

# Nature conservation assessment concept for water tourism use of open-cast mining lakes

## Zwenkauer See / Markkleeberger See / Störmthaler See

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## Investigations for the "*Determination of Completion*" for navigation to § 17 para. 2 sentence 2 of the Saxon Water Act

### Hypothesis

Navigation traffic may have a significant negative impact on the natural balance of the lakes.

### Questions:

1. Are general **usage restrictions** required?
2. Are **usage intensity limits** required?



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Coordination of nature conservation services

*Local partner:*

- *Büro Knoblich*
- *Naturschutzzinstitut Region Leipzig e.V.*

## The open-cast mining lakes

### Zwenkauer See

area 9.7 km<sup>2</sup>  
volume 172 Mio. m<sup>3</sup>

### Markkleeberger See

area 2.52 km<sup>2</sup>  
volume 60.7 Mio. m<sup>3</sup>

### Störmthaler See

area 7.33 km<sup>2</sup>  
volume 158 Mio. m<sup>3</sup>







Harbour installation Kap Zwenkau

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[https://www.lmbv.de/files/LMBV/Fotos/Nachrichten/2013/20130603\\_LMBV\\_Oeffnung\\_Zitzschen\\_002.jpg](https://www.lmbv.de/files/LMBV/Fotos/Nachrichten/2013/20130603_LMBV_Oeffnung_Zitzschen_002.jpg)



Beach suited for bathing

© E. Krause, 2016

## The lakes

- big
- deep
- oligotrophic
- shores with little structure

## Rapid change

- forestation
- rising water level
- settlement development
- water management
- tourist uses by water and land
- **decrease of open landscape structures observed**

## Competitive use

- recreation and water tourism
- urban planning
- flood protection

and ...

- nature protection



open  
landscape  
structures







## Total stress analysis

- dynamic hydro-, morpho-, ecological system
- declining open landscape structures / forest development
- increasing disturbances by recreational use
- man-made shores (stability of banks)
- further disruptions foreseeable

**Challenge: Identification and evaluation of the effects of shipping (recreational navigation) impact factors, as some of many factors.**

## Impact factors

### indirect

<del>1</del>	<del>exhaust gases and combustion residues</del>
<del>2</del>	<del>antifouling</del>
<del>3</del>	<del>nutrients</del>

### direct

<del>4</del>	<del>acoustic interference</del>
5	visual stimuli
6	mechanical effects / surge wave impact

