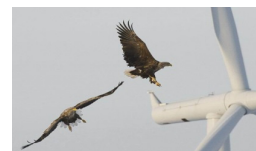


# Nye prosjekter og veien framover

- Pilotstudier → Søknader til EnergiX 3/9
  - Koordineringsmøte forskere
  - Brukermøte i slutten av mai – innspill
- Kina
- Samarbeid med Norsk vannkraftsenter
- Implementering av resultater fra CEDREN
- Horizon 2020 (FoU i EU)
- Energi21
- Energi21
- Videre arbeid i CEDREN
- FME-ordningen og CEDREN



**CEDREN**

Centre for Environmental Design of Renewable Energy

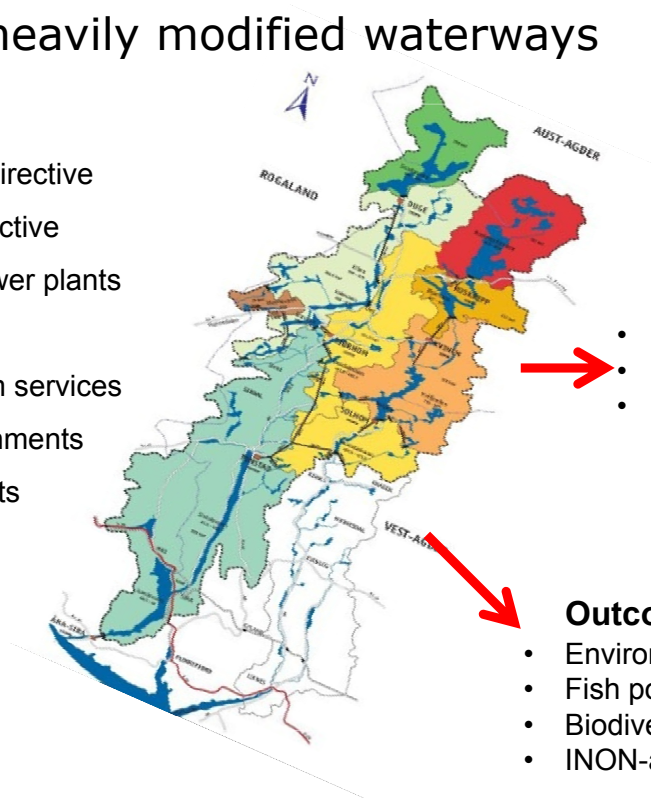


## PolWater

Policy integration and environmental standards in heavily modified waterways

### Policies:

- EU Water Framework Directive
- Renewable Energy Directive
- Relicensing of hydropower plants
- Act on Biodiversity
- Off-setting of ecosystem services
- Upgrading and refurbishments
- New hydropower projects



### Outcome:

- Power production
- Security of supply
- Economical profit

### Outcome:

- Environmental standards
- Fish population
- Biodiversity
- INON-areas

**CEDREN**

Centre for Environmental Design of Renewable Energy



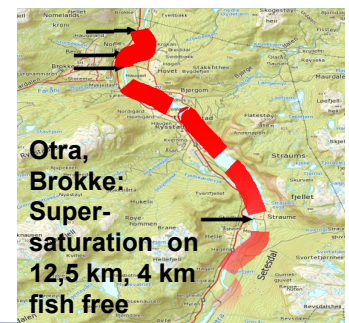
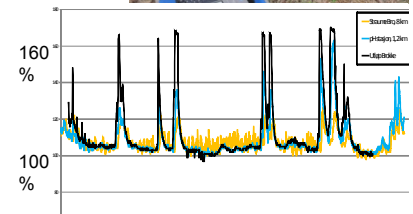
# SUPERSAT- Effects, solutions, guidelines

- Hydropower induced supersaturation is still common
- Fish kills have been observed in several rivers in the last years
- Sub-lethal effects (e.g. reduced fish production)
- No guidelines – little is known about effects on freshwater ecosystems
- Zero supersaturation target is expensive to reach at existing plants with today's technology

## Pilot study (2013-2014)

- Summary of state of the art knowledge
- Designing a research proposal focusing on:
  - *Biological effects (including fish, invertebrates, sublethal effects)*
  - *Technical solutions*
  - *Guidelines – how much supersaturation can be tolerated? What can be done?*

Partners: Industry, Norwegian and international research institutes  
Kontakt: Ulrich Pulg, LFI Uni Miljø, [ulrich.pulg@uni.no](mailto:ulrich.pulg@uni.no)



