



Innovation and Networking for Fatigue and  
Reliability Analysis of Structures – Training for  
Assessment of Risk



# WP3 – Reliability approaches for decision-making

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 676139

3rd Infrastar Implementation Day, COWI Copenhagen, 26 June 2019

Lead Beneficiary	AAU
Other Beneficiaries	IFFSTAR, PHIMECA, COWI, BAM, EPFL, NeoStrain
Work-Package Title	Reliability approaches for decision-making

## General Objectives:

- Apply reliability analysis and risk-based optimal decision making for life-cycle analysis to concrete foundations and towers for wind turbines concrete bridge elements
- Perform stochastic modelling using JCSS Probabilistic Model Code
- Develop methods for coupling monitoring information (throughout the life of the systems) with structural reliability models

Amol Mankar

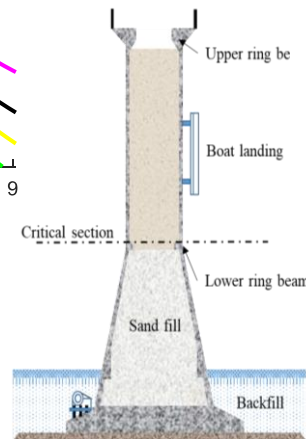
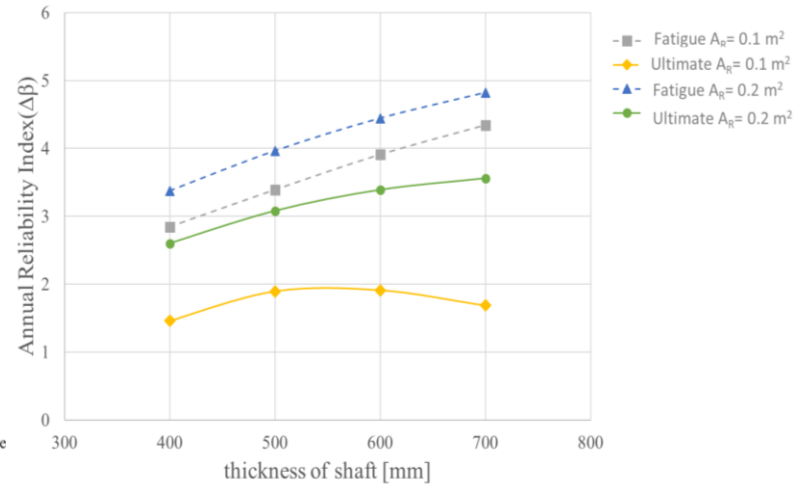
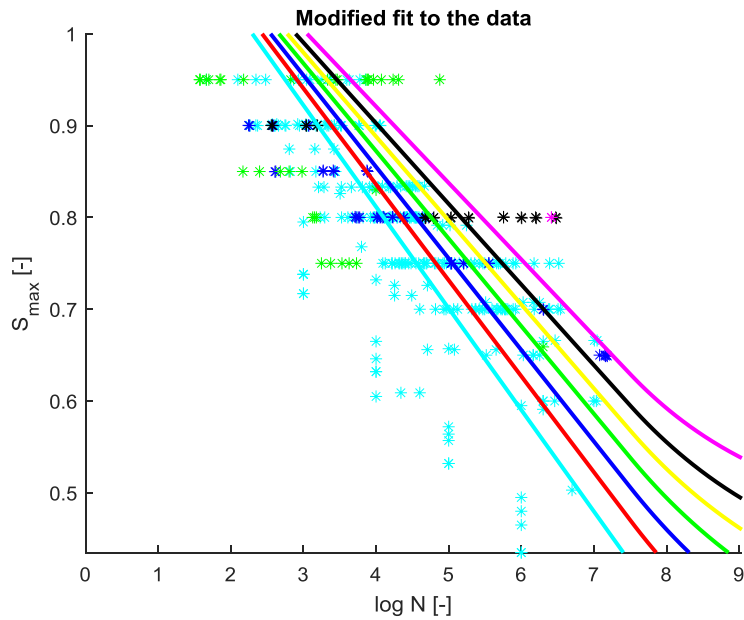
Fatigue reliability of concrete wind turbine and bridge elements

**Objectives:** Development of methods for fatigue reliability of wind turbine towers and foundations and of bridge elements

- Development of a probabilistic framework for reliability assessment
- Application of the probabilistic model:
  - wind turbine foundations and innovative concrete towers
  - concrete bridges.
- Study on defining a design parameter for concrete bridges, wind turbine towers and foundations
- Reliability analysis and Calibration of partial safety factors including considerations of the effect of inspections and monitoring

Amol Mankar

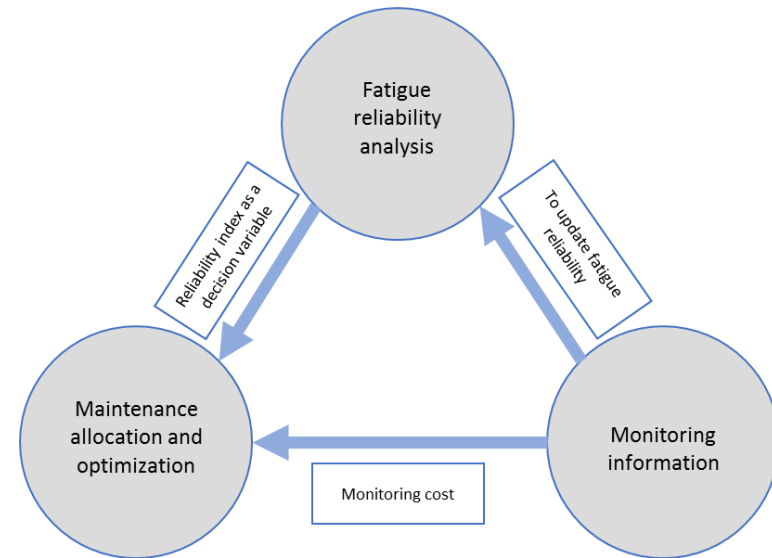
Fatigue reliability of concrete wind turbine and bridge elements



