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# Analysis of the short- and medium-term availability of land for onshore wind energy in Germany

Marie-Luise Plappert, M. Sc.  
Section V 1.3 / Renewable Energies

## Agenda

### **UBA project „Analysis of the short- and medium-term availability of land for onshore wind energy use “**

- Background and aim of the project
- Data basis and methodology: Determination of area and performance potential

### **Space availability and performance potential: Classification of the results**

### **Summary and outlook**

## Background and aim of the project

EVUPLAN project: "**Analysis of the short and medium term availability of land for onshore wind energy use**"

**Objective:** Identification of land bottlenecks for the short to medium term development of wind energy

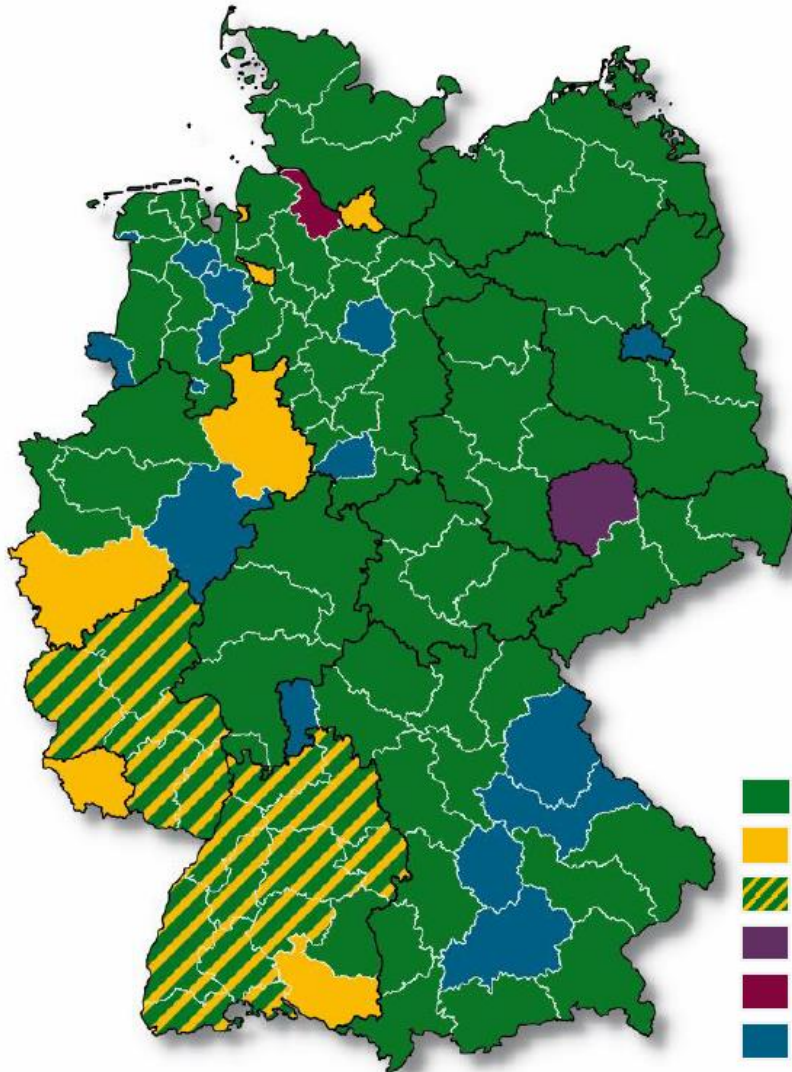
**Background:** The prerequisite for achieving the expansion targets and for functioning competition is a constant and sufficient availability of space

**Procedure:**

1. Compilation of a data set of the areas designated at regional planning level (and partly at urban land use planning level) for onshore wind energy (including drafts)
2. Analysis of the installable capacity on the sites, taking into account the plant stock/repowering
3. Classification of the area potentials
4. Derivation of recommendations for action

Duration: 01/2017 - 11/2019, processing by Navigant, Fraunhofer IEE as subcontractor