### other

<del>7</del>	<del>water maintenance</del>
<del>8</del>	<del>traffic safety</del>



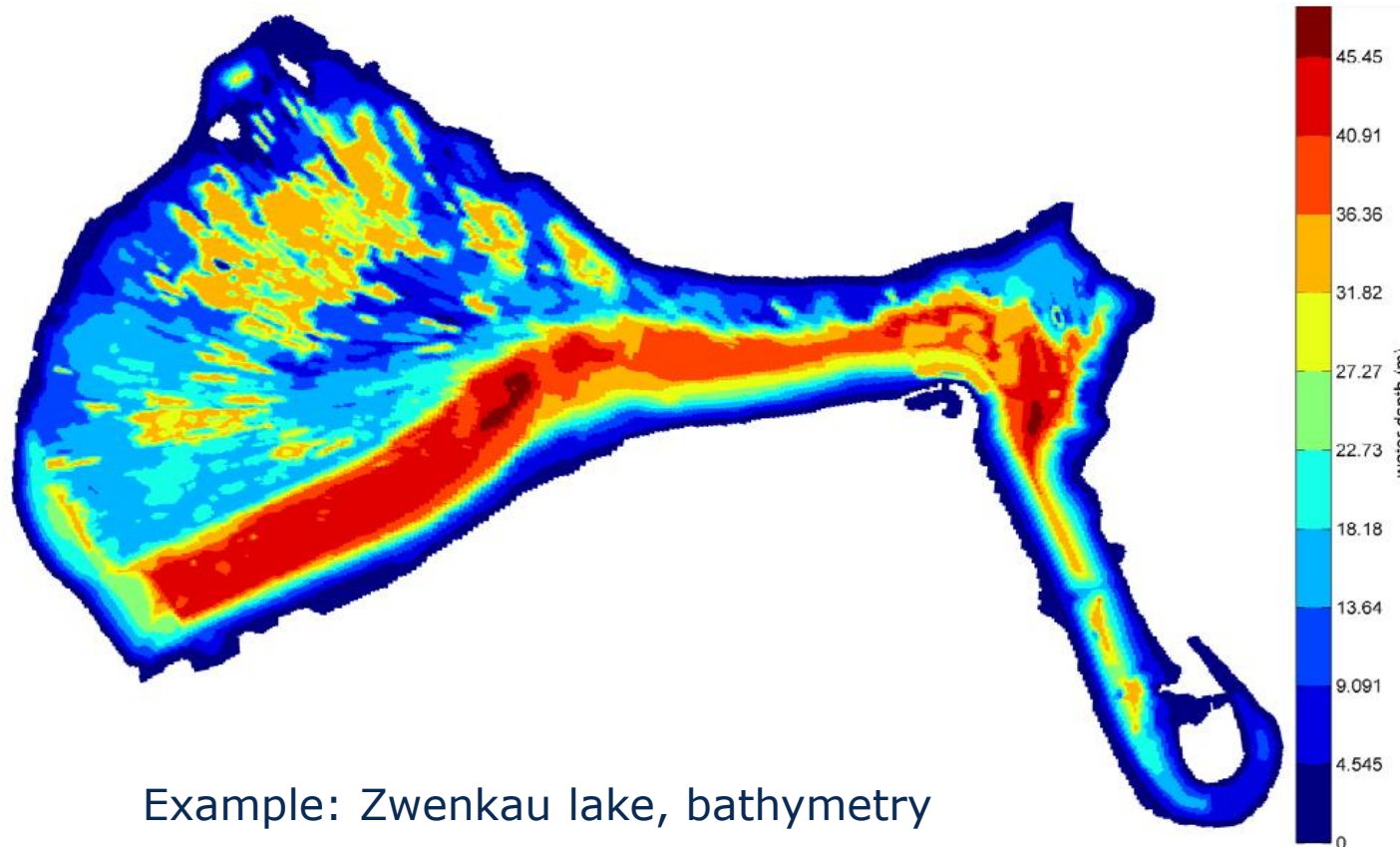
## **Factor: mechanical effects (surge wave impact )**