**CEDREN**

Centre for Environmental Design of Renewable Energy



## Ecological challenges for wind power development and power line constructions (WINDNET)

### WP1: Pre- and post-construction studies of wind energy development in central Norway

- Radar studies of bird migration and local movements in the landscape
- Micro-siting tool for "bird-friendly" turbine placement
- Cumulative impacts

### WP2: Pre- and post-construction studies of the central grid development

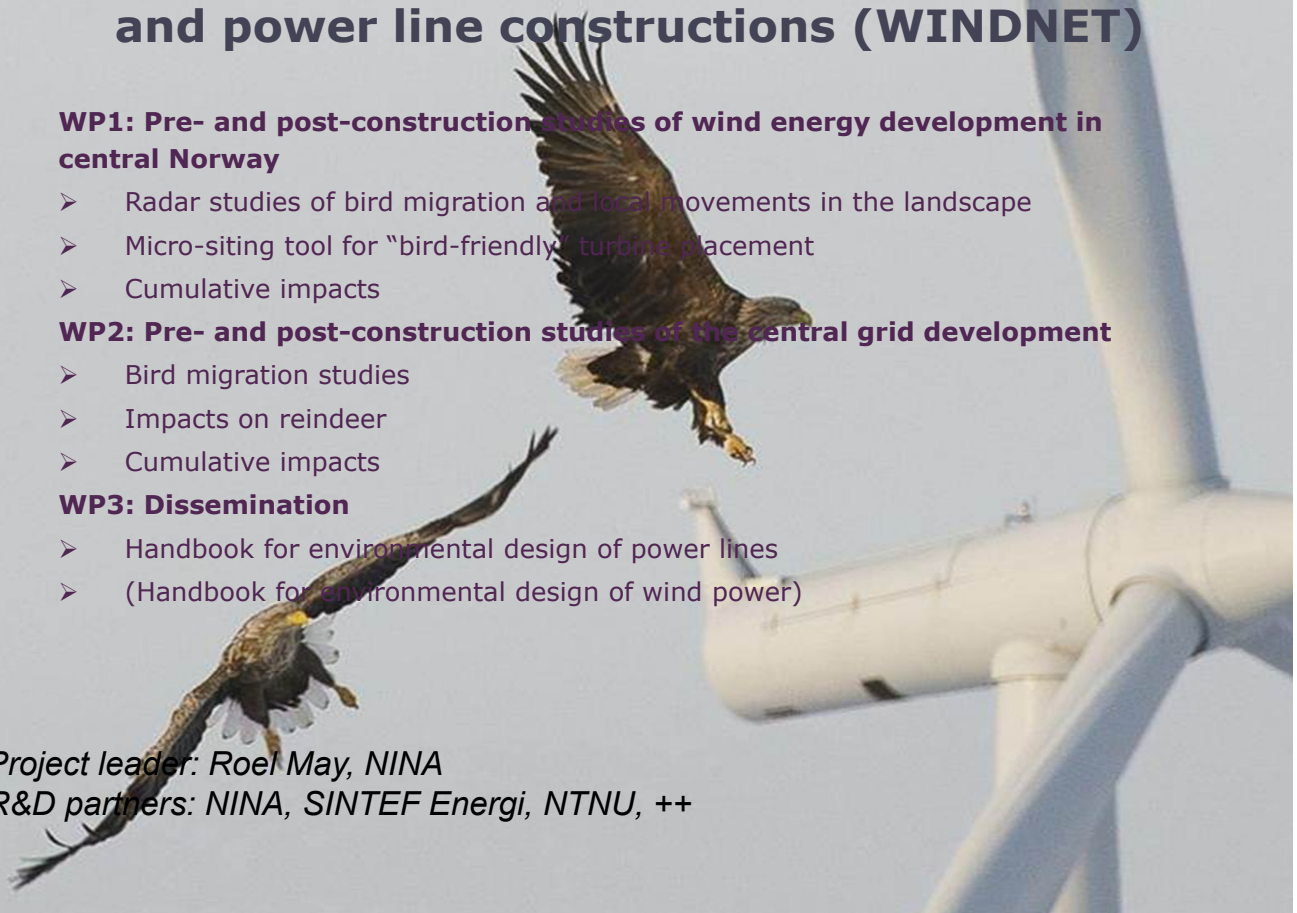
- Bird migration studies
- Impacts on reindeer
- Cumulative impacts

### WP3: Dissemination

- Handbook for environmental design of power lines
- (Handbook for environmental design of wind power)

Project leader: Roel May, NINA

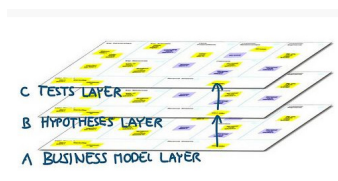
R&D partners: NINA, SINTEF Energi, NTNU, ++



# Miljømål og tiltak i regulerte vassdrag

Enighet om realistiske miljømål og kostnadseffektive tiltak i et regulert vassdrag med mål om ytterligere miljøvennlig vannkraftproduksjon?

