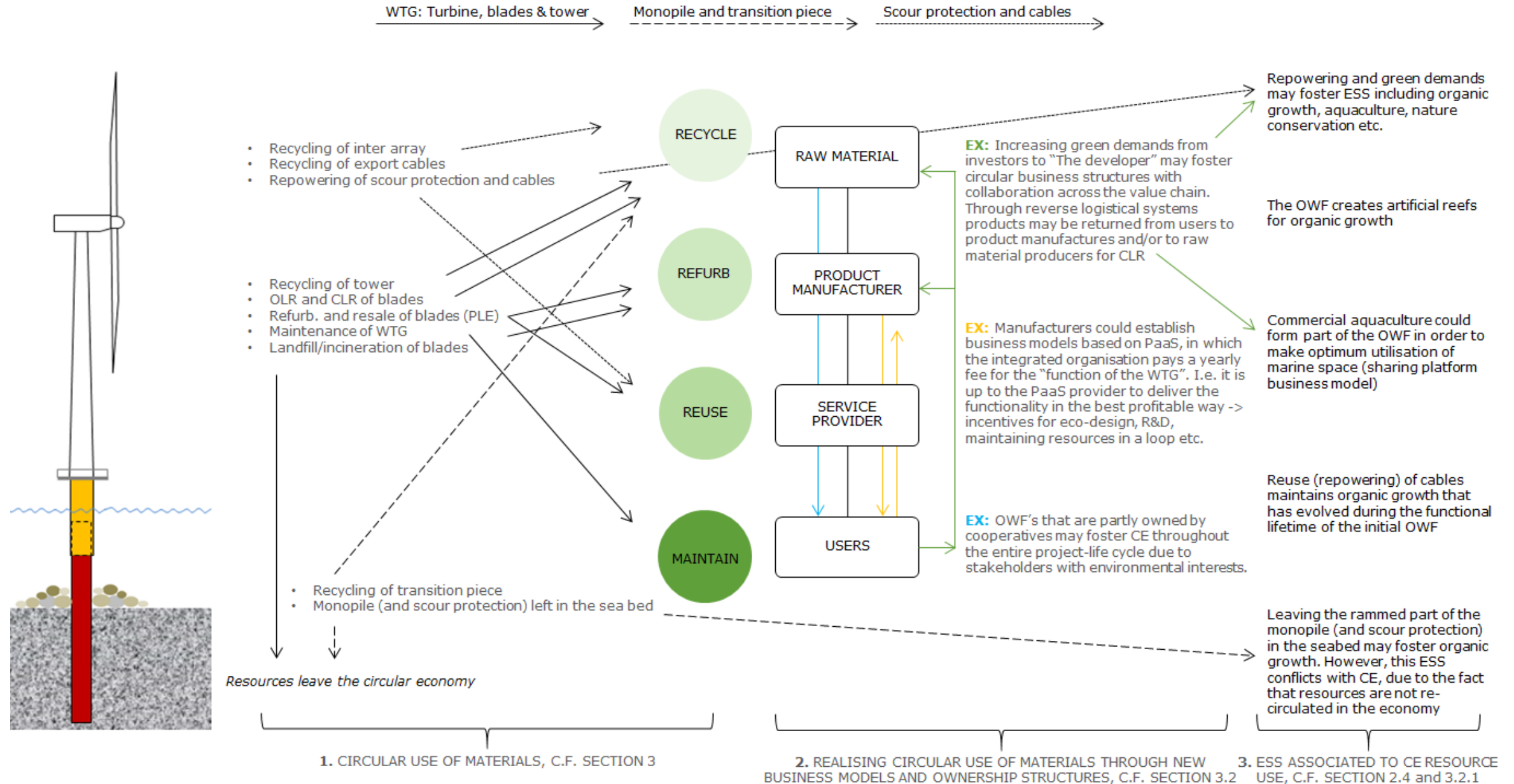
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- Current practices and future potentials for CE and ESS for Monopile-based wind turbines in the North Sea
- Potential conflicts
- Future studies

* "current": actual as well as expected practices



OWF's from a CE and ESS approach (current practices and opportunities)



Next steps

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- Quantification of resource potential
- Wind turbine foundations
- New materials for blades
- Reuse of materials and components
- Legal barriers (and opportunities) for CE and ES
- Inventorize opportunities for and potential gains from ESS

**The project proposals are further described in the publication*

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