## Data basis



### High coverage at regional planning level

### Inclusion of area designations at the level of urban land use planning for:

- City states Bremen and Hamburg
- Saarland
- NRW (governmental districts Köln, Detmold)
- Rheinland-Pfalz
- Baden-Württemberg
- FrankfurtRheinMain

### Latest data status (legally binding or draft)

- Current status of regional plan
- Current status of urban land use plan
- Current status of regional plan and urban land-use plan
- Obsolete data
- Invalid (not considered)
- No data

## Methodology: Analysis of the available area

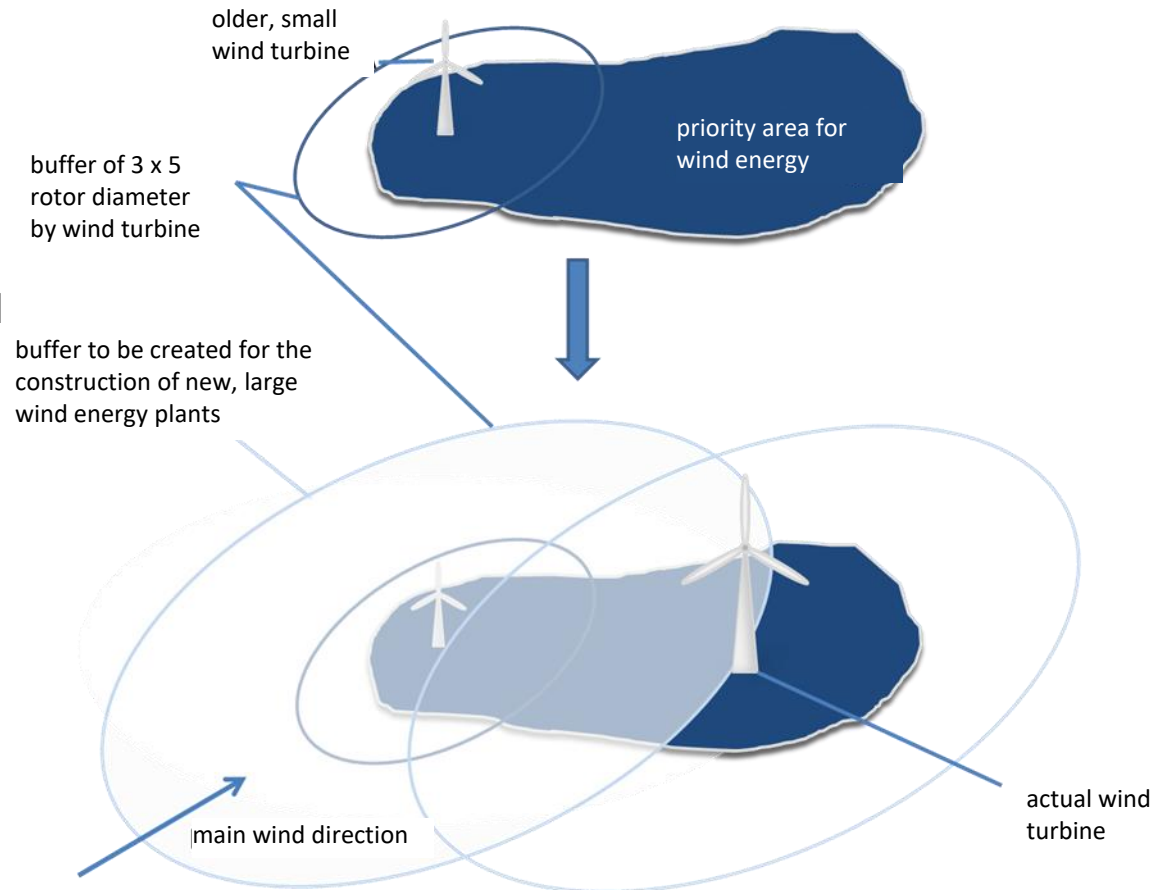
### ➤ Assumptions:

- 5 Rotor diameter in main wind direction
- 3 Rotor diameter in crosswind direction

### ➤ Elliptical buffers around wind turbines

### ➤ Yield-weighted main wind direction determined in upstream simulation

### ➤ The decisive factor is the rotor diameter of the larger plant

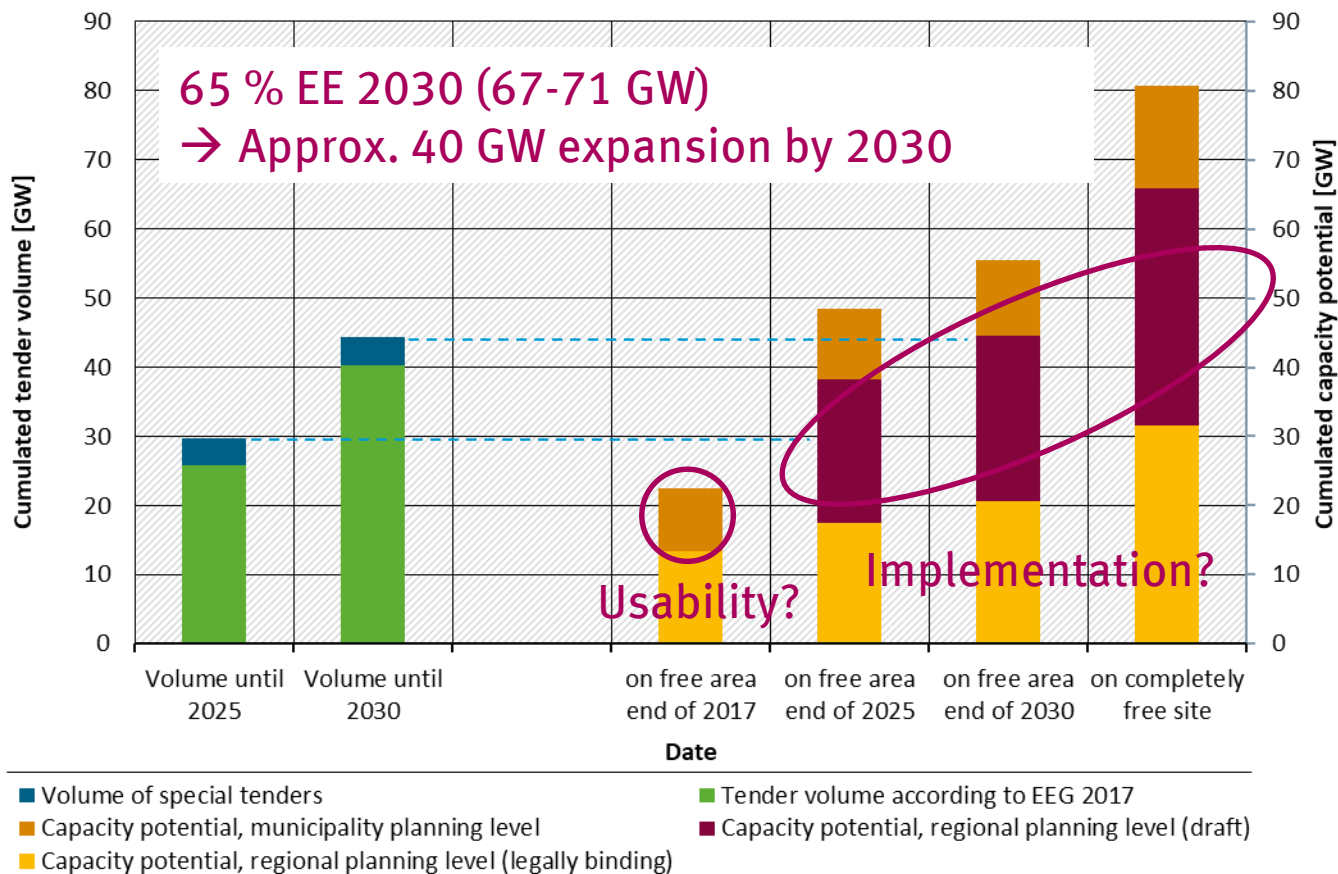


## Area potential in the federal states

State	Area state (km <sup>2</sup> )	Designated + draft wind area (km <sup>2</sup> )	Proportion of national territory (%)	01/2018 free area (km <sup>2</sup> )	Proportion of free wind areas (%)	Output of placeable wind turbines (MW)
BB	29.654	556,5	1,8	204,6	36,8	4.904
BE	892	0,0				
BW	35.751	213,6	0,6	138,4	64,8	3.983
BY	70.550	368,9	0,5	267,1	72,4	6.699
HB	420	4,2	1,0	0,8	18,7	35
HE	21.115	445,0	2,1	338,2	76,0	8.467
HH	755	1,8	0,2	0,1	4,2	11
MV	23.214	158,4	0,7	94,7	59,8	2.909
NI	47.593	390,3	0,8	112,9	28,9	4.060
NW	34.113	255,1	0,7	56,2	22,0	2.247
RP	19.854	344,0	1,7	179,6	52,2	5.912
SH	15.802	311,7	2,0	76,8	24,6	2.993
SL	2.569	52,4	2,0	27,8	53,1	991
