

# Monitoring the effects of far-shore wind farms on the seascape

Socio-landscape study into the perception of far-shore wind farms in the Belgian part of the North Sea

commissioned by BMM/MUMM

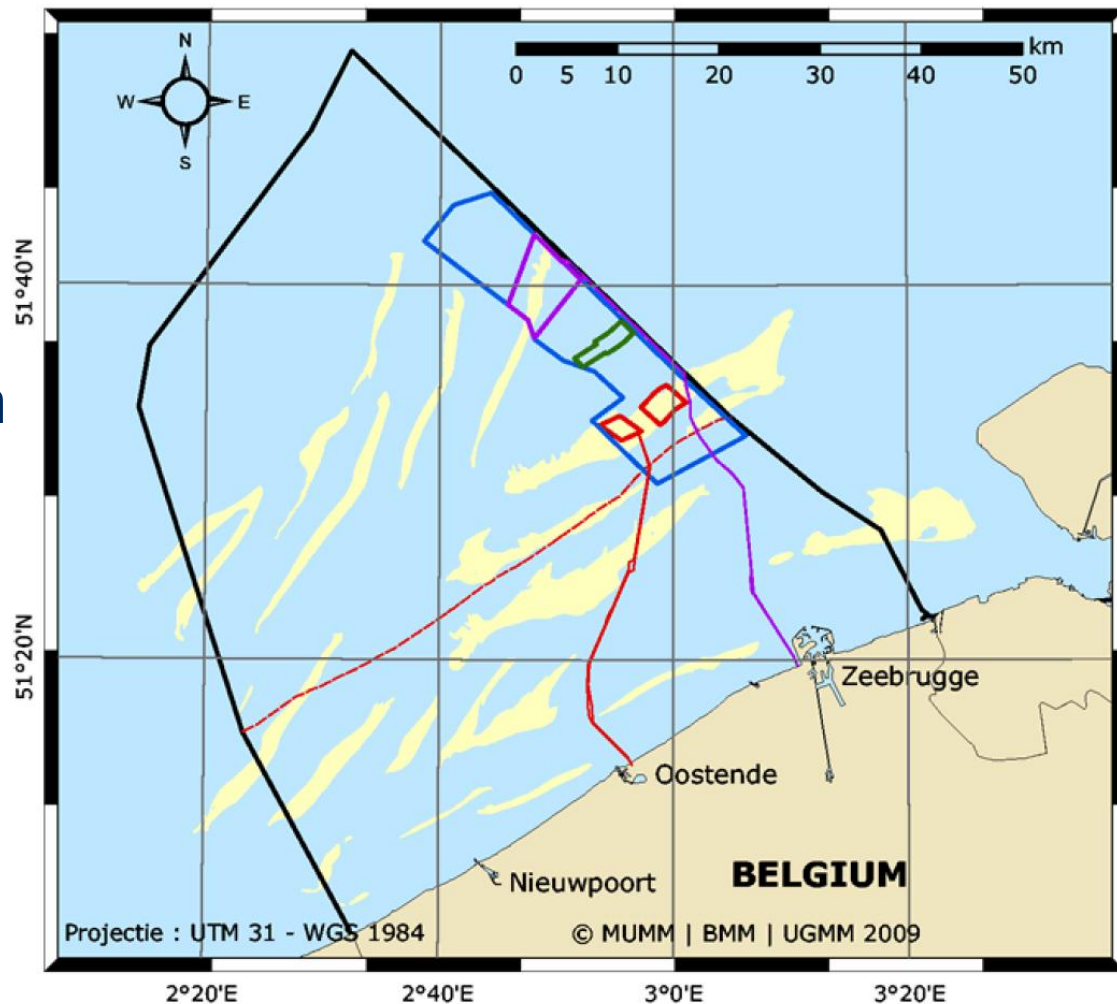
February 18, 2011 // Rik Houthaeve – An Vanhulle

# Study framework

- monitoring of environmental effects of several licensed wind farms and their cumulative effects (mandate of BMM/MUMM)
- 2 parts:
  - Landscape simulation & photographic study
  - Socio-landscape study

# Background

- Licensed wind farm projects in June 2009:
  - C-Power
  - Belwind
  - Eldepasco



# Landscape simulation & photographic study

## ■ PART 1: photorealistic simulations

- Goal: Estimating the visibility of the far shore wind farms, from land and on sea
- Method: Assembling wind farm simulations into a neutral picture of a seaview
- Fictional point of views:
  - Nieuwpoort, Ostend, Blankenberge, 2 levels
  - Point of views at sea, 2-2,5 km off the wind farms
- Different settings (1 or more wind farm projects + setting with complete occupation of legal zone with wind farms)

# Landscape simulation & photographic study

- PART 2: photomontage
  - Real viewpoints in Nieuwpoort, Ostend & Blankenberge
  - 2 levels: promenade (dyke) & point as high as possible
  - Different settings (1 or more wind farm projects + setting with complete occupation of legal zone with wind farms)
  - Photos were taken in optimal weather conditions and with maximal visibility



