JADE UNIVERSITY OF APPLIED SCIENCES
Wilhelmshaven Oldenburg Elsfleth

Visibility analysis as a tool for regional planning in the context of "repowering" (wind-turbine upgrading)

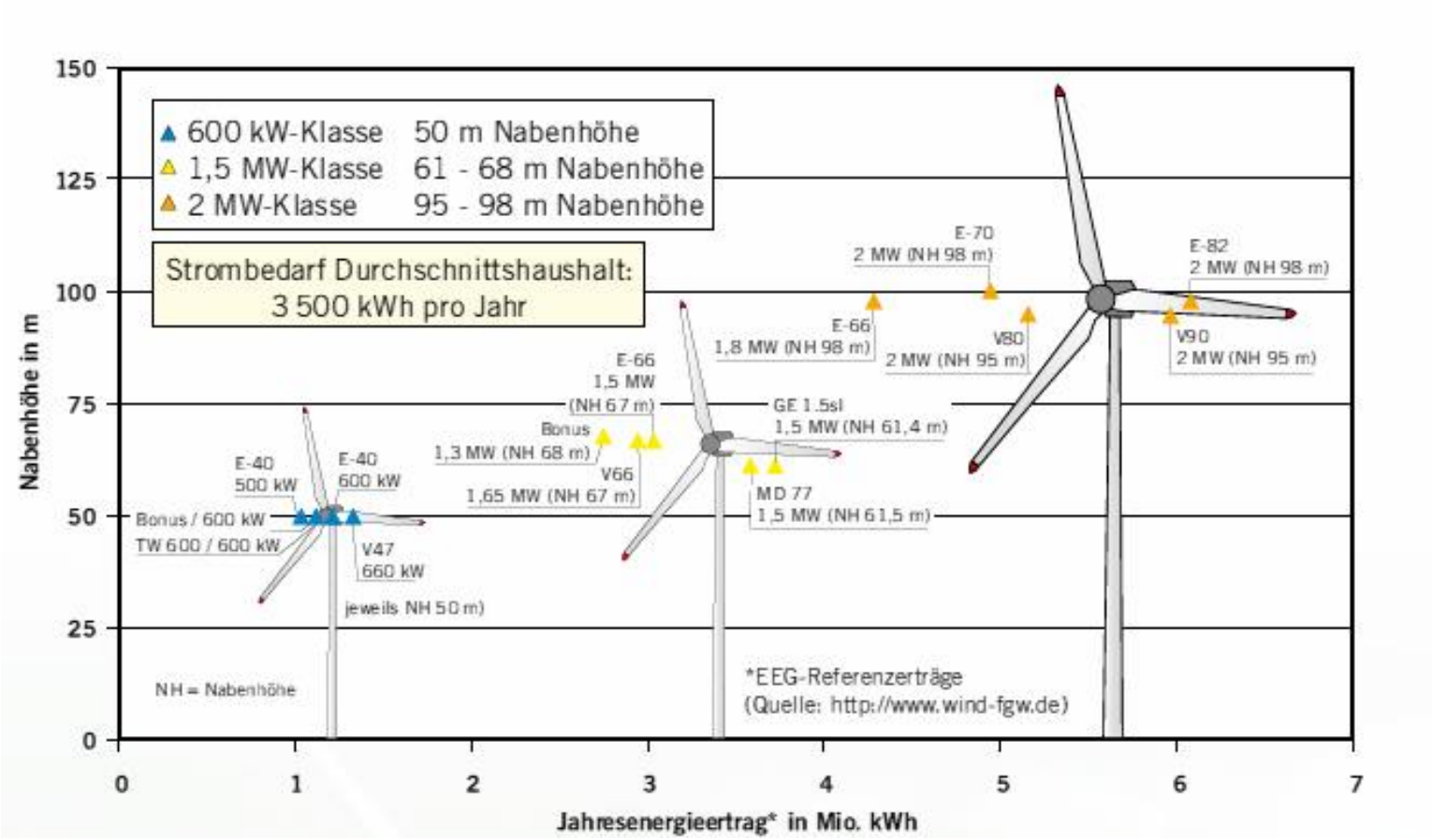
A transferable example of the Interreg-Project
"North Sea Sustainable Energy Planning"

NORTH SEA SUSTAINABLE ENERGY PLANNING

The Interreg IVB North Sea Region Programme
Investing in the future by working together for a sustainable and competitive region

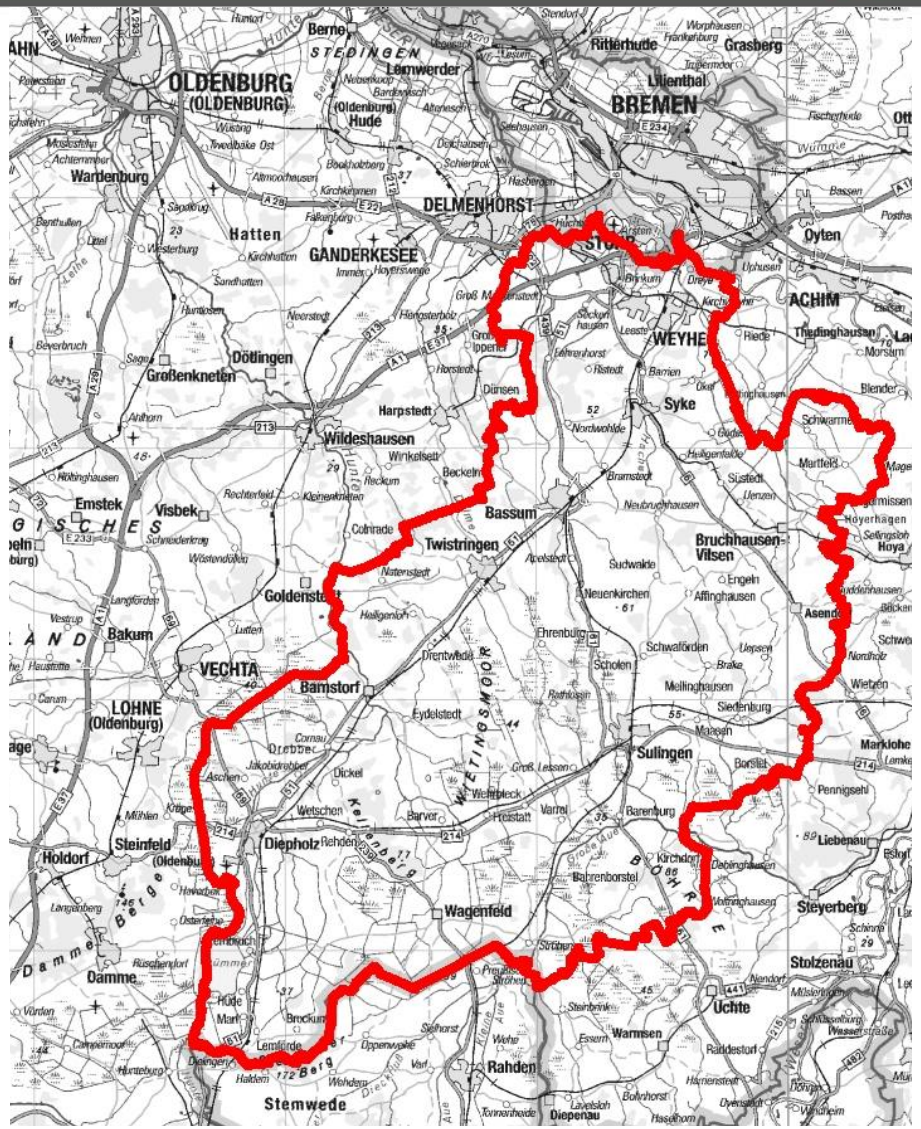
EUROPEAN UNION
European Regional Development Fund