SN	18.449	46,5	0,3	8,7	18,7	403
ST	20.452	215,3	1,0	22,0	10,2	774
TH	16.202	91,3	0,6	34,7	38,0	893
<b>Germany</b>	<b>357.385</b>	<b>3.455,0</b>	<b>1,0</b>	<b>1.562,6</b>	<b>45</b>	<b>45.281</b> <b>39.489</b>

## Result: performance potentials and tender quantities

Comparison of tender volume from 2017 with identified performance potential of the wind areas



Assumption operating life of existing installations 20 years

Uncertainties:

- Usability of older areas
- Implementation of design areas
- Urban land use planning
- Area efficiency

Land availability in the years up to 2025 strongly dependent on the implementation of the design areas (e.g. high potential Schleswig-Holstein)

## Interim conclusion - classification of the results

### Are there sufficient areas for short to medium-term expansion?

**Theoretically yes**, but only realisable under **ideal conditions**: unlimited usability, efficient space allocation, adoption of all design areas

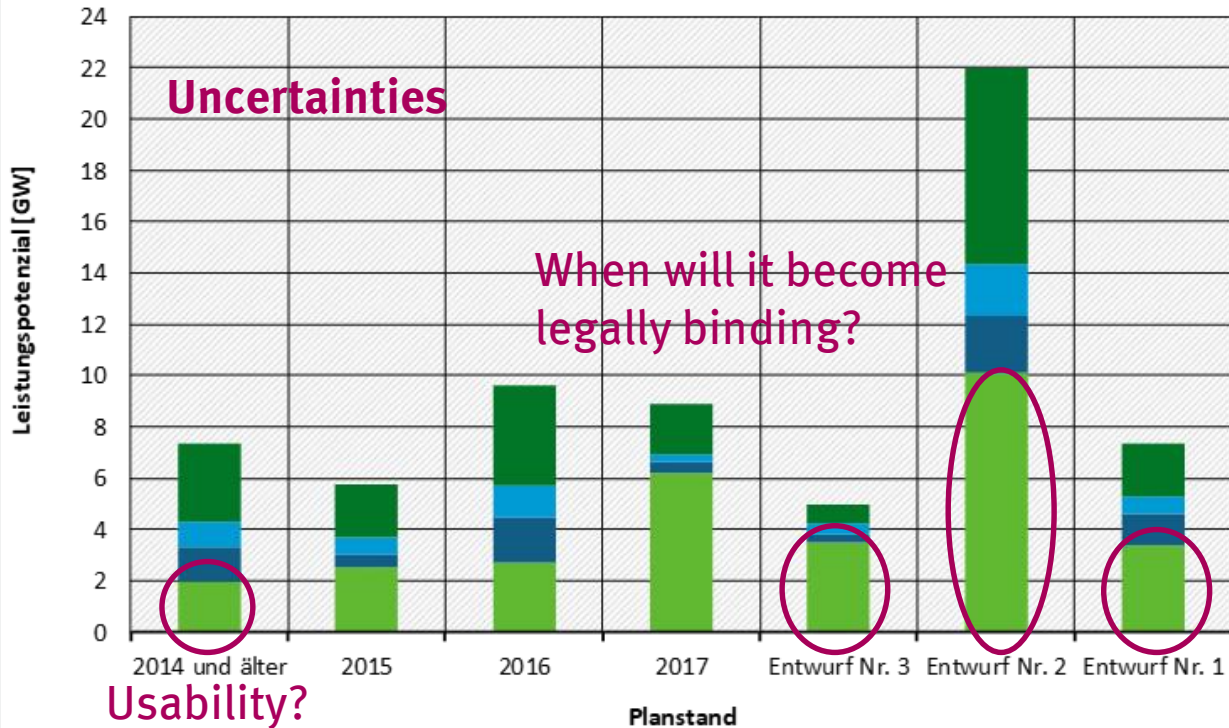
### What are the uncertainties?