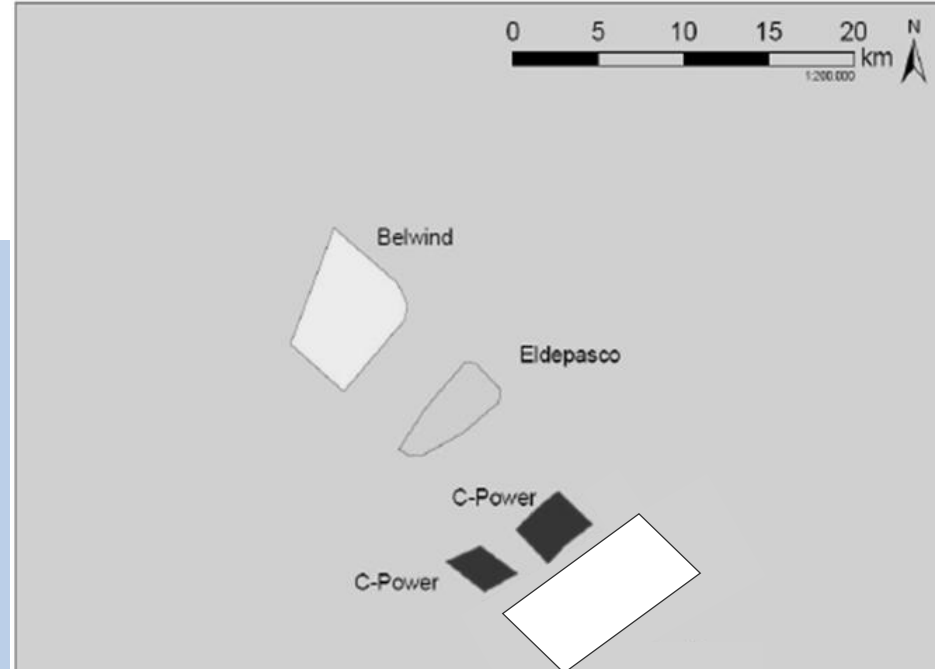




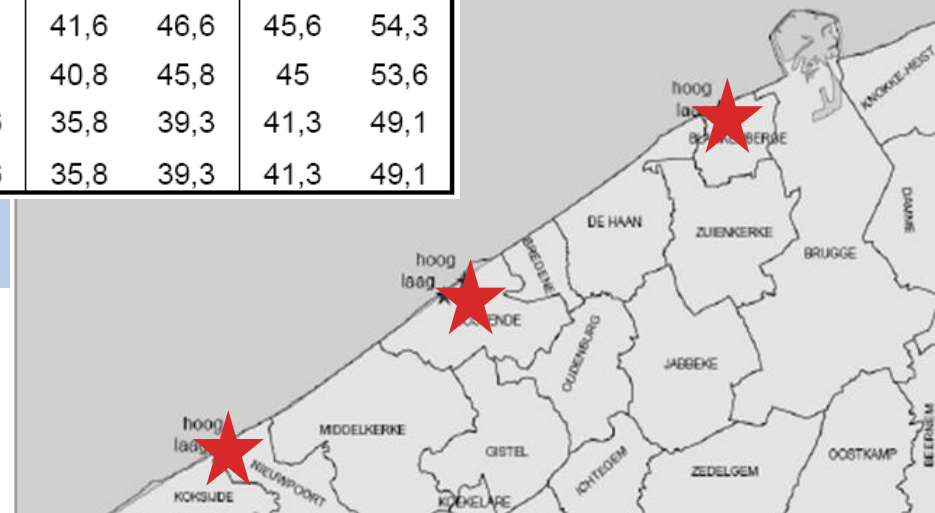




- Points of view & distance to the wind farms



Afstand windturbines van windpark tot fotopunt (km) afgerond								
Fotopunt	Zone voor C-Power		C-power		Eldepasco		Belwind	
	min	max	min	max	min	max	min	max
Nieuwpoort dijk	43,4	53,1	45,6	52,3	51,7	57,2	54,5	63
Nieuwpoort hoog	42,4	52,1	44,8	51,3	50,9	56,4	53,8	62,4
Oostende dijk	30,6	40,3	34,1	40	41,6	46,6	45,6	54,3
Oostende hoog	29,6	39,2	33,3	39	40,8	45,8	45	53,6
Blankenberge dijk	22,2	29,9	27,3	30,6	35,8	39,3	41,3	49,1
Blankenberge hoog	22,2	29,9	27,3	30,6	35,8	39,3	41,3	49,1