„Evolution“ of Wind Turbines



Quelle: DEWI GmbH

District of Diepholz



Source: Auszug aus den Geobasisdaten der Niedersächsischen Vermessungs- und Katasterverwaltung, © 2011 Landesamt für Geoinformation und Landentwicklung Niedersachsen (LGLN)

District of Diepholz

- Number of approved turbines: 314

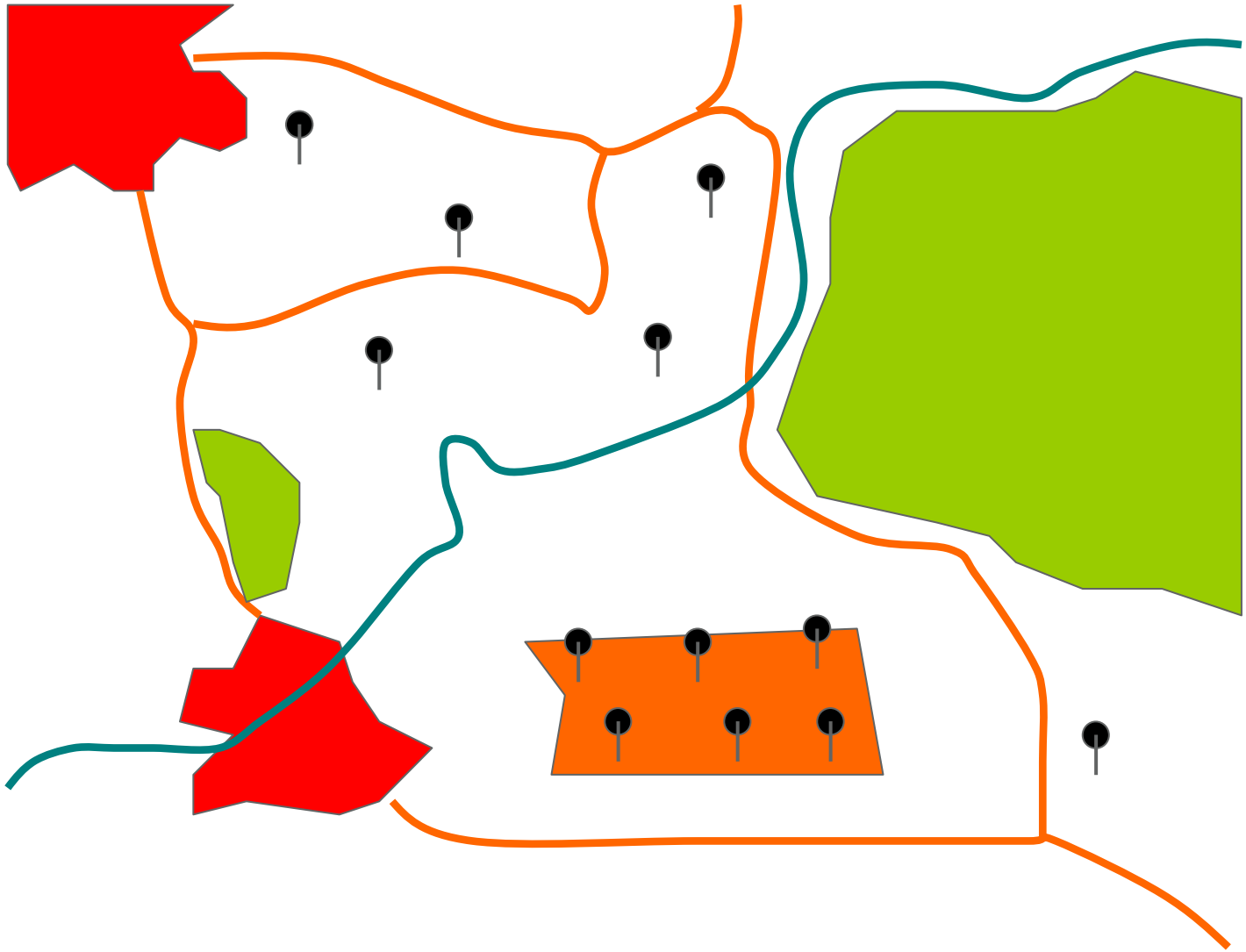
- highest turbines: 140 m Hub Height, 180 m Blade Tip Height

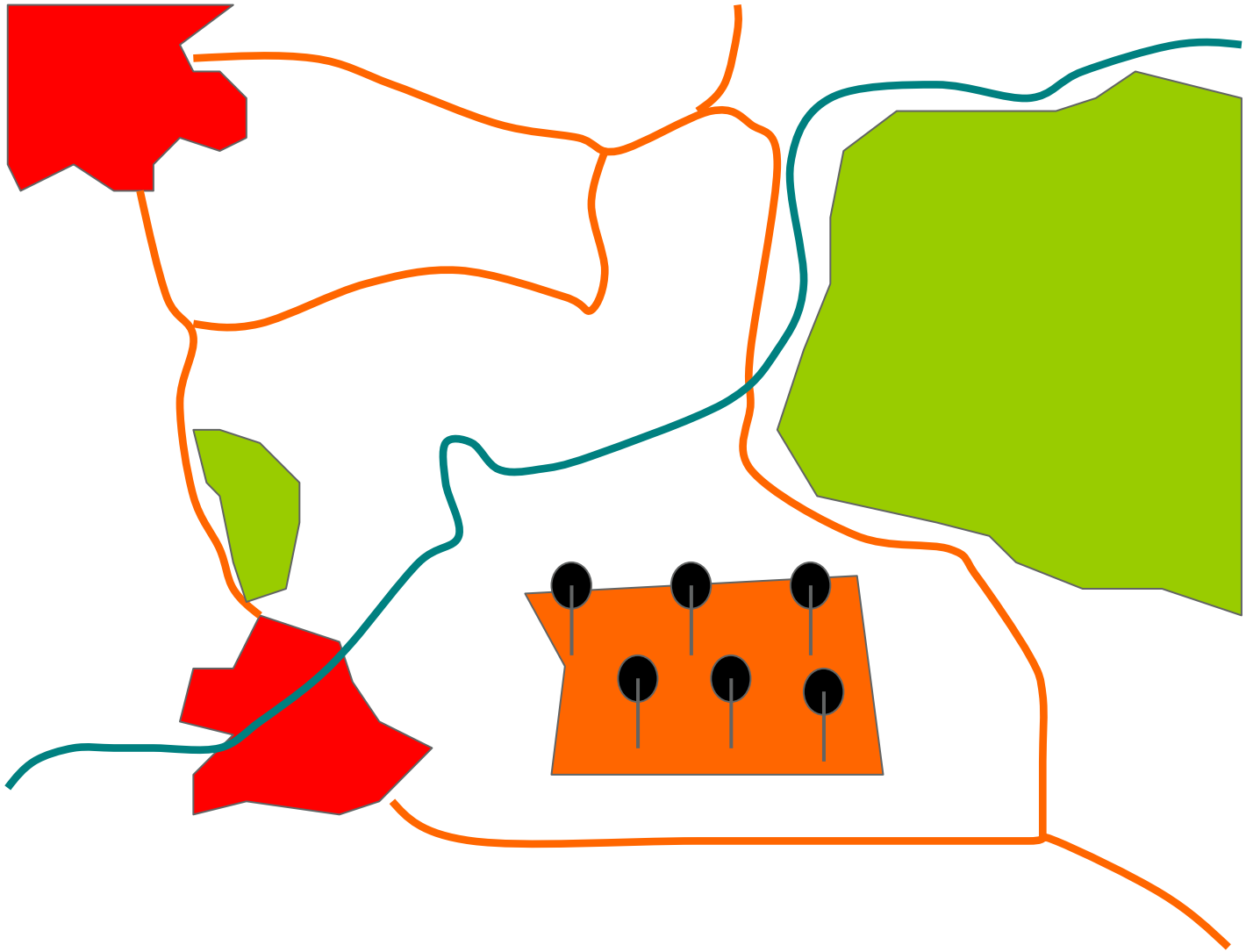
- smallest turbines: 7,5 m Hub Height, 11,5 m Blade Tip Height

