

Maritime Safety of Offshore Wind Farms

Models versus expert opinions

TNO Built Environment and Geosciences



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Netherlands Organisation for Applied Scientific Research TNO

- Independent Research Institute
- Over 4500 employees
- **5 Business Areas**
 - TNO Quality of Life
 - TNO Defense, Security and Safety
 - TNO Science and Industry
 - **TNO Built Environment and Geosciences**
 - TNO Information and Communication Technologies



- (Inter)national active: industries, (semi)government, universities, and other knowledge institutes



Move 'first concepts' to 'innovation': TNO value chain

Develop knowledge



Apply knowledge



Exploit knowledge

Wind power production in the Netherlands

- General Dutch commitment to invest in other than the 'conventional sources of energy'
- (Inter)national and regional targets (EU–NL-provinces) are set (6000 MW offshore by 2020)
- Only limited space available onshore to reach these targets (either for technical, practical, safety reasons – or for environmental, social or emotional/NIMBY reasons)
- Dutch Government has **not** designated specific areas for wind farm projects
- Park developers are basically free too choose (> 12 nautical miles), albeit avoiding all governmental restrictions
- By now 2 offshore wind park plans have been approved



Our involvement in present Dutch onshore and offshore wind farm initiatives

- TNO takes part in **We@Sea**, a platform of Dutch stakeholders in off shore wind farm initiatives
- TNO is consulted whereas **environmental aspects** of using the North Sea are concerned
- TNO is consulted regarding **safety issues**, performs (project) **risk analyses** and **reliability studies**
- TNO is consulted balancing aspects of **spatial planning**
- TNO participates in development new **signalling systems**
- TNO verifies engineering of **constructions**



Why maritime safety addressed here today ?

spatial planning of multiple offshore wind farms

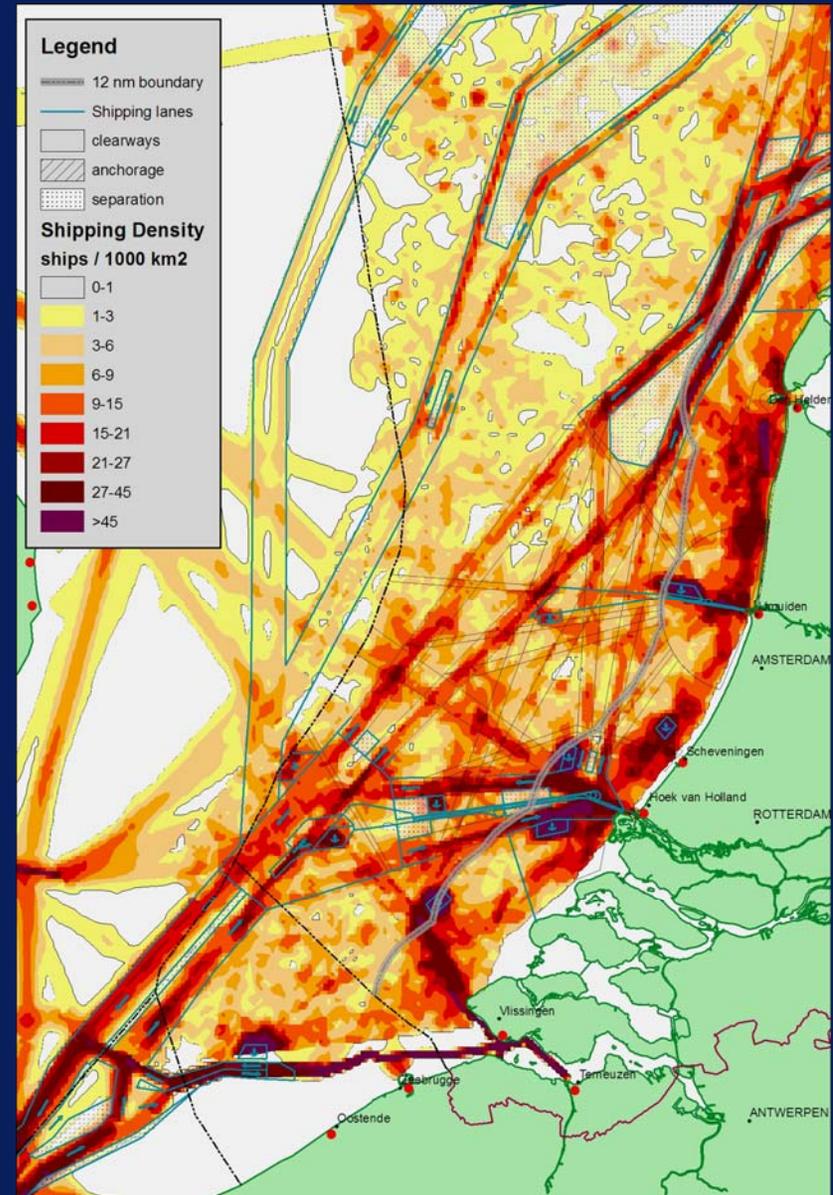


Introducing to you in red

The traffic density on the Dutch part of the North Sea, partially regulated by so called 'clearways'

50 % of the traffic is *directed* being international transport (bulk carriers and oil tankers) and short sea shipping (ferries, coasters)

50% of the traffic is *NOT directed* (fishery, recreation)



In green:

An overview of planned wind farm off the West coast of the Netherlands

So far 2 applications approved,
57 applications running,
up to 80 expected.....