Fotopunt	Park	Positie aan de horizon (graden t.o. Noorden)		Horizontale breedte van het park (graden) (% van 180° zeezicht)	
		West	Oost		
Nieuwpoort dijk	Belwind	4,5	10,6	6,1	3%
Nieuwpoort dijk	Eldepasco	11,9	17,0	5,1	3%
Nieuwpoort dijk	C-Power	17,0	25,2	8,2	5%
Nieuwpoort dijk	Zone voor C-Power	20,8	32,6	11,8	7%
	<b>ALLE parken</b>	<b>4,5</b>	<b>32,6</b>	<b>28,1</b>	<b>16%</b>
Nieuwpoort hoog	Belwind	3,7	9,9	6,2	3%
Nieuwpoort hoog	Eldepasco	11,1	16,3	5,2	3%
Nieuwpoort hoog	C-Power	16,1	24,6	8,4	5%
Nieuwpoort hoog	Zone voor C-Power	20,0	32,1	12,2	7%
	<b>ALLE parken</b>	<b>3,7</b>	<b>32,1</b>	<b>28,5</b>	<b>16%</b>
Oostende dijk	Belwind	349,5	357,3	7,9	4%
Oostende dijk	Eldepasco	356,4	4,0	7,6	4%
Oostende dijk	C-Power	0,4	12,8	12,4	7%
Oostende dijk	Zone voor C-Power	4,6	22,8	18,2	10%
	<b>ALLE parken</b>	<b>349,5</b>	<b>22,8</b>	<b>33,3</b>	<b>19%</b>
Oostende hoog	Belwind	347,8	355,9	8,0	4%
Oostende hoog	Eldepasco	354,6	2,5	7,8	4%
Oostende hoog	C-Power	358,4	11,3	12,9	7%
Oostende hoog	Zone voor C-Power	2,5	21,5	19,0	11%
	<b>ALLE parken</b>	<b>347,8</b>	<b>21,5</b>	<b>33,6</b>	<b>19%</b>
Blankenberge dijk	Belwind	326,2	334,9	8,7	5%
Blankenberge dijk	Eldepasco	329,3	339,5	10,2	6%
Blankenberge dijk	C-Power	327,8	344,6	16,8	9%
Blankenberge dijk	Zone voor C-Power	329,5	356,3	26,8	15%
	<b>ALLE parken</b>	<b>326,2</b>	<b>356,3</b>	<b>30,1</b>	<b>17%</b>
Blankenberge hoog	Belwind	326,1	334,8	8,7	5%
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Blankenberge hoog	Zone voor C-Power	329,3	356,0	26,7	15%
	<b>ALLE parken</b>	<b>326,1</b>	<b>356,0</b>	<b>30,0</b>	<b>17%</b>

# Landscape simulation & photographic study

- Visibility of the wind farms depends on:
  - ~ horizontal horizon occupation (determined by viewing angle)
  - ~ vertical horizon occupation (determined by distance to the parks, curvature of the earth & rules of perspective: image reduction)
  - ~ weather conditions: seasonal differences / horizon fuzziness
  - ~ turbine characteristics: color (contrast), height, shape,...

# Socio-landscape study

- 4 steps:
  - Theoretical study
  - Setting up the inquiry
  - Inquiry
  - Report with recommendations

# Socio-landscape study: methodology

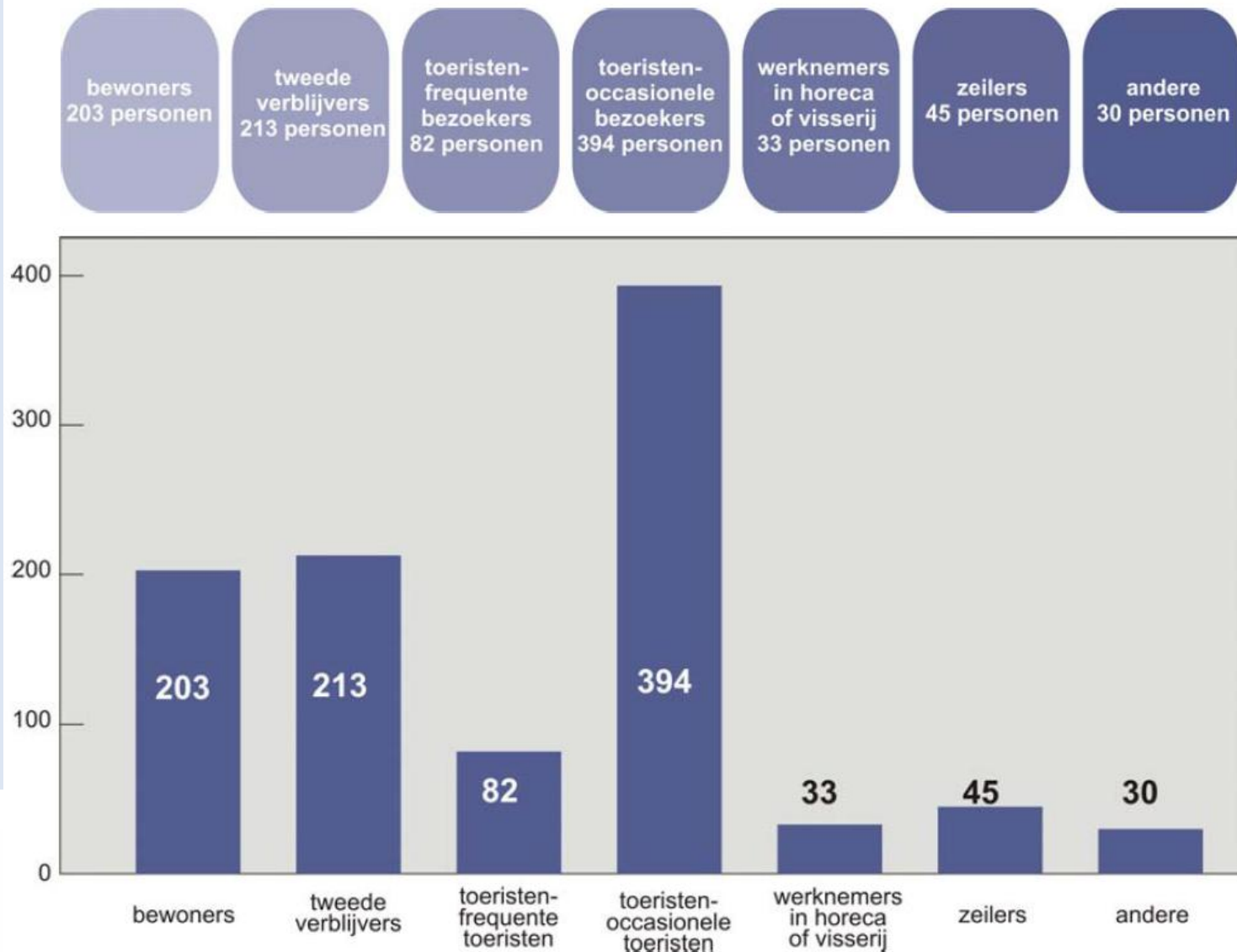
- Face to face paper-assisted personal interviewing
- Interviews with seaview, first 6 windturbines were already built (C-Power)
- 1.000 adults from different categories:
  - Local inhabitants (235)
  - People not living, but working at the coastside (mainly in restaurants/cafés) (42)
  - Second residents (222)
  - Day tourists (257)
  - Long stay tourists (244)
  - Sailors (45)