Morteza Ahmadi	Optimal maintenance planning of existing structures using monitoring data
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**Objectives:** Prepare an optimal framework for maintenance planning of existing structures against fatigue using monitoring data

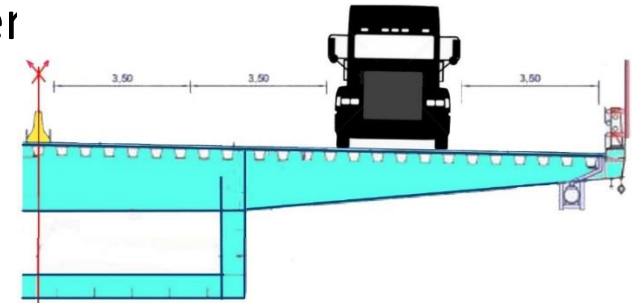
- A new time dependent reliability method (AK-SYS-T)
- Application of time series method to represent fatigue loading
- Crack propagation in orthotropic decks under transversal tension



Morteza  
Ahmadivala

Optimal maintenance planning of existing structures using monitoring data

- Crack propagation in orthotropic decks under transversal tension



- Motivation:

- Crack propagation through the deck plate is very dangerous since inspections are very difficult for this part

- Objectives:

- Study the influence of transversal tension on crack propagation
- Investigate some repair methods to prevent this phenomenon



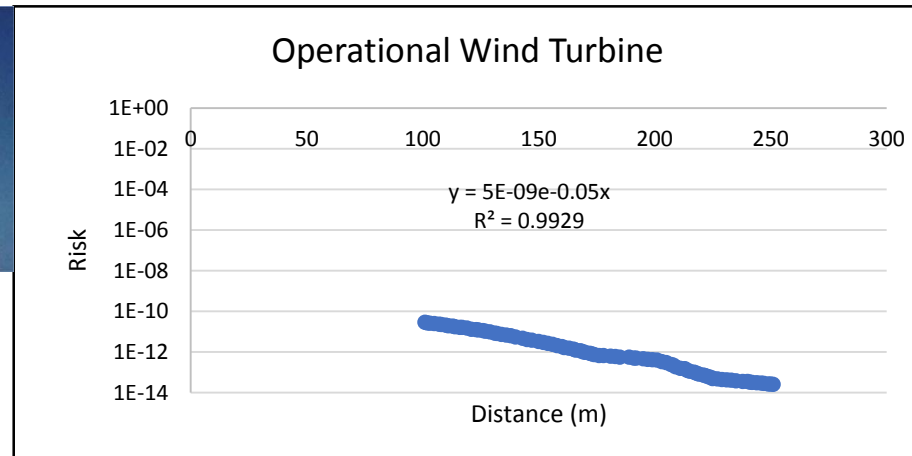
Sima Rastayesh

Development of methods for risk assessment of wind turbine support structures and bridges

- Identification of data from inspections, sensors and condition monitoring systems needed for decision making,
- Modeling of adverse events (both SLS and ULS limit states) and identification of methods and tools for estimation of the probability of the adverse events,
- Modeling of consequences of adverse events,
- Identification and development of illustrative computer tools for decision making → Bayesian network

Sima Rastayesh	Development of methods for risk assessment of wind turbine support structures and bridges
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## ➤ Risk Assessment of Wind Turbines Close to Highways



## ➤ Should heating and ice detection systems be applied ?





Lijia Long

Quantification of the value of monitoring information

## Objectives:

Development of a framework for the quantification of the value of monitoring information

- Development of a method based on the value of information analysis to determine the structural and damage detection system influencing parameters, including:
  - Number of sensors
  - Sensor location
  - Measurement noise and Type I error from sensors
  - Monitoring year
  - Deterioration type and rate



# WP3 – ESR N°12

## Field application case studies

Quantification of the value of SHM data for the fatigue safety evaluation of a road viaduct

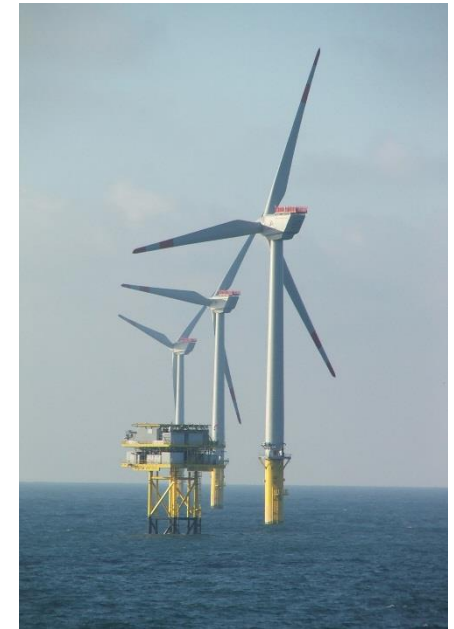


Quantification of the posterior utilities of SHM campaigns on an orthotropic steel bridge deck



Risk Assessment and Value of Action Analysis for Icing Conditions of Wind Turbines Close to Highways

On the value of SHM information for offshore wind turbines.



# Thank you for your attention

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Stay tuned

<http://infrastar.eu>



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