- More than **50%** of the performance potential can be attributed to **plans in draft form**
- High **non-usability** of designated areas: **23% of the area** by regional plans up to and including 2014 has not been developed with wind turbines
- Introduction of uniform **distances to settlements**. Even a **distance of 1,000 m** would have a significant impact on the current area setting (**-20 to -50 %**)
- In the analysis the rotor was expected to be outside the area boundary, within reductions of up to 20% are expected



## Result: Performance potential according to planning status

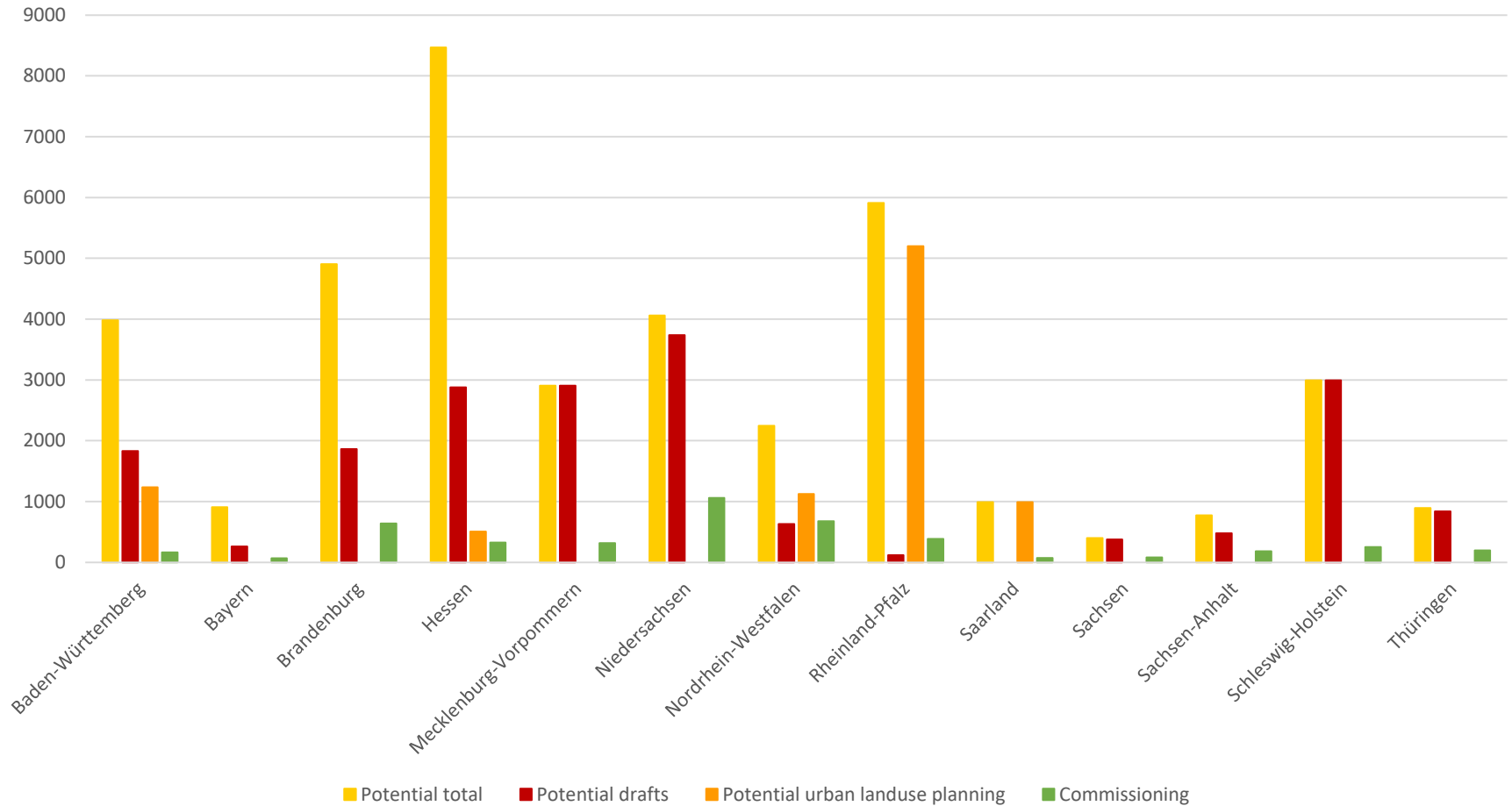
Performance potential of the designated areas at regional planning level after the date of designation/ draft version