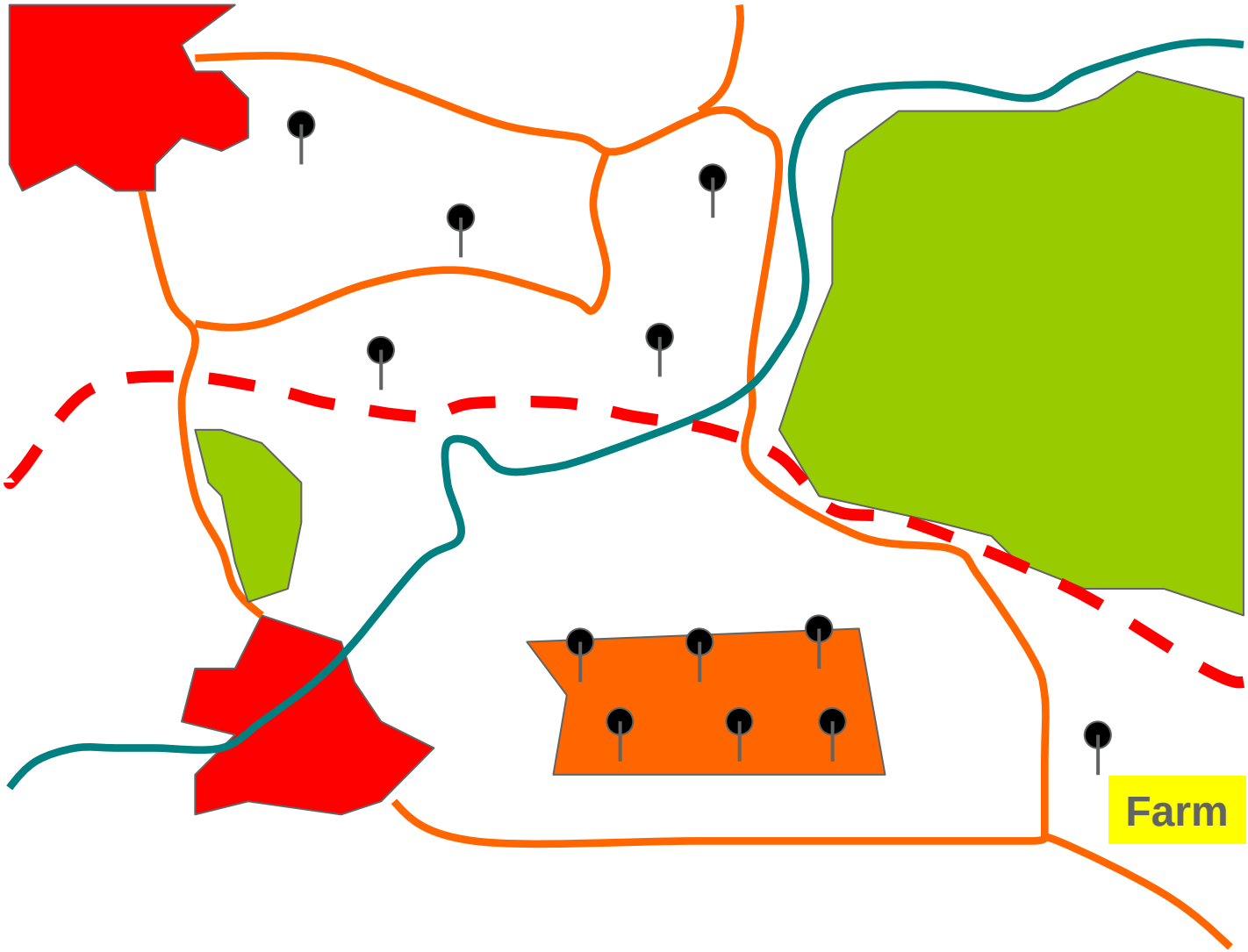
- Renewing the Regional Planning: Focus on the steering the development of windturbines within the district

- In addition to "hard exclusion criteria (eg distance to residential) also the impact on the landscape should be considered in advance.