**Assessment basis 1: wind-induced wave simulation**

**Assessment basis 2: Calculation of boat-induced waves**

## Factor: mechanical effects (wave action)

### Assessment basis 1: wind wave simulation



Example: Zwenkau lake, bathymetry

Delft-3D  
Bathymetry of lake  
Wind data of DWD

Annual wind event and  
storm event

$$w_{10} = f(\text{direction}, a, L)$$

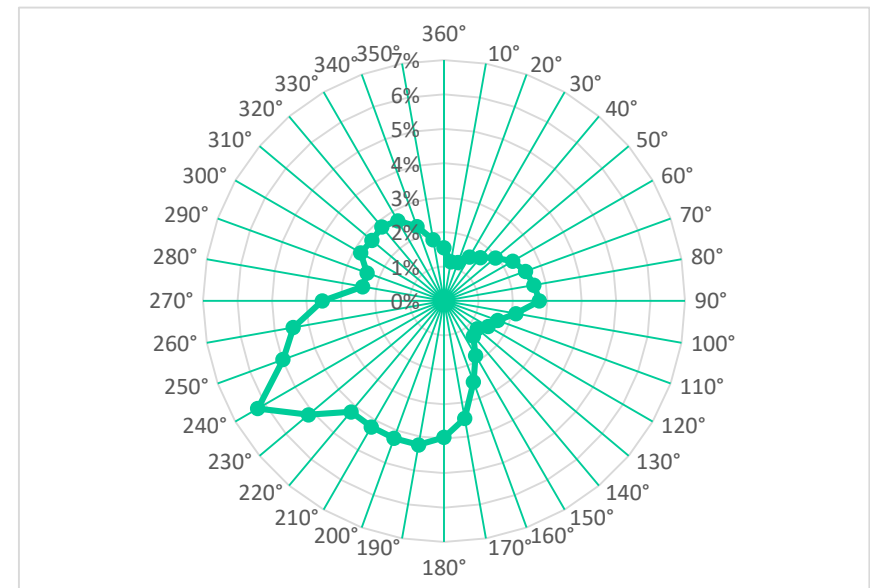
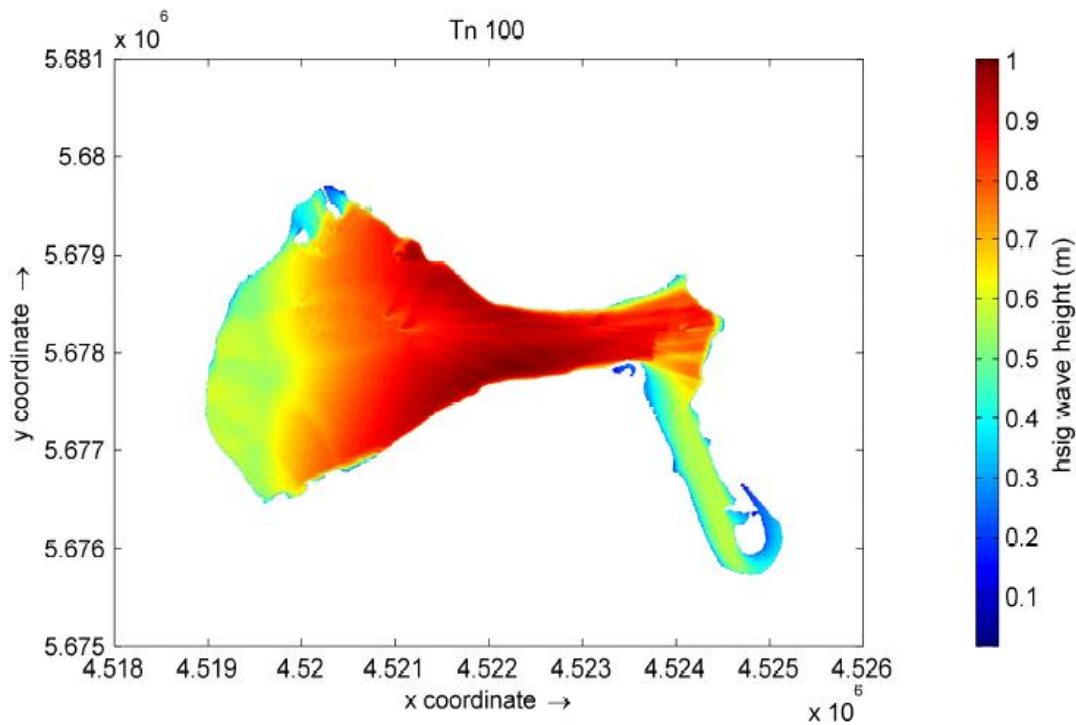
Main wind direction W/SW

$$T=1a: 0,2 \text{ m} < H_{\text{sig}} < 0,42 \text{ m}$$

$$T=100 a: 0,5 \text{ m} < H_{\text{sig}} < 1,1 \text{ m}$$

## Factor: mechanical effects (wave action)

Assessment basis 1: wind wave simulation, Zwenkau, waterlevel 112,5 m asl



Main wind direction W/SW (240° )