- Legally binding areas largely occupied by existing facilities
- Over 50 % of the performance potential to be attributed to areas in the draft--> **not yet available**
- 17.0 GW (~ 50 %) of the areas in the draft would be directly available after entry into force

**No approval according to BImSchG!**

# Performance potentials compared to commissioning 2018 to 2020\* [MW]

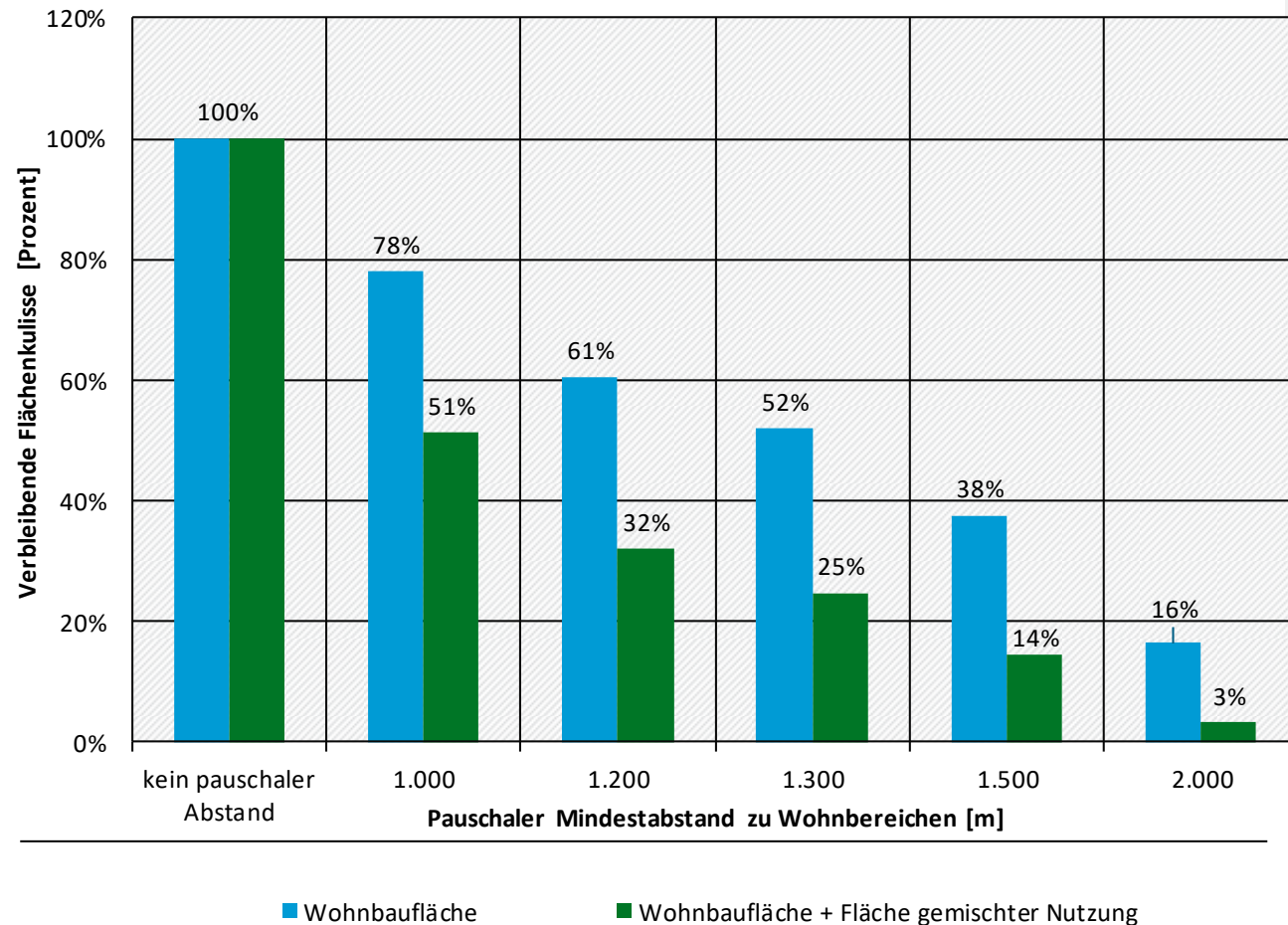


\* Commissioning up to 11.11.2020 included

## Effects of settlement distances on the performance potential

- Database:  
Designation of areas at regional and urban land use plan level
- 10H-affected areas in Bavaria already deducted
- Buffering:  
Only residential areas (blue)  
Housing areas and areas of mixed use (green)

→ Remaining performance potential



## Recommendations

- Setting (binding) **targets at federal or land level at an early** stage which are sufficient to ensure the necessary expansion in the medium and long term
- Increasing **the legal certainty of regional and land use plans** (recovery procedural errors, legal and technical assistance in drawing them up)
- Greater guarantee of the **economic efficiency** of areas (sufficient wind resistance, no restrictions on building height)
- Dealing with **legal obstacles to licensing**, e.g. aviation, species protection
- **Long operating times** of non repowerable wind turbines
- Increase in **data availability, monitoring of the area situation** in order to identify possible bottlenecks at an early stage

## Summary and outlook

- In the UBA project, a capacity potential of **almost 40 GW was determined for 2030**
- However, this is subject to **high uncertainties** (usability, drafts, distance to residential buildings, etc.)
- A comparison of the identified potentials in the federal states with commissioning and licensing in 2018-2020 shows that a very high proportion of land is (still) not used
- It is therefore of great importance to analyse the **current land availability for wind energy**, particularly with regard to usability, in greater detail in order to be able to identify possible need for action in a transparent manner (further UBA project, results expected by the end of 2021)
- A first approach to increase data availability and to monitor the land situation on a permanent basis is found in the current draft of the EEG

# Thank you very much for your attention!

**Marie-Luise Plappert**

Marie-Luise.Plappert@uba.de

Tel.: +49(0)340 2103-2820

<https://www.umweltbundesamt.de/themen/klima-energie/erneuerbare-energien/windenergie>