1. Samfunnsøkonomisk nytte av en vassdragsregulering
2. Samfunnsøkonomisk nytte av levedyktige bestander av prioriterte arter
3. Hvor mye vann trengs til hvilke tider for å nå ulike prioriterte miljømål?
4. Hvordan samordne regulant og vertskommune (og fylkesmenn?) for å identifisere og komme til enighet om realistiske miljømål og kostnadseffektive tiltak i et regulert vassdrag?
5. Hva er effektive og gjennomførbare finansieringsmodeller for finansiering av miljøtiltak i regulerte vassdrag?



Project leader: Ingrid Nesheim, NIVA

R&D partners: NIVA, NINA, SINTEF Energi, NTNU, ++

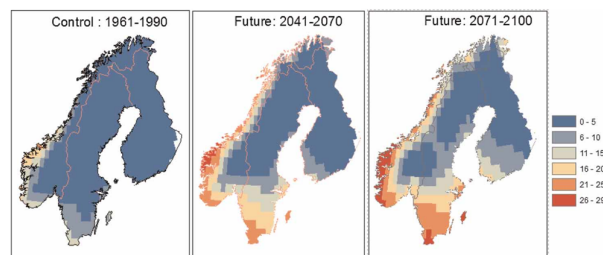
**CEDREN**

Centre for Environmental Design of Renewable Energy

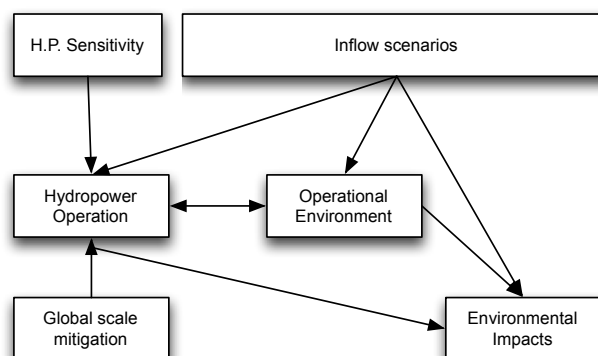
**5** **FM**  
CENTRE FOR ENVIRONMENTAL DESIGN OF RENEWABLE ENERGY

## HydroClim - Hydropower in the future climate

- Changes in seasonal distribution and increases in runoff is expected for most of the northern hemisphere.
- This will have effects on operation and environmental issues for the hydropower industry
- CEDREN funded pilot study
  - Summarize regional inflow changes and effects on production.
  - How to utilize increased inflow – production or environment?
  - Preparation for Klimaforsk application
- “Klimaforsk” application in 2015:
  - Six work packages to cover the hydropower system from market to environmental effects.



Number of winters with duration longer than 60 days. Gebre and Alfreksen (2013)



Work packages of main project proposal

**CEDREN**

Centre for Environmental Design of Renewable Energy

**5** **FM**  
CENTRE FOR ENVIRONMENTAL DESIGN OF RENEWABLE ENERGY



## SafePass

# Håndbok for toveis vandringsdesign for laks og innlandsfisk

**Et brukerfinansiert prosjekt i CEDREN**

**CEDREN**

Centre for Environmental Design of Renewable Energy

**FME**  
CENTRE FOR  
ENVIRONMENT-  
FRIENDLY ENERGY  
RESEARCH



## FutureHydro – China-Norway collaboration

- Future hydropower to help integrating other renewables
- Environmental design of future hydropower
- Knowledge exchange
- 2,8 mill NOK in support from RCN China-Norway program 2013-2015 + in-kind CEDREN



- China Institute for Water and Hydropower Research
- North China University of Water Resources and Electric Power
- Tsinghua University
- SINTEF, NTNU, NINA (CEDREN)



