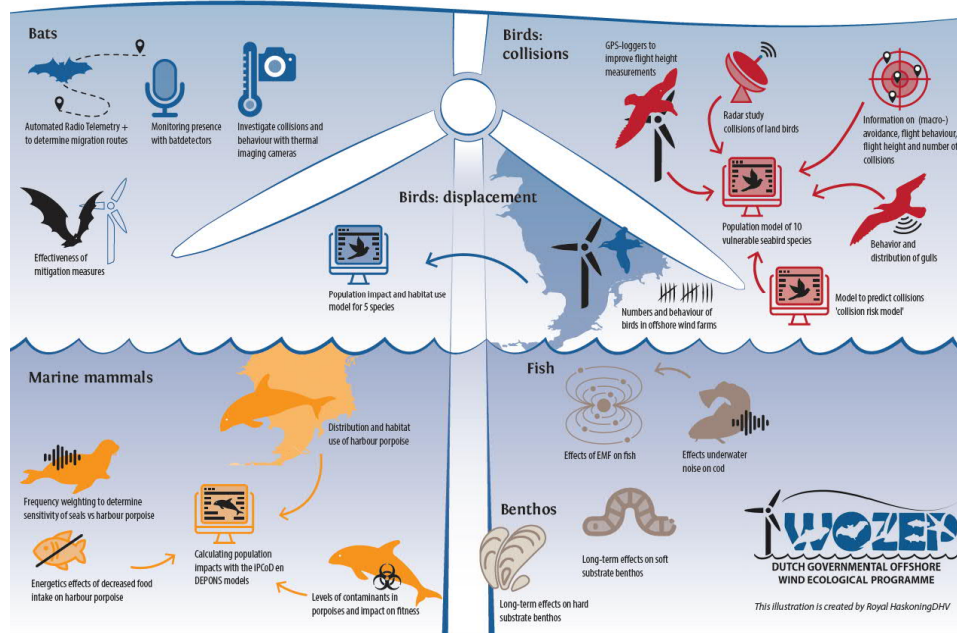




Rijkswaterstaat
Ministerie van Infrastructuur en Waterstaat

Offshore Wind Ecological Programme (Wozep)



Ecologisch onderzoek wind op zee Verleden, heden en toekomst

Marijke Warnas, Rijkswaterstaat

16 april 2019



Het begin

Veel onduidelijkheid eerste ronde windparken

Masterplan Wind op Zee in 2010

- Shortlist onderzoek
- Vervolg Uitvoering Masterplan (VUM)

Kader Ecologie en Cumulatie

Wind op Zee Ecologisch Programma





Ontwikkeling

Van grote vragen:

- Wat zijn de (belangrijkste) effecten?
- Aantallen dieren

Naar details

- Input verbeteren voor modelstudies
- Dosis-effectrelaties
- Impact op populaties





Historisch overzicht

Van in opdracht van de overheid uitgevoerd onderzoek naar de ecologische effecten van windenergie op zee.

Dus niet van monitorings- en evaluatieprogramma's van individuele windparken, waar ook heel veel onderzoek is uitgevoerd.



       									
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						Collisions	Habitat loss		
Shortlist	2010-2011			Research with larvaebator on direct mortality from piling noise on common sole larvae		Distribution of birds over the Dutch Continental Shelf (DCS)		Source model for piling noise	Temporary Threshold Shift (TTS) and hearing threshold harbour porpoise and seals
				Survey fish larvae		Research on colonies of the little black backed gull on Texel and at Volkerak		Determine measurement standards	Harbour porpoise counts

       									
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VUM	2011 - 2015			Research with larvaebrator on direct and delayed mortality of piling noise on larvae of common sole, bass and herring	Batdetector research into bat migration	Overview available collision rate models (CRM)	Literature study avoidance behaviour of sea birds at offshore wind farms and possible effects of configuration	Propagation model piling noise	Effects of offshore piling noise on harbour porpoise and seals
								International workshop harmonisation	Research on swimming speeds as a reaction to disturbance
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KEC	2015				Literature study and scenario study road map offshore wind farms until 2023	Scenario study road map offshore wind farms until 2023 with Band model (collisions) and assumption Bradbury 10% (habitat loss)		Scenario study road map offshore wind farms until 2023 with the iPCoD model	

       										
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Wozep	2016		International literature study	Literature study on the effects of Electro-Magnetic Fields (EMF)	Continuation and expansion of bat detector research	Pilot telemetry	Pilot thermal imaging camera's	Inventarisation GPS-databases	International workshop behaviour common guillemot	
			Feasibility studies new benthos surveys				Study on bat population size	Inventarisation collision detection systems	Study on sea bird survival	
									Validation piling noise model	Seasonal changes in energetics for the harbour porpoise
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Wozep	2017		Soft substrate survey		Continuation and expansion of bat detector research	Telemetry study		Development of GPS-loggers with improved height measurement	Pilot behavioural observations of common guillemot in offshore wind farms	Update Aquarius model
										Research into contaminants and hearing damage in stranded harbour porpoises
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							Evaluation of mitigation measure for bats in offshore wind farms using collected bat detector data	Measuring fluxes and avoidance with bird radar at Luchterduinen	Development of population models for 10 species			Analysis stranding data and harbour porpoise populations	
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Wozep	2019			Measuring electromagnetic fields of cables from operational wind farms	Continuation and expansion of bat detector research	Telemetry study	Inventarisation alternatives to thermal imaging	Measuring fluxes and avoidance with bird radar at Luchterduinen	Analysis ring data for better input population models Analysis ESAS database for better input population models Update GPS-data for better input population models	Extension standard MWTL monitoring in breeding season	Gps-study sandwich tern at the Putten colony (including analysis of existing GPS and ring data)	Feasibility study pilot Passive Acoustic Monitoring (PAM) network Determine TTS harbour porpoise dependent on frequency

       												
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									Analysis ESAS database for better input population models			
									Update GPS-data for better input population models			Determine TTS harbour porpoise dependent on frequency



De toekomst

Vogels habitatverlies

- Veldonderzoek verbeteren
inputparameters modellen

Vogels aanvaringen

- Voortzetten radarstudie Luchterduinen
- Haalbaarheidsstudie IBM aanvaringen
- Radarstudie Borssele





De toekomst

Vleermuizen

- Voortzetten telemetrie
- Voortzetten batdetector

Zeezoogdieren

- Taggen van zeehonden rond aanleg Borssele
- Geluidsmetingen rond Borssele





De toekomst

Benthos

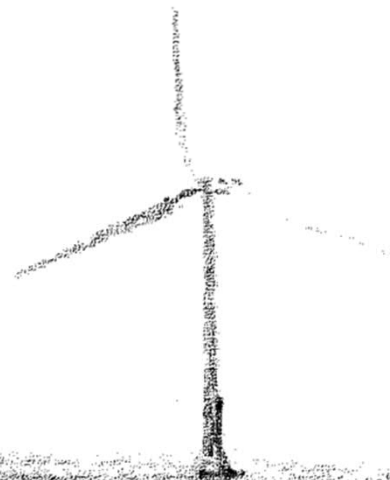
- Pilot hardsubstraat

Vis

- Veldmetingen elektromagnetische velden

Ecosysteemeffecten

- Vervolgstudie?







Rapporten

Shortlist

[Rapporten Shortlist Wind op Zee](#)

VUM

[Rapporten VUM](#)

Wozep

[Rapporten Wozep](#)