Wave heights

T=1a:  $0,2 \text{ m} < H_{\text{sig}} < 0,42 \text{ m}$

T=100 a:  $0,5 \text{ m} < H_{\text{sig}} < 1,1 \text{ m}$

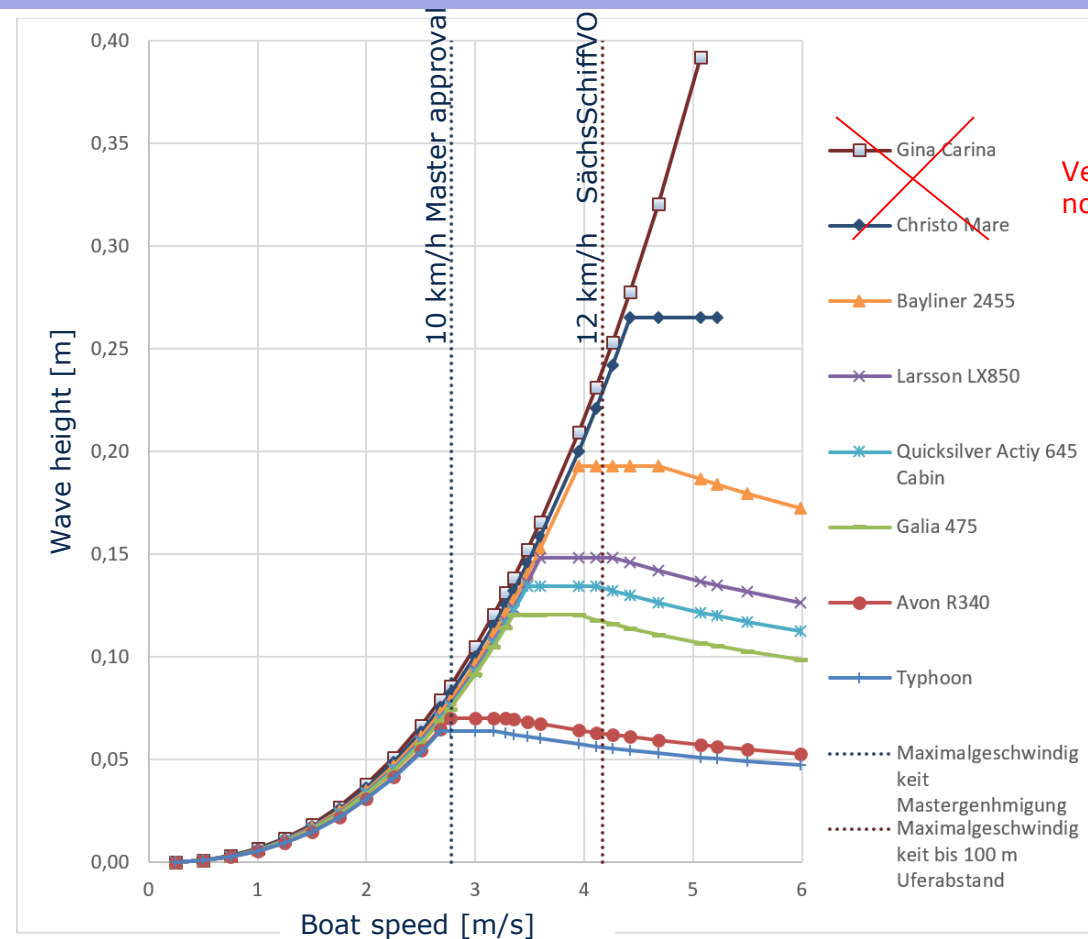


## Factor: mechanical effects (wave action)

### Assessment basis 2: Calculation of boat-induced waves (shape, speed)

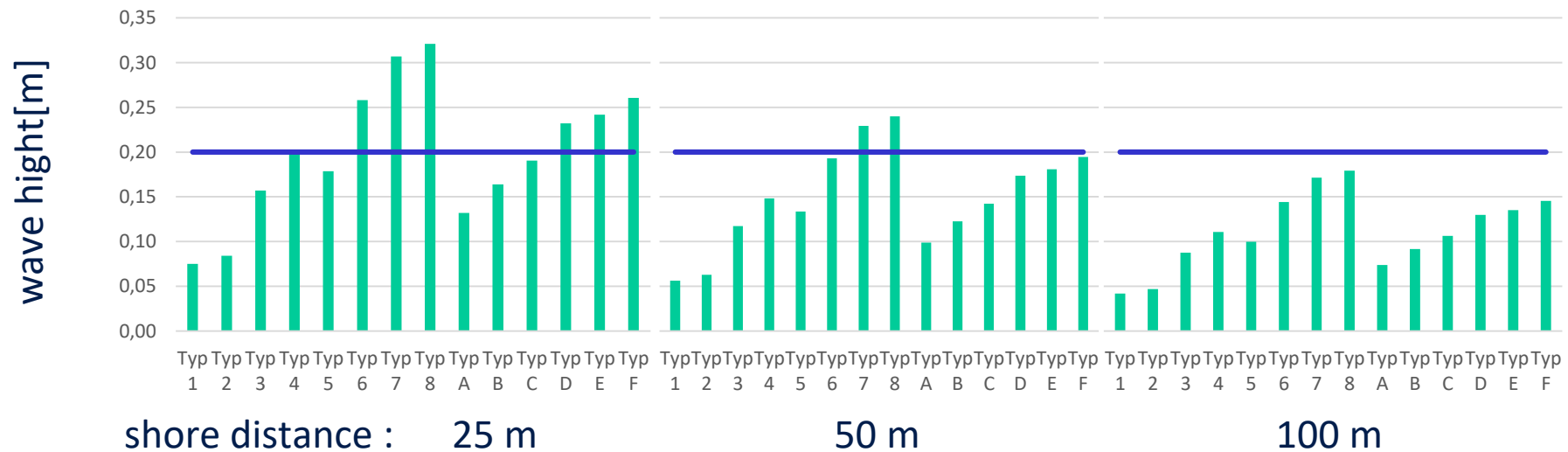
Height of boat-induced wave as a function of vessel type and speed in a distance of 50 m from the shoreline.