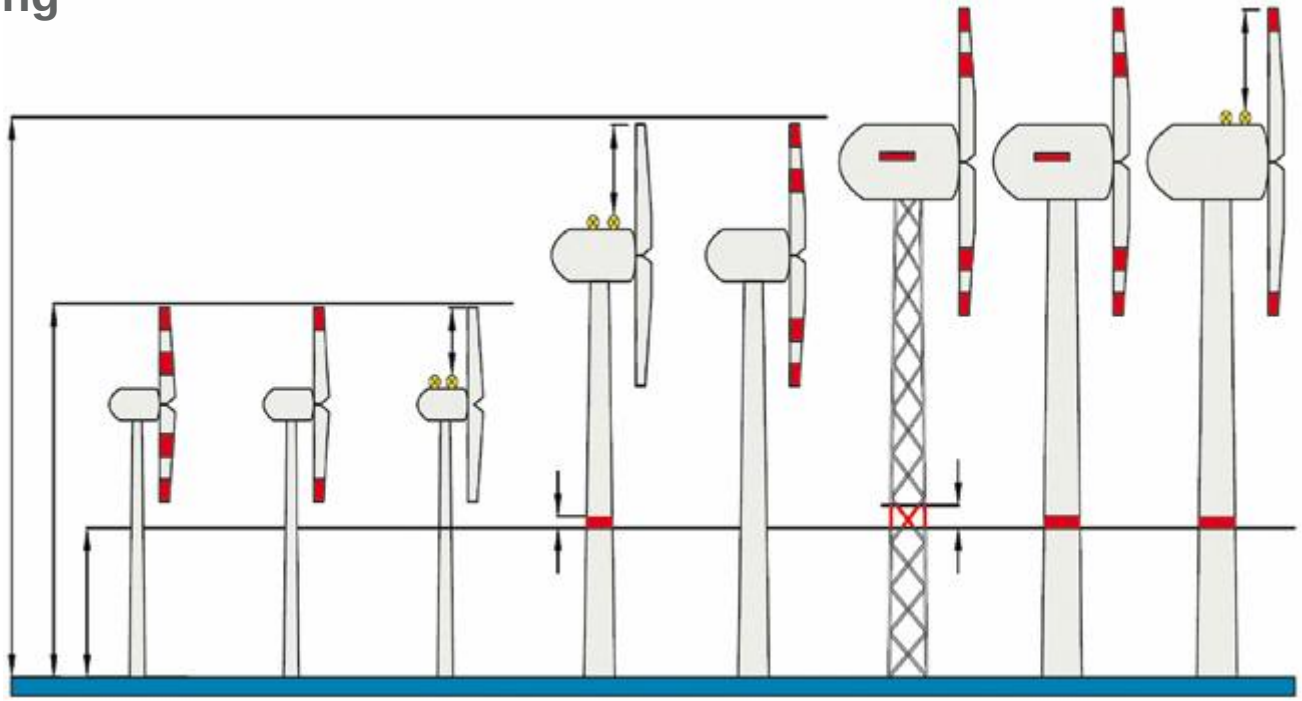
- Communication tool, to present the status quo und different scenarios





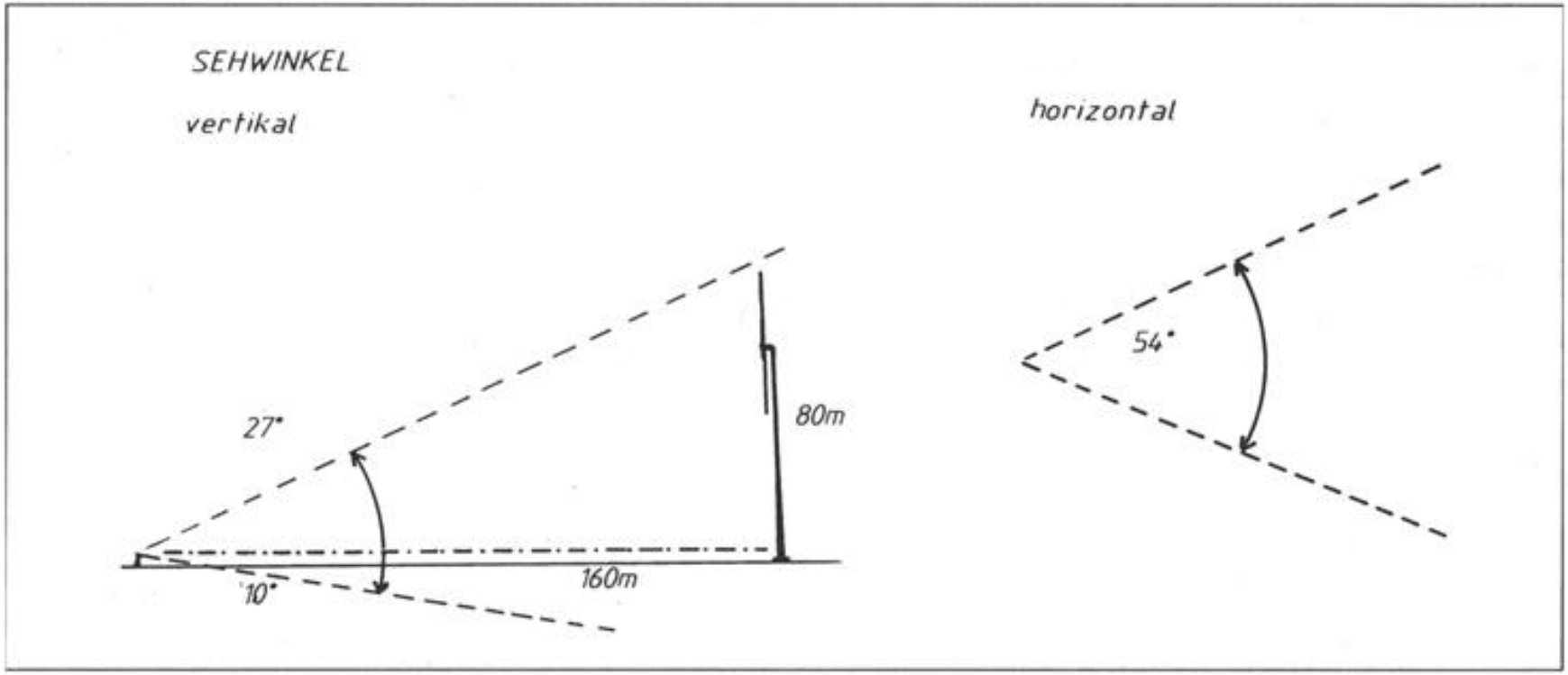

Farm

Lighting



Quelle: HIWUS-Studie 2008

The human eye



Source: Grundsätze zur Planung von Windkraftanlagen (Ergänzung des Gemeinsamen Runderlasses vom 4. Juli 1995), Gl.-Nr.: 2320.2 Fundstelle: Amtsbl. Schl.-H. vom 01.12.2003 S.893

Impact zone	Distance for a 150m WT	Distance for a 100m WT	Distance for a 80m WT	Description of the typical impact of the WT for the given distance
1	2	3	4	5
Close proximity	< 300 m	< 190 m	< 150 m	The distance is too small to allow views of the complete object; it can only be fully viewed by scanning.
I Foreground	300 m - 570 m	190 m - 400 m	150 m - 300 m	Object is conspicuous and captures the attention. WT fills half to all of the field of vision.
II Middle distance	570 m - 1.100 m	400 m - 800 m	300 m - 600 m	Full view, dominant; the complete outline of the WT can be seen in one view; it fills a quarter to half of the field of vision.
III Distant view	1.100 m – 2.800 m	800 m – 2.000 m	600 m – 1.500 m	The view is sub-dominant; WT fills 1/10 to 1/4 of the field of vision.
Far distance view	2.800 m - 40 km	2.000 m - 35 km	1.500 m - 30 km	Max. visibility zone. Only visible at max. distance in very good visibility and light conditions and if the tower is white.