Analyzing the risk analyses

Present and future 'users' (stakeholders) of the North Sea, focusing on safety instruments, mathematical models, trends and technology, and compare those with daily practice
Our aim is to 'value' estimates of (in-) direct effects

Approach

- Insight in the safety issues involved / **scenario** analysis
- Inventory / Survey of recent risk studies performed
- Compare calculated probabilities to the risk acceptance
- Consider **cumulative** effects multiple park initiatives
- Search for risk mitigating measures
- Interview experts and question the outcome



Modelling collision risks

Questions raised (1)

The probability upon collisions is demonstrated to be low, hardly influenced by wind turbines but :
Risk is a function of both 'probability' and 'effects'?

Offshore wind presently takes off
Are present accident databases representative ?

Most models emphasize the component
'probability' not so much 'effect'
What is really to be expected ?



Modelling collision risks

Questions raised (2)

Single park initiatives are well defined
How to calculate multiple park initiatives nearby
busy nautical traffic lanes ?

We know all about occurred accidents
What do we know about the occurrence of near
misses ?

Models versus expert opinions
Why do experts (Coastal Guard; Sea Pilots)
express a complete different risk estimation
(‘gut feeling’) ?



Wind Farms life cycle

To what extent and by which parameters is risk influenced in each project stage (design, build, maintain, exploit)?

Is a more strict traffic regulation in place?

What is the influence of global competition?

How to ensure nautical safety (and security)?

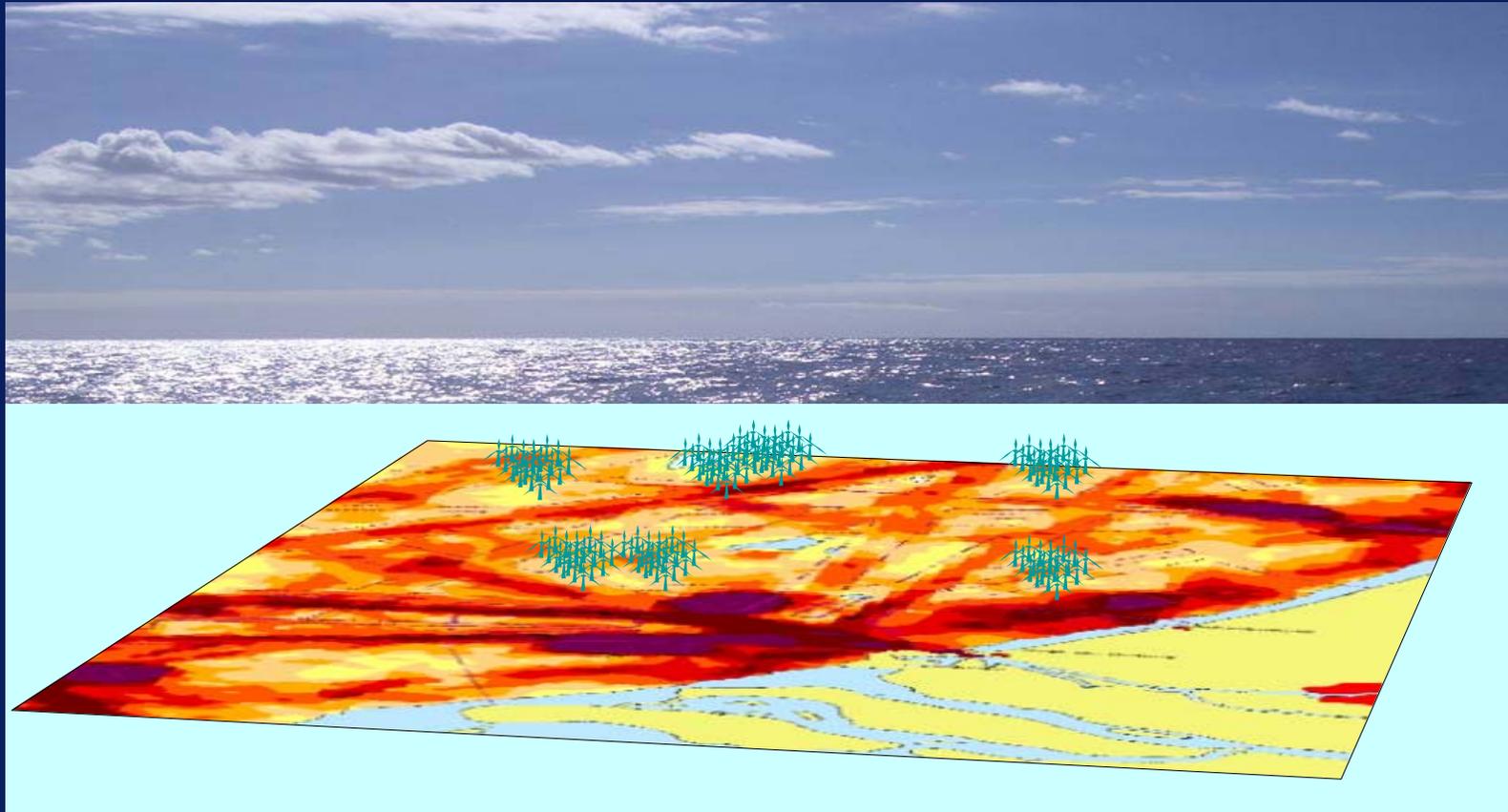
Are present detection and signalling systems sufficient?

What is the strategy to control a safe building process when it comes to multiple park initiatives '1 by 1', 'set by set' or 'many at once'?

Does multiple park maintenance put extra stress upon maritime safety?



So is there a difference ?



Time for an integrated risk management approach ?