Stamm, J. et al. (2013): Loads on bed and banks caused by leisure motor boats - prognosis and measurement for deep water. IAHR World Congress, Chengdu.



## Factor: mechanical effects (wave action)

### Assessment basis 2: Calculation of boat-induced waves (shape, speed)



**CONCLUSION: No further restrictions than SächsSchiffVO from a nature conservation point of view**

## Factor: visual stimulus trigger ("scare effect")

### Influencing factors of visual stimuli

distance

visual shading

boat type

approach type

Type-specific factors  
(differs depending on the season and sub-habitat)

**Number of boats on the lake at the same time (= stimulus trigger)**

**Assessment basis 1: Avifaunistic mapping**

**Assessment basis 2: Estimation of the active number of boats on the lake**



## The "simultaneity factor"

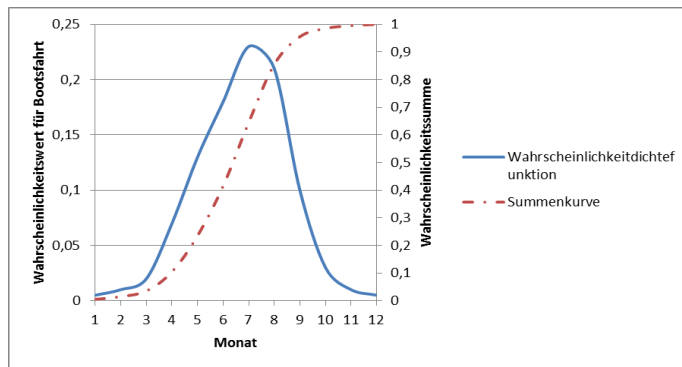
Maximum occupancy of the Zwenkau lake with boats on basis of harbour berths (320)

	Motorized boats	Sailing boats without a motor	Surcharge (slipway, locks)	Total number of boats on the lake	Occupancy boats/ha [boats/10.000 m <sup>2</sup> ]
<b>Normal occupancy rate (GZF = 0,2)</b>	52	10	18	80	0,08
<b>Maximum occupancy rate (GZF = 0,33)</b>	99	8	33	140	0,14

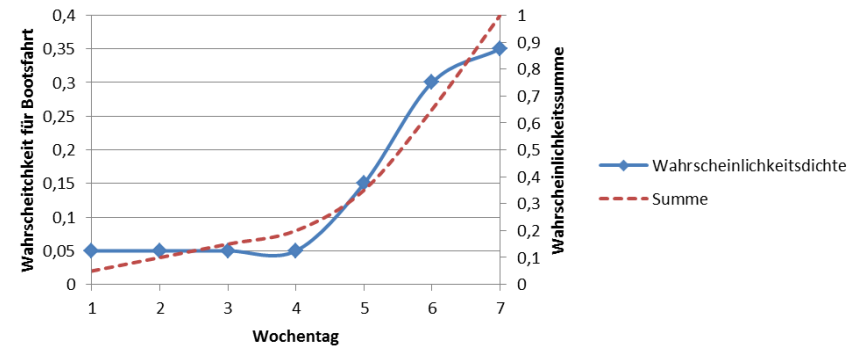
(GFZ=Gleichzeitigkeitsfaktor, factor of simultaneity)