# Socio-landscape study: methodology

- Based on a previous study from 2002
- Questionnaire built up from general questions about the coast to specific questions about the wind farms
- Interviews taken in summer of 2009, in 7 different coastal towns, on the promenade
- Use of seaview + photorealistic simulations
- Weather conditions & visibility were noted by interviewers



# Grouping of respondents

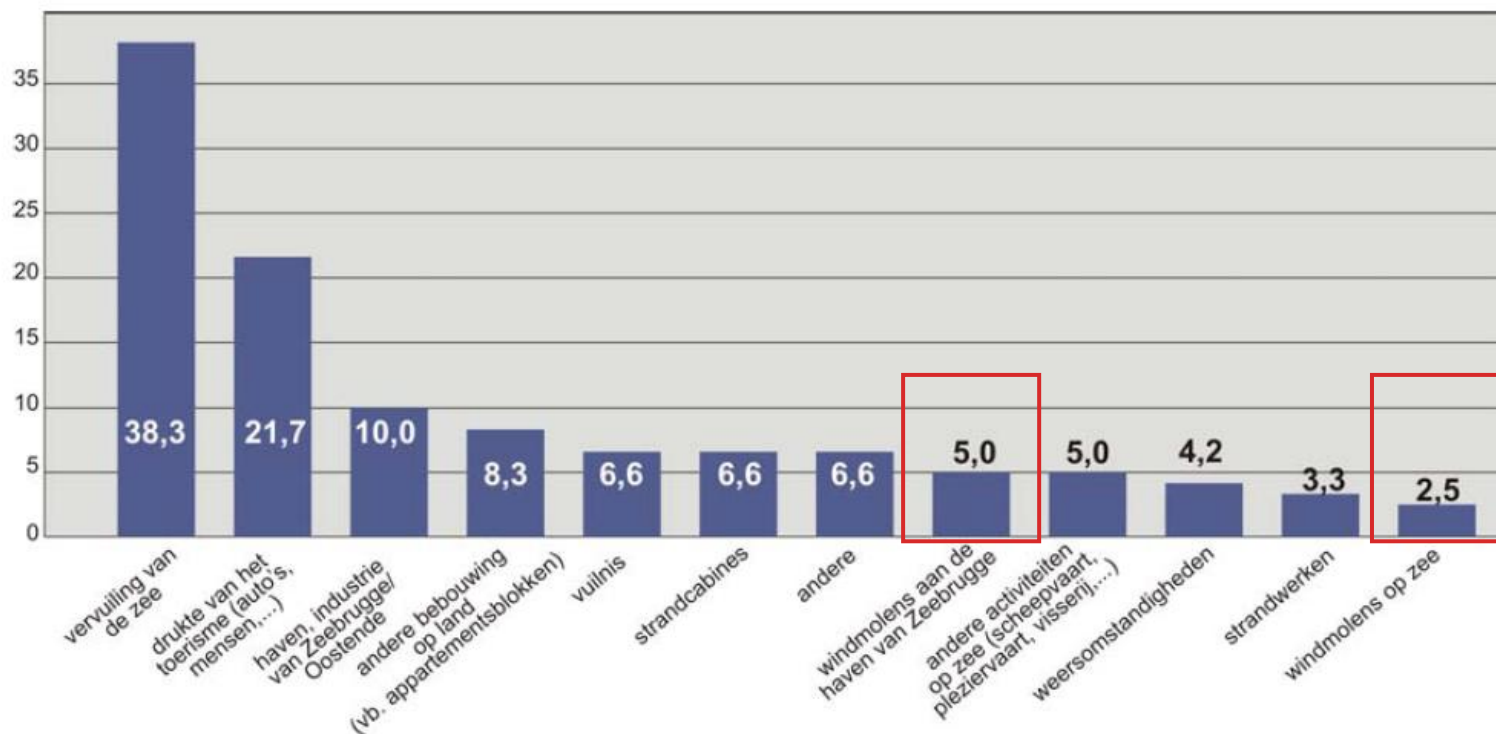


# General perception & appreciation of the coast

Most appreciated aspects (of 13 choices):