**CEDREN**

Centre for Environmental Design of Renewable Energy

**FME**  
CENTRE FOR  
ENVIRONMENT-  
FRIENDLY ENERGY  
RESEARCH



# CEDREN i Kina

FutureHydro



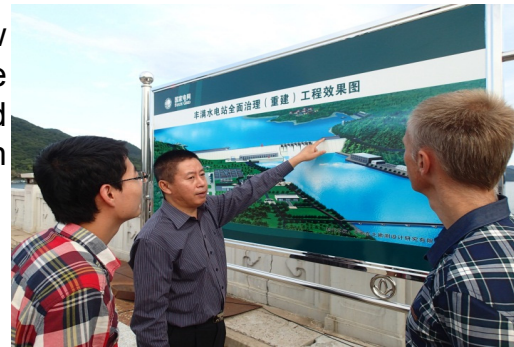
Visit to Beijing and Fengman Hydropower



Presentations, Discussions



New dam to be constructed at Fengman



Group work

**CEDREN**

Centre for Environmental Design of Renewable Energy



## NORSK VANNKRAFTSENTER

Norsk Vannkraftsenter (NVKS) er et nasjonalt samlende senter for å sikre og videreutvikle undervisning og forskning innen vannkraftteknologi. Senteret drives i samarbeid mellom universiteter, forskningsinstitusjoner, vannkraftbransjen og norske myndigheter, med hovedsete på NTNU.



**CEDREN**

Centre for Environmental Design of Renewable Energy



# Hvorfor etablere Norsk Vannkraftsenter?

Fremtidig behov for rekruttering og nye løsninger i kraftnæringen på bakgrunn av høy snittalder blant ansatte og inntog av ny teknologi

Dette krever økt kompetanse, spesialisert undervisning, etterutdanning og FoU innen vannkraftteknologi

Felles utfordringer = felles innsats



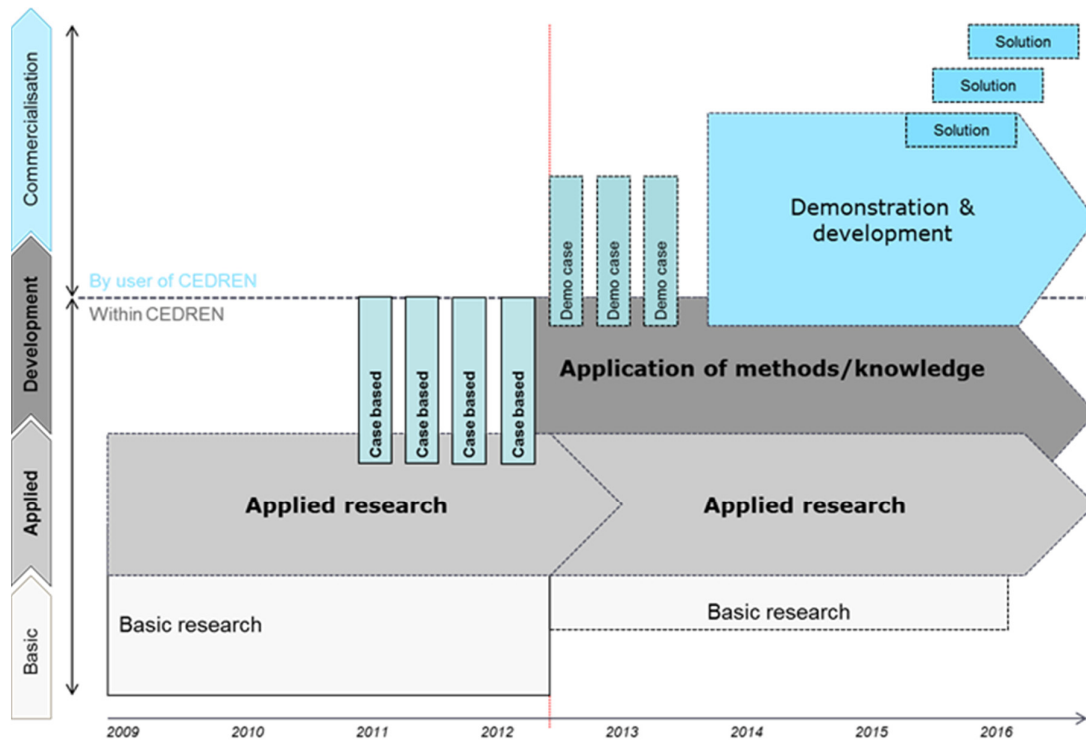
## Norsk Vannkraftsenter



Bygg	Maskin	Elkraft
<ul style="list-style-type: none"><li>✓ Dammer, vannveier og kraftstasjoner</li><li>✓ Ingeniørgeologi</li><li>✓ Kraftverkshydrologi</li><li>✓ Vannkraftsystemer</li><li>✓ Vassdragsdrift</li></ul>	<ul style="list-style-type: none"><li>✓ Turbiner</li><li>✓ Ventiler</li><li>✓ Rørgater</li><li>✓ Vannveier</li><li>✓ Regulerings-teknikk</li><li>✓ Trykksvingninger</li></ul>	<ul style="list-style-type: none"><li>✓ Generatorer</li><li>✓ Transformatorer</li><li>✓ Apparat-anlegg</li><li>✓ Kontrollanlegg</li></ul>