# The "simultaneity factor"

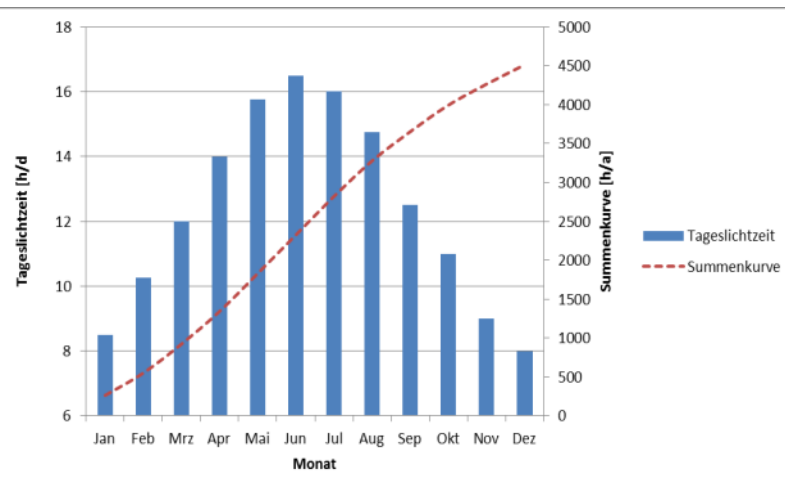
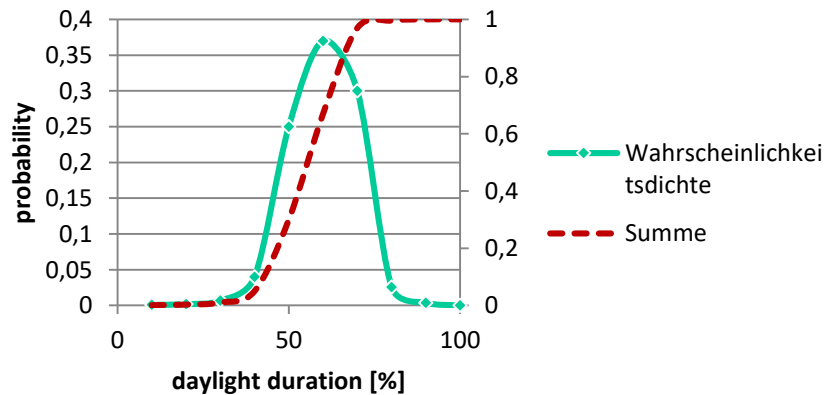
Probability of boat occurrence over the months of the year