1. The beach, sun and sea (tanning and swimming): 49,3%
2. Walking along the seaside, in dunes or on the dike, getting some fresh air: 43,0%
3. The cosiness and holiday atmosphere: 35,8%
4. Nature, clean and fresh air (dunes, birds and nature reserves): 33,9%
5. The repose and quietude: 28,8%
6. The grandiose landscape and views, the sea view: 25,8%

# General perception & appreciation of the coast: elements of disturbance in the current seascape



Figuur 8: Storende elementen in het huidige zeelandschap, in % van het aantal mensen dat iets storends vindt aan het huidige zeelandschap (120 respondenten), Grontmij-enquête 2009

# General perception & appreciation of the coast



# Ideas about wind energy

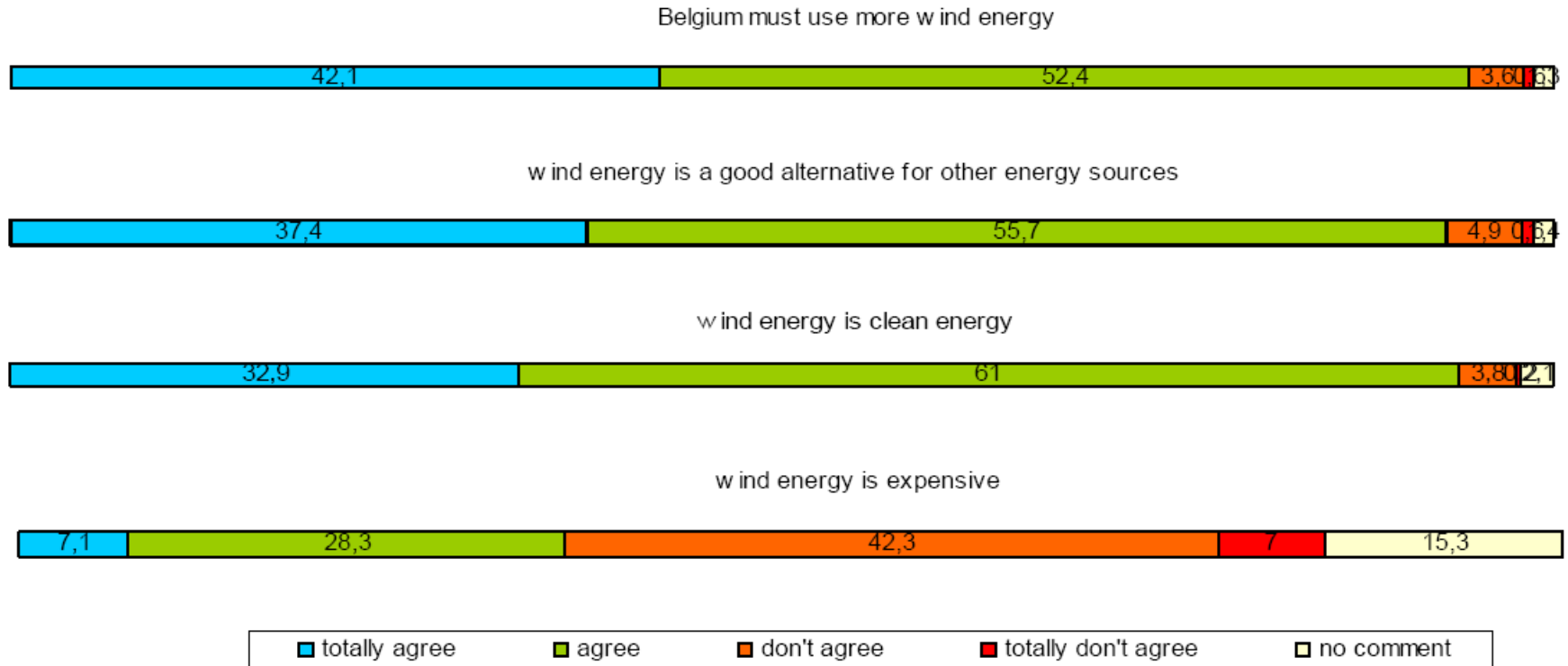


Figure 2. Agreement / disagreement with the statements on wind energy in general, survey 2009 (in %)