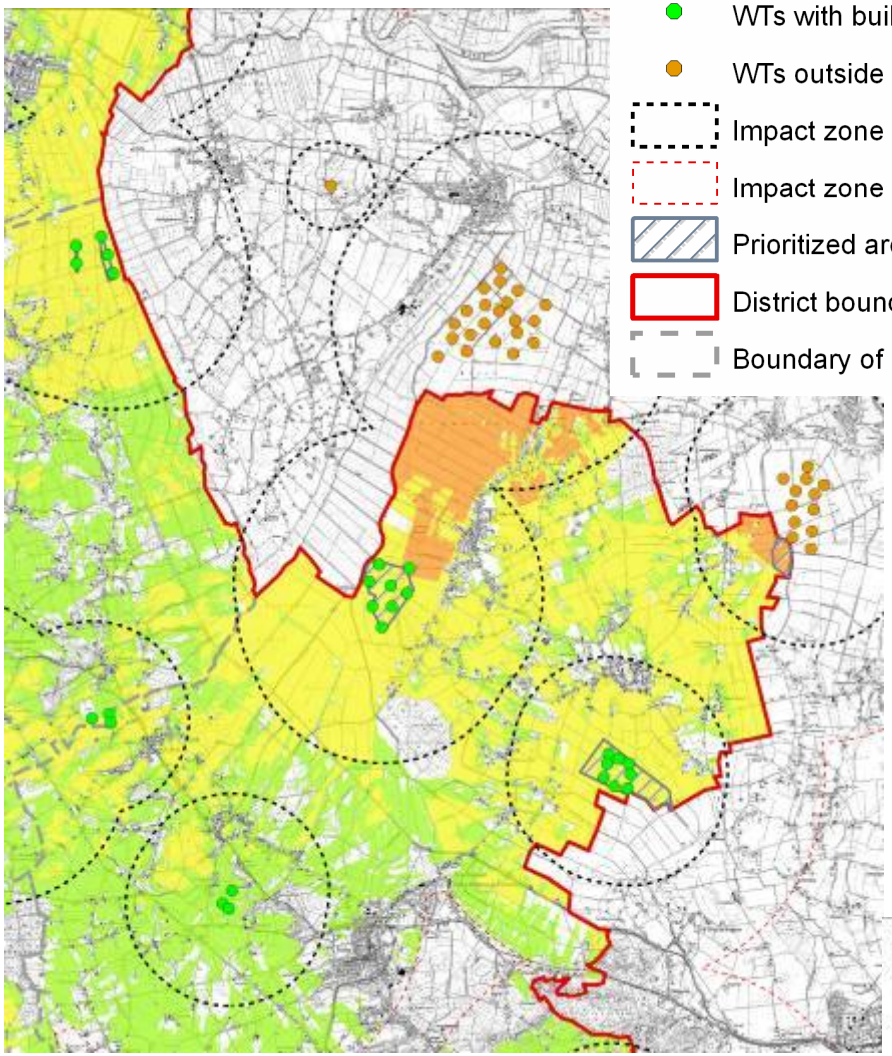
Source: Grundsätze zur Planung von Windkraftanlagen (Ergänzung des Gemeinsamen Runderlasses vom 4. Juli 1995), Gl.-Nr.: 2320.2 Fundstelle: Amtsbl. Schl.-H. vom 01.12.2003 S.893

Impact Analysis

Base for the impact analysis are following input variables

- impact zones / working scales
- digital terrain model
- visually effective surface coverage (digital surface model)
- height of the viewer

Impact zone	Weighting	Distance for WT height up to 180 m	Distance for WT height up to 150 m	Distance for WT height up to 100 m	Distance for WT height up to 80 m	Distance for WT height up to 50 m
Subdominant perception (Zone III)	2	3.600 m	2.800 m	2.000 m	1.500 m	900 m
Far distance view with factored-in perceptibility (double of Zone III)	1	7.200 m	5.600 m	4.000 m	3.000 m	1.800 m



- WTs with building permission granted
- WTs outside district boundary
- Impact zone III
- Impact zone 'Far distance view'
- Prioritized area for WTs
- District boundary
- Boundary of Municipalities

Impairment of the Landscape

- None to very minimal
- minimal
- significant
- high
- very high

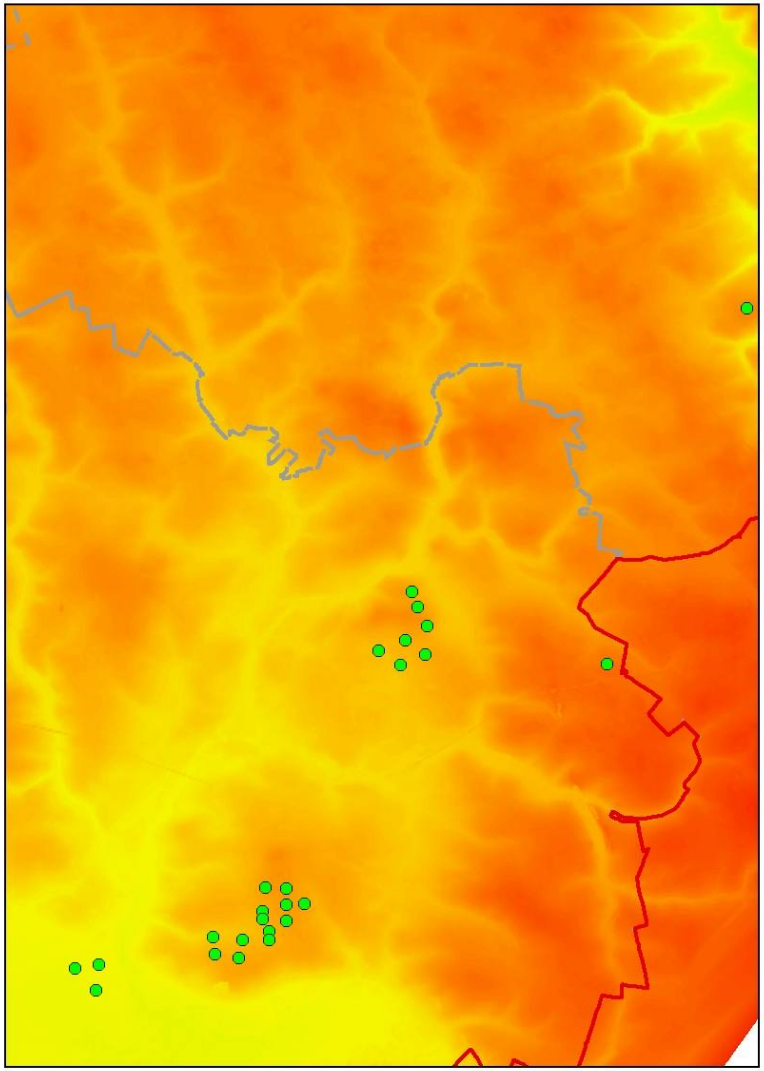
Quelle:
Auszug aus den Geobasisdaten
der Niedersächsischen
Vermessungs- und Katasterverwaltung, 2010