# Basic – applied research → demonstration



**CEDREN**

Centre for Environmental Design of Renewable Energy



## CEDREN Årsseminar 2013 ***Innovasjonsworkshop med forskere og brukere.***

### **Målsetting:**

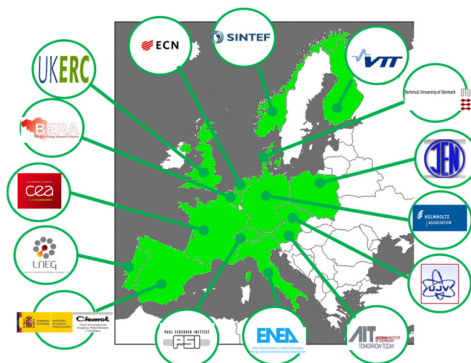
Teste konkrete resultater fra prosjektene mht. relevans, mulighet for videre utvikling og implementering og kommersialisering.

**CEDREN**

Centre for Environmental Design of Renewable Energy

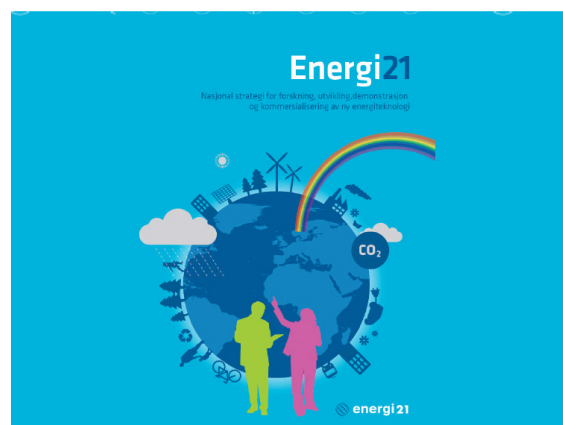


- LCE9: Deadline March 2015
- Large-scale balancing and energy storage
- Collaboration with industry
- European Energy Research Alliance (EERA) collaboration
  - Joint Program on Energy Storage



## Energi21

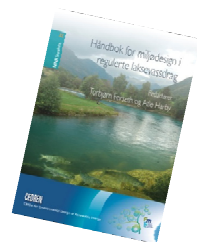
- Spesielle satsinger
  - Vannkraft
  - Fleksible energisystemer
- Øvrige satsinger:
  - Solkraft
  - Offshore vind
  - Energieffektivisering
  - CO<sub>2</sub>-håndtering
- På høring fram til 22. mai





# CEDREN Work Plan 2014

- Oppdatert kommunikasjonsstrategi
- EnviDORR: Håndbok på engelsk
- EnviPEAK: Sluttrapport og tiltak
- HydroPEAK: Publisering, PhD
- OPTIPOL: Formidling, LCP Toolbox
- SusGrid: Planprosesser, medvirkning, tiltak
- EcoManage: Utvikle indikatorer
- FutureHydro: Workshop i Norge og besøk til Kina
- HydroBalance: Scenarier og roadmap
- Tools: Utveksle data mellom modeller

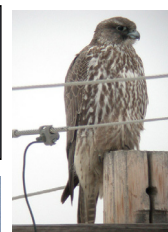
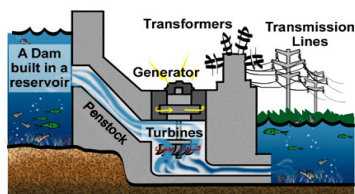


**CEDREN**

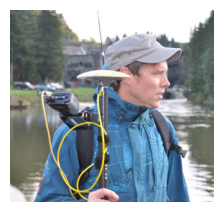
Centre for Environmental Design of Renewable Energy



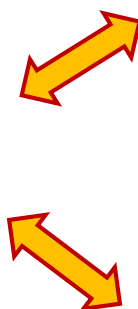
## Samspill



Miljø



Teknologi



Samfunn



- Videreføring FME?
- Nye FME?
- Prosjekter?
- Andre ordninger?

**CEDREN**

Centre for Environmental Design of Renewable Energy