# Ideas about wind energy

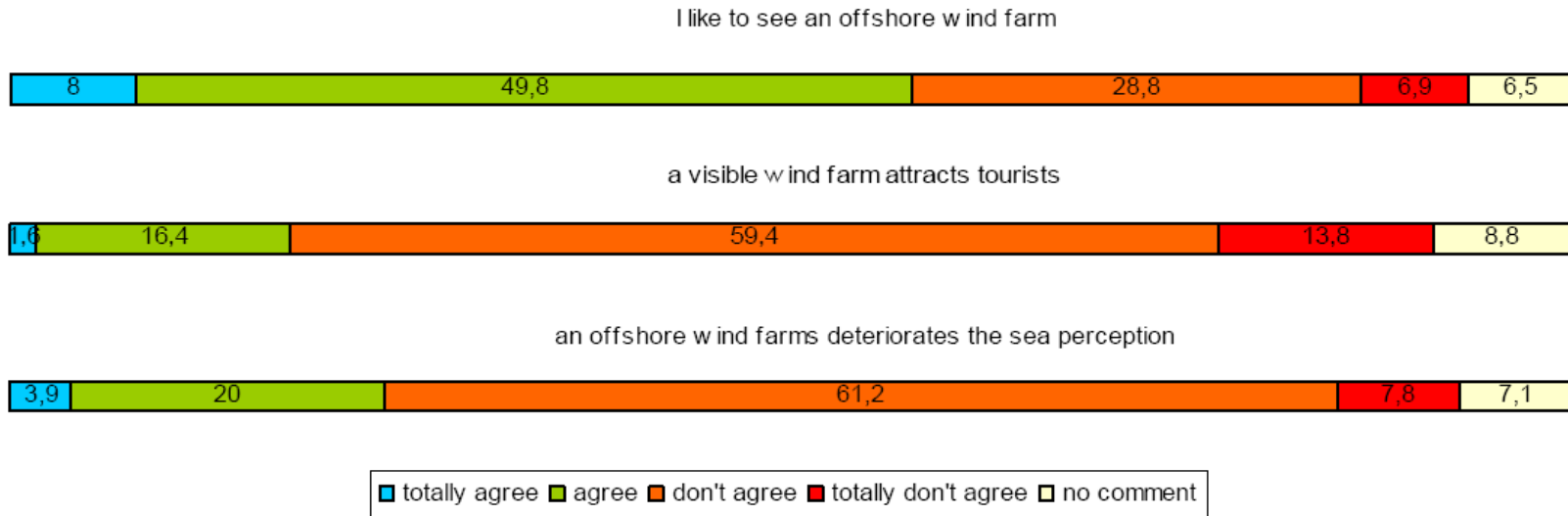
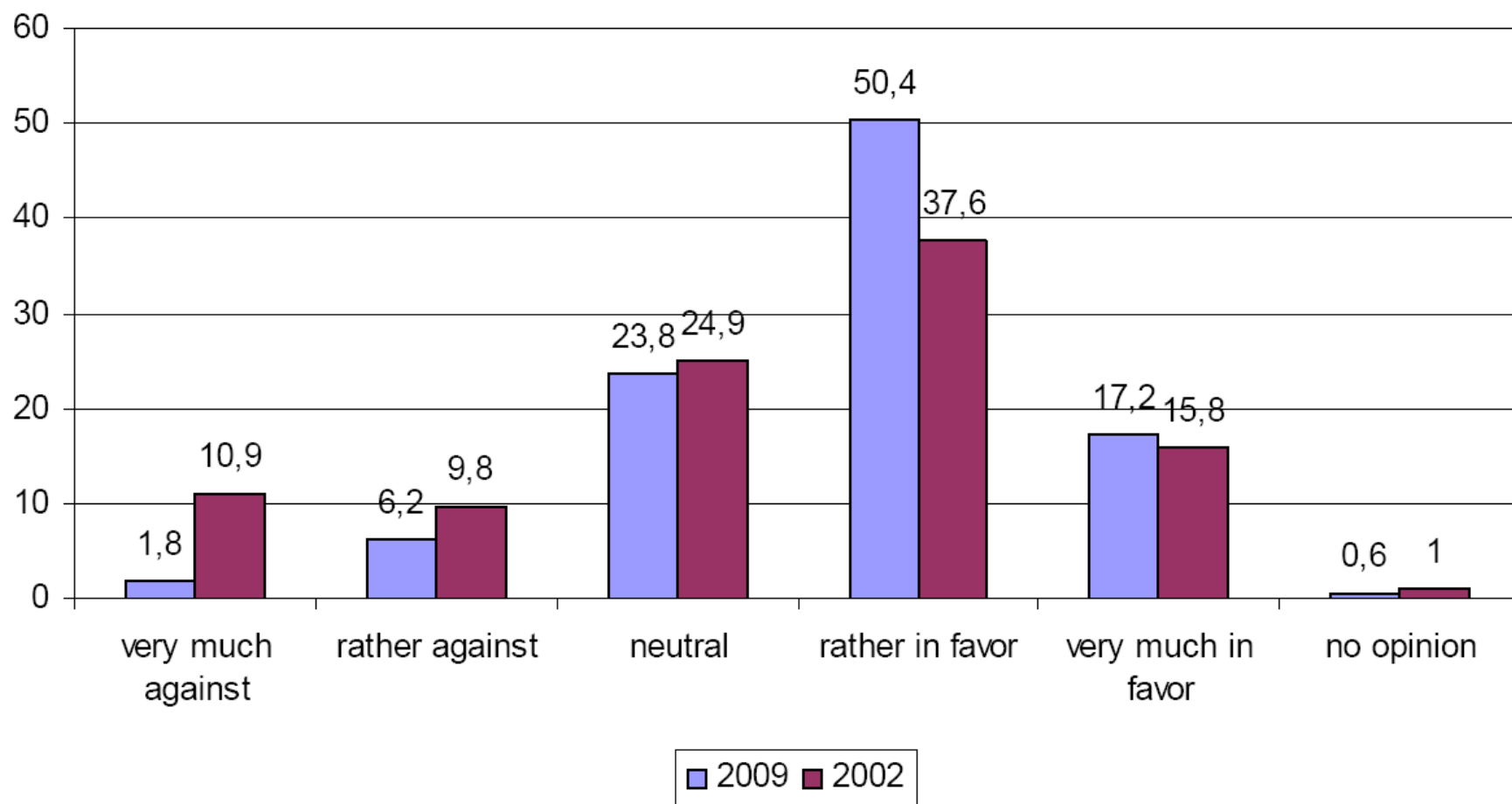