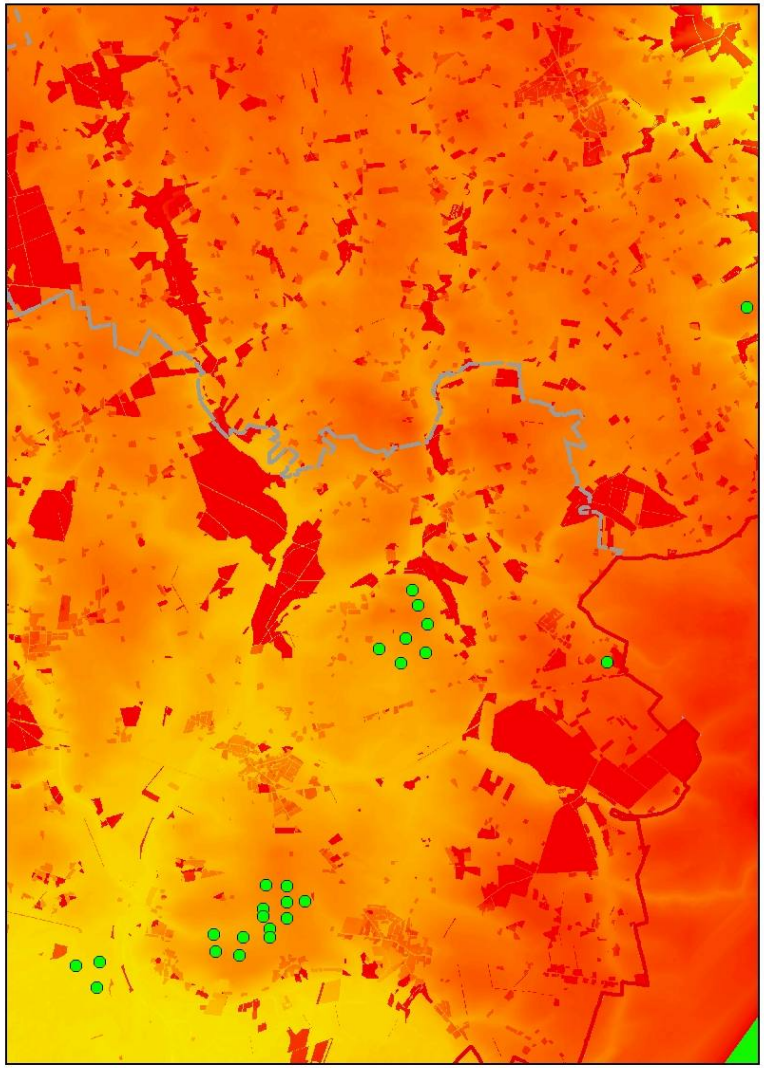
Geofachdaten

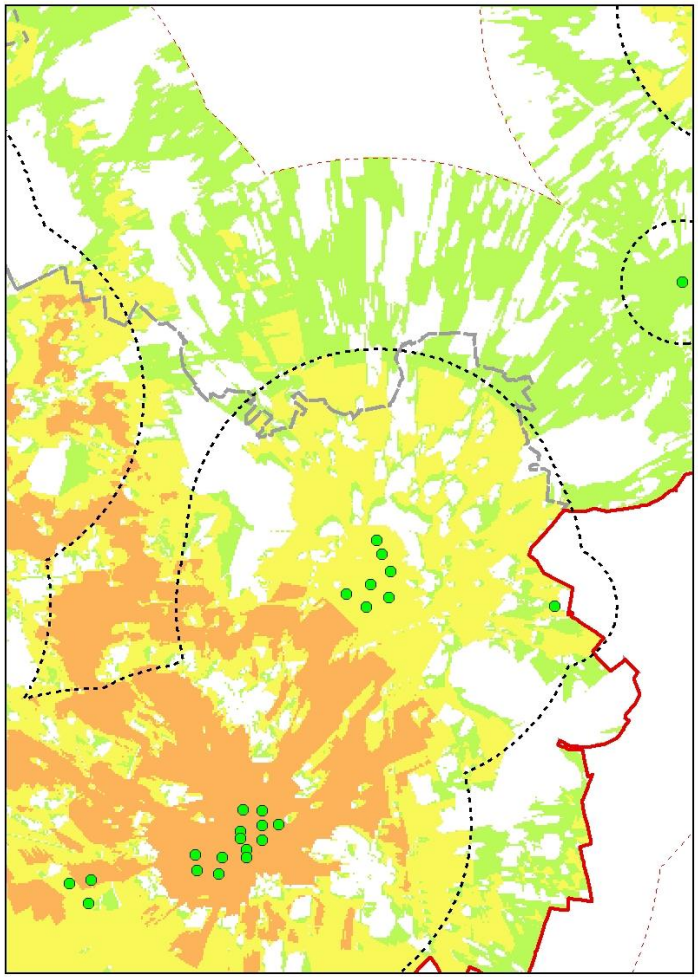
GLL

LGN

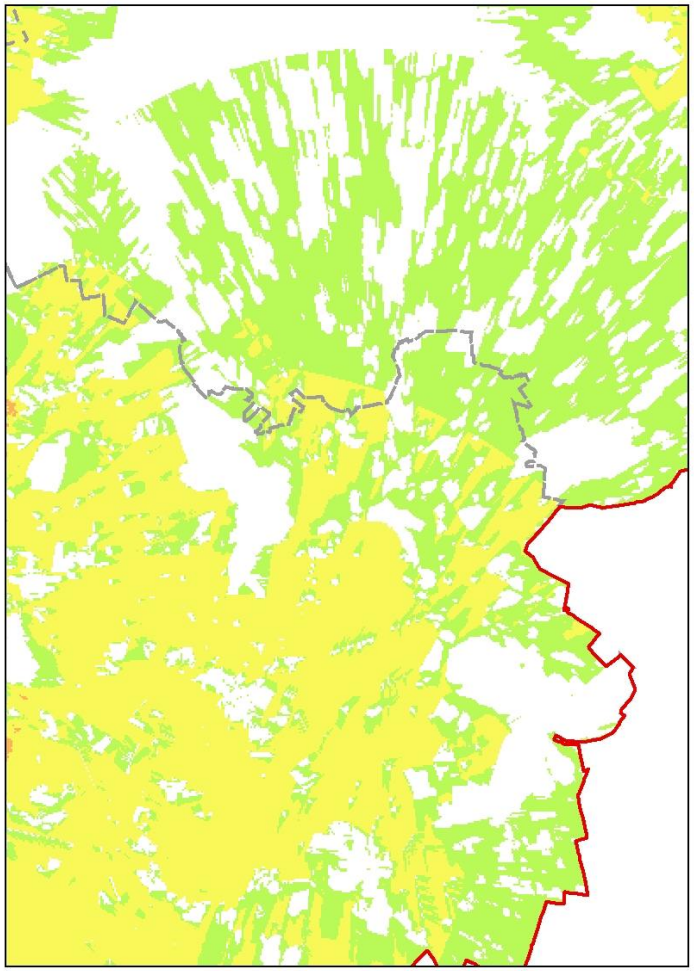
Landkreis Diepholz



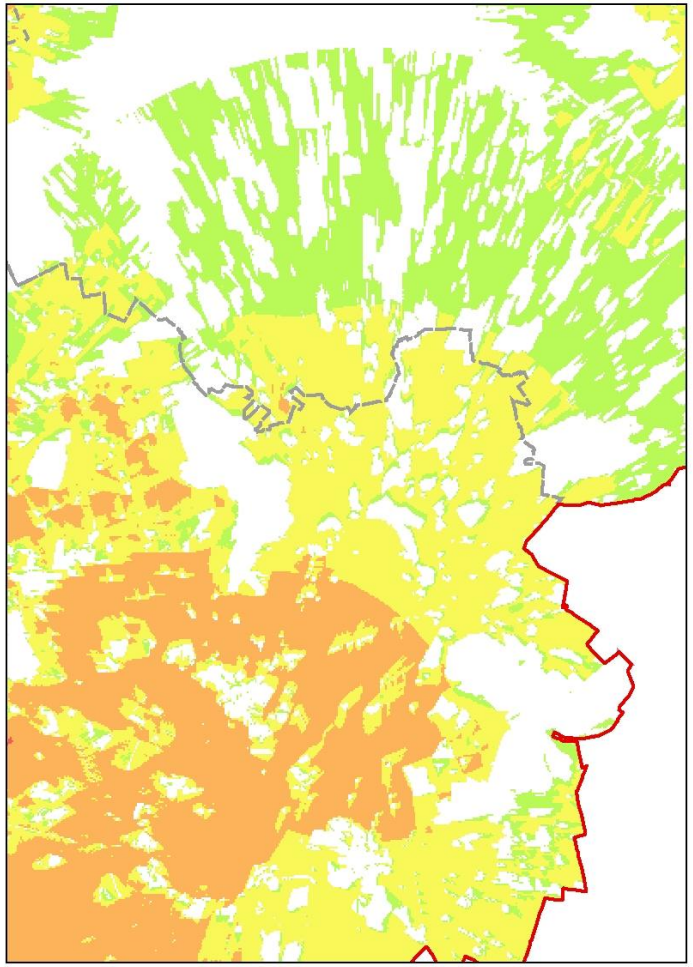




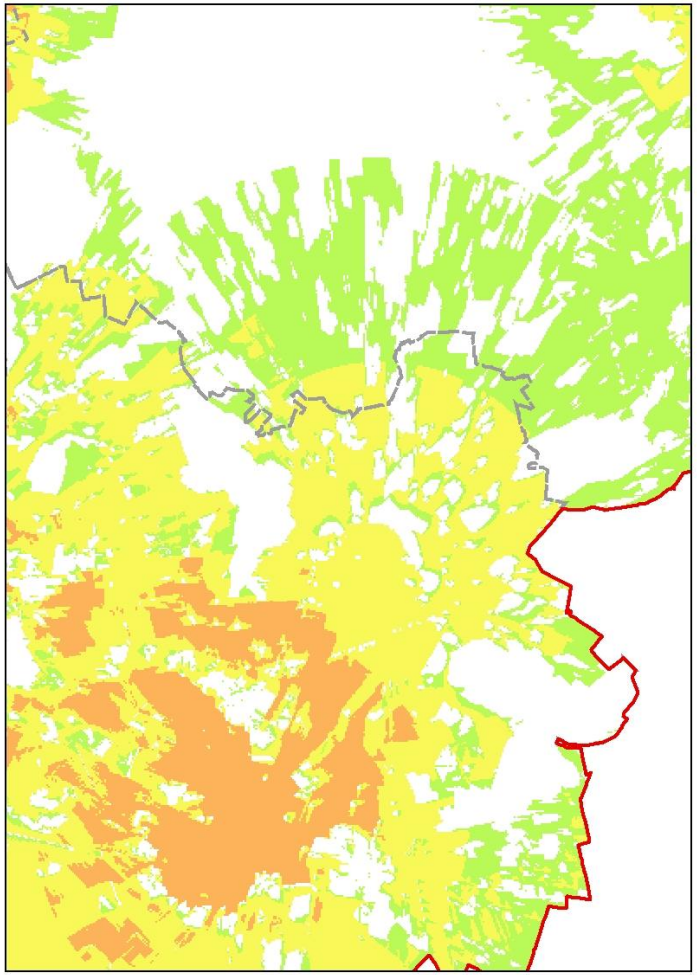
Status Quo



Development in current priority area



Potential development without steering



Vision 2020

With the help of impact analysis is the regional planning in a position to define landscape spaces in which **the impairment is very high** and also identify those in which there are **to date no or only minor impaired**.