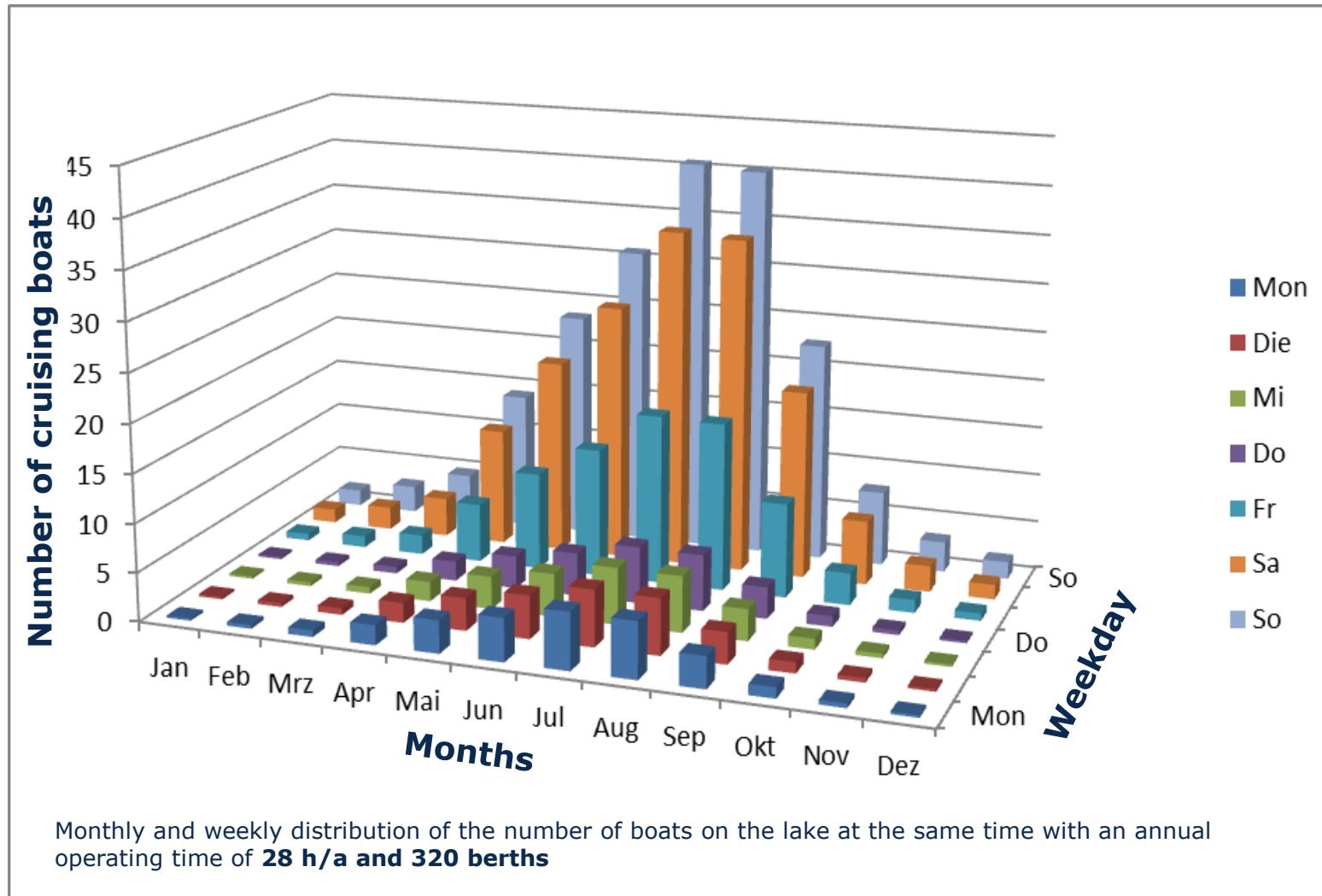
Wahrscheinlichkeit des Bootsauftretens über die Woche