Figure 5. People's opinion on the view of an offshore wind farm, survey 2009 (in %)

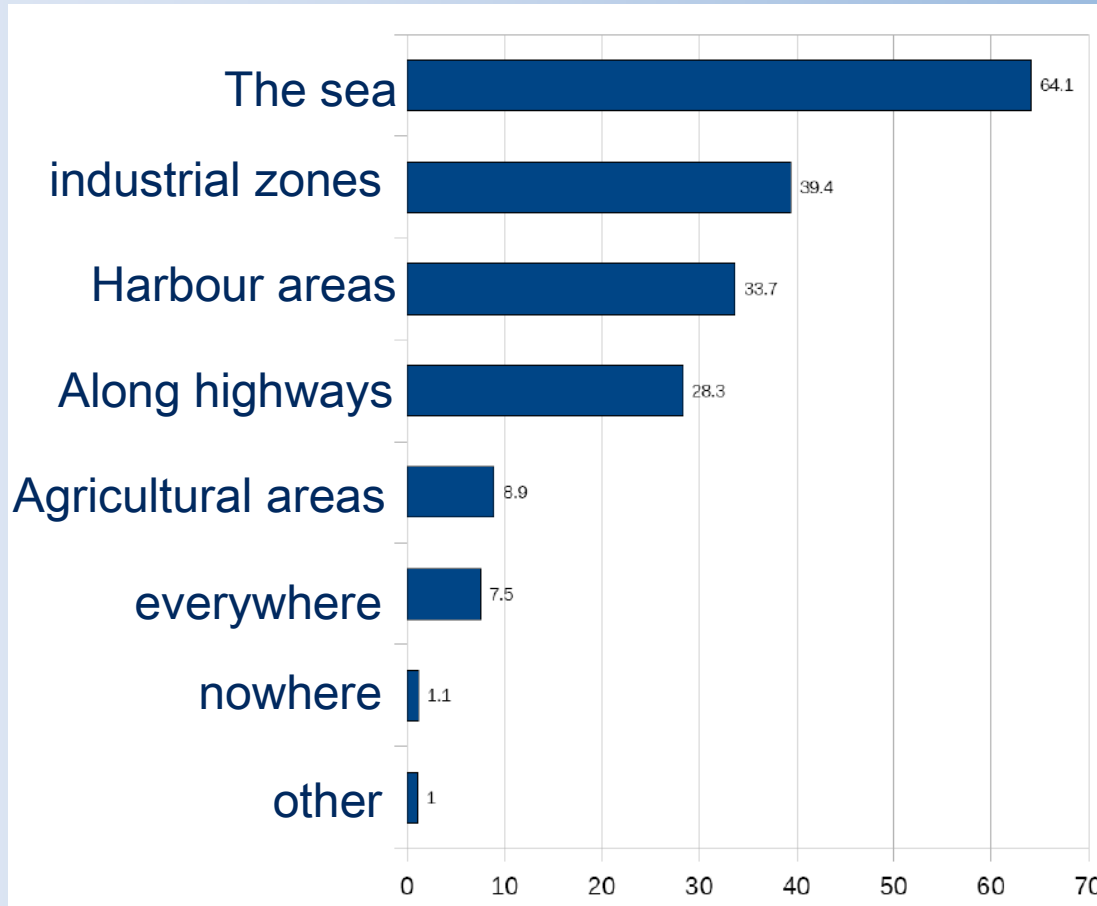
+10% in favor icw 2002  
Decline of opponents icw 2002



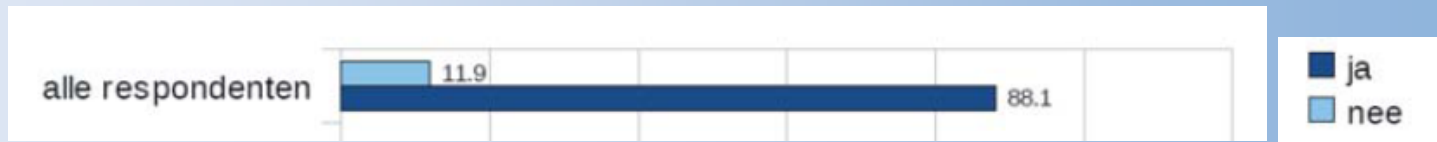
# Opinion on the construction of offshore wind farms