A random check of the model in the field confirmed the results of the impact analysis **also on a very small scale**.

With little effort, it is possible to explore the effect of **different sceanrios** on the landscape.

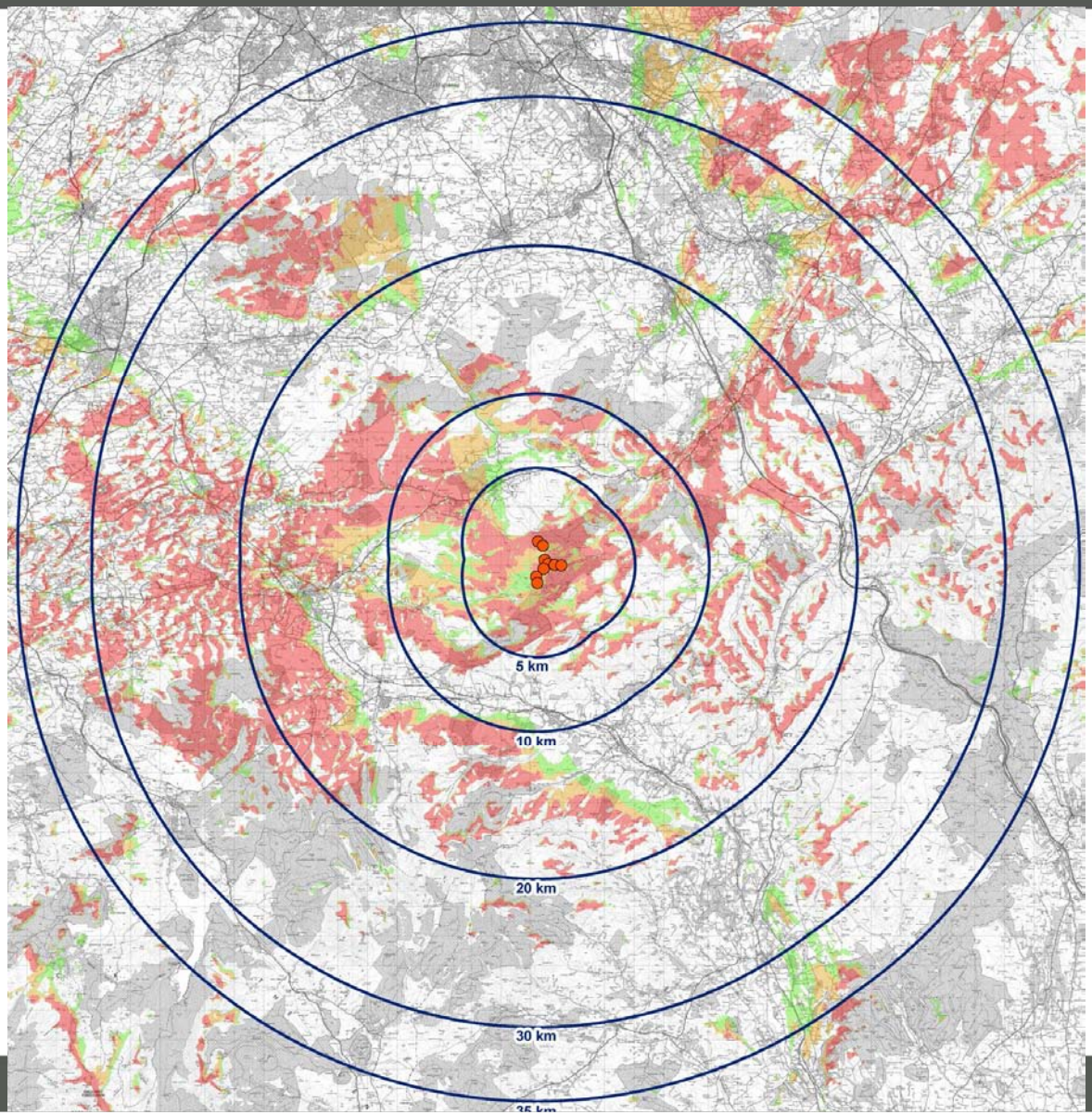
The authority of the District of Diepholz uses the tool not only for the regional planning **assessment of new sites**, but also for the visualization of impacts in the context of **policy discussions**.