Probability of boat occurrence over daylight duration



## The "simultaneity factor"



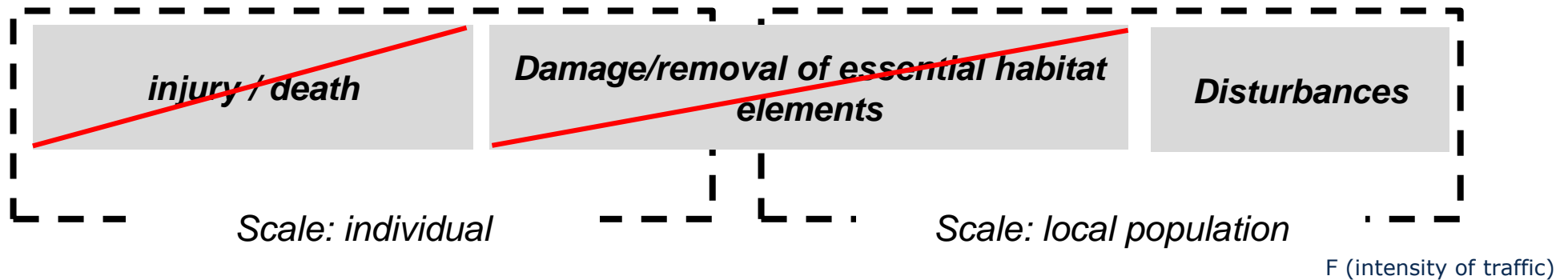
$5 < n < 40$



## Assessment based on knowledge of disturbance ecology

Not every effect is “significant” in the legal sense

**But: relevance of prohibition facts**

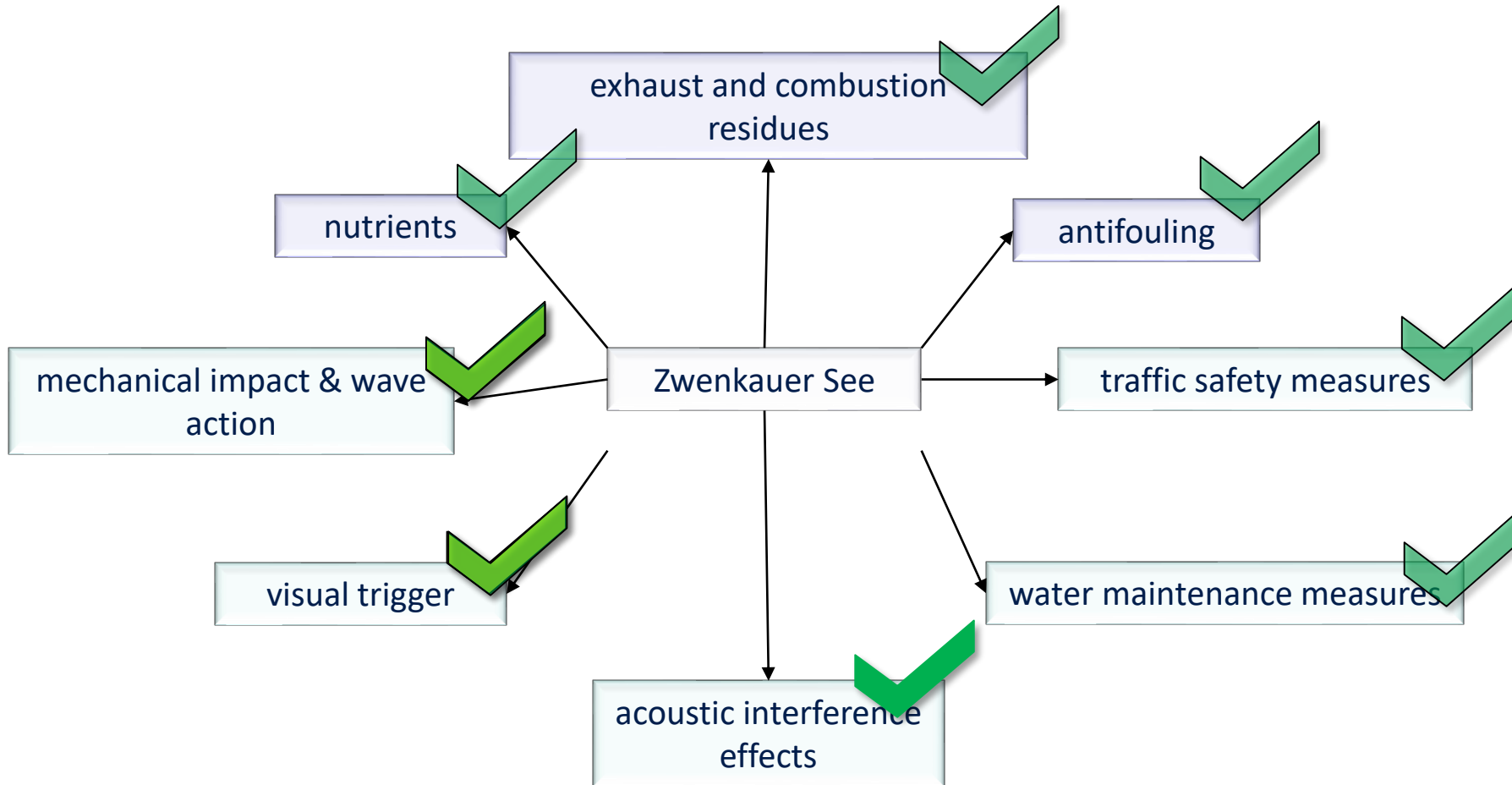


**Assessment basis 1: Avifaunistic mapping**

**Assessment basis 2: Traffic intensity**

**Expert assessment** for almost 100 individual species and species groups, under consideration of habituation, existing disturbances and spatial distribution of habitat structures

## General conclusion



**=> no further restrictions required within the framework of the FdF ("determination of completion")**

## **General conclusion**

**No significant  
impairments in the  
legal sense**

**Recommendation  
to continue the  
existing  
regulations**

**Additional expert  
recommendations**

**Methodology transferable to other lakes**



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Thank you very much for your attention!