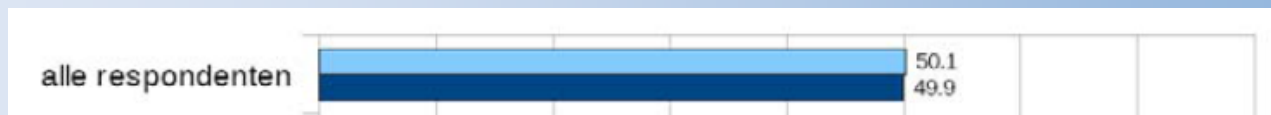
# The best place to construct a wind farm



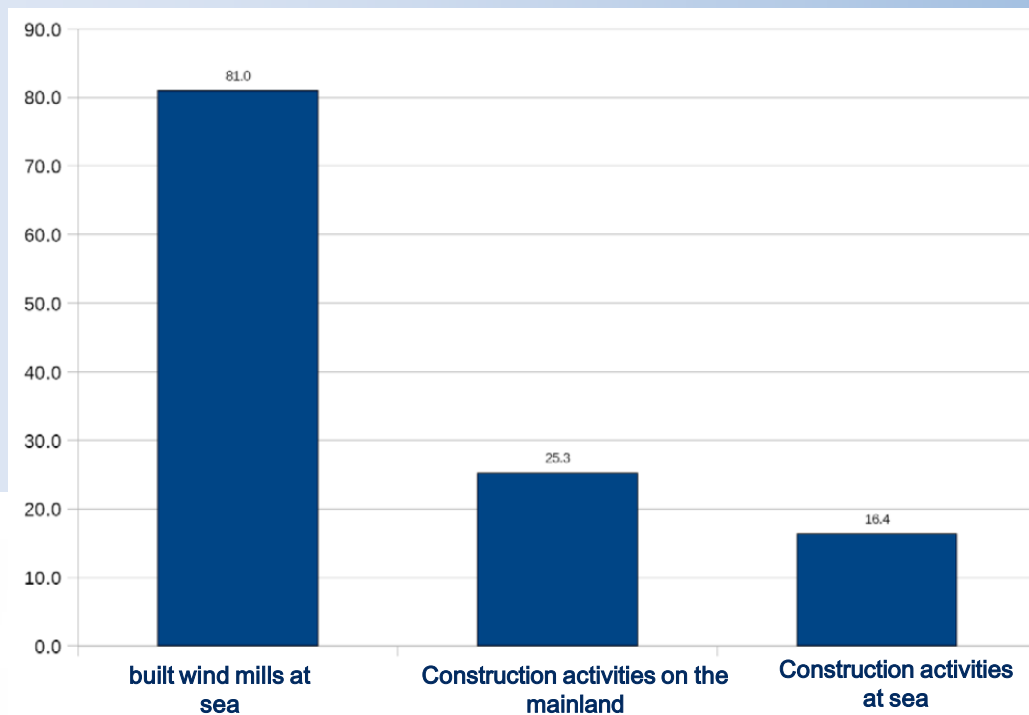
# Perception of first constructed wind mills



*Knowledge of the fact that wind farms are being constructed at sea*



*Own experience with construction activities or with the wind mills themselves*

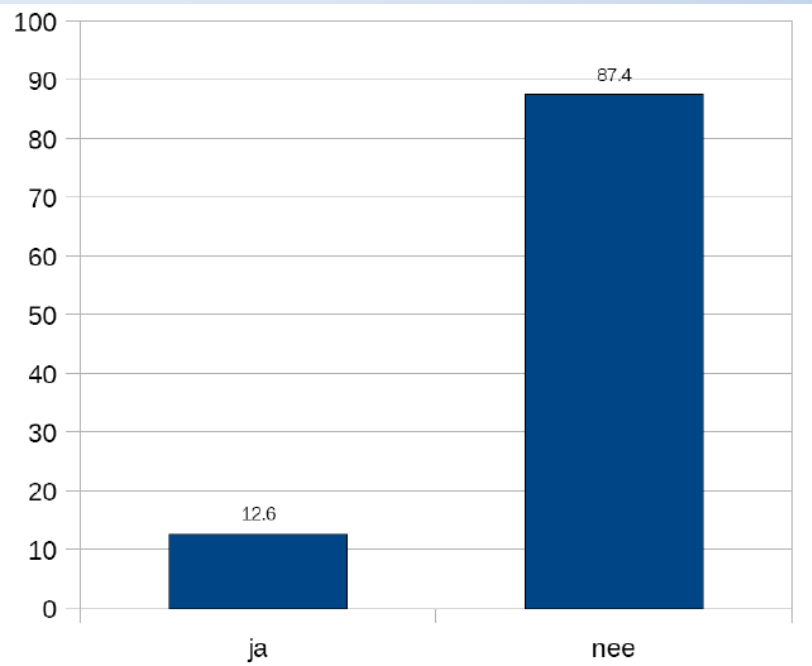


planning connecting  
respecting  
the future

# Perception of first constructed wind mills