Impact analysis is a FIRST step on the level of regional planning !

For more specific plannings more accurate techniques and methodological approaches should be used to assess the impact on the landscape well predicted but also to communicate appropriately, such as:

- Cumulative Views

- Visualizations, animations



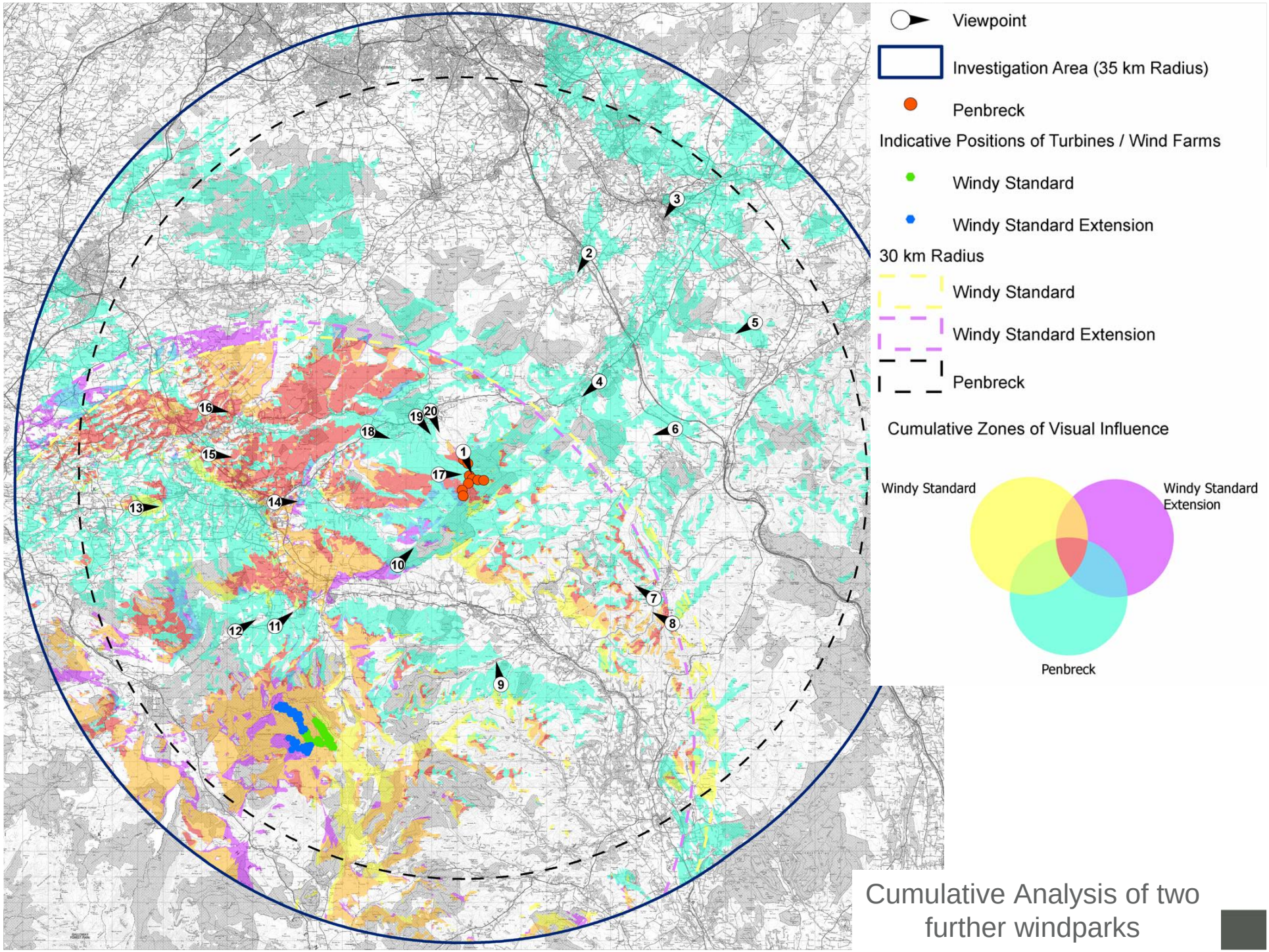
Turbine

Zone of Theoretical Visibility
for Blade Tip Height (125m)
Number of visible Turbines

1-3

4-6

7-9



Cumulative Analysis of two further windparks

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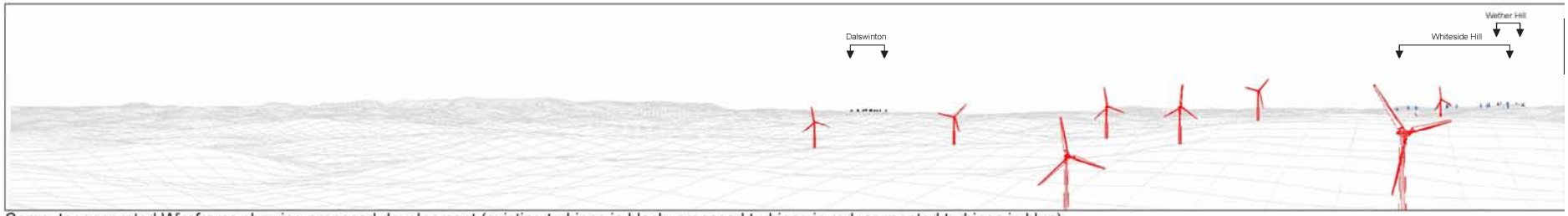
Existing View



Computer generated Wireframe showing proposed development (existing turbines in black, proposed turbines in red, consented turbines in blue)

Figures by Planungsgruppe Grün (Bremen)

Thank you for your attention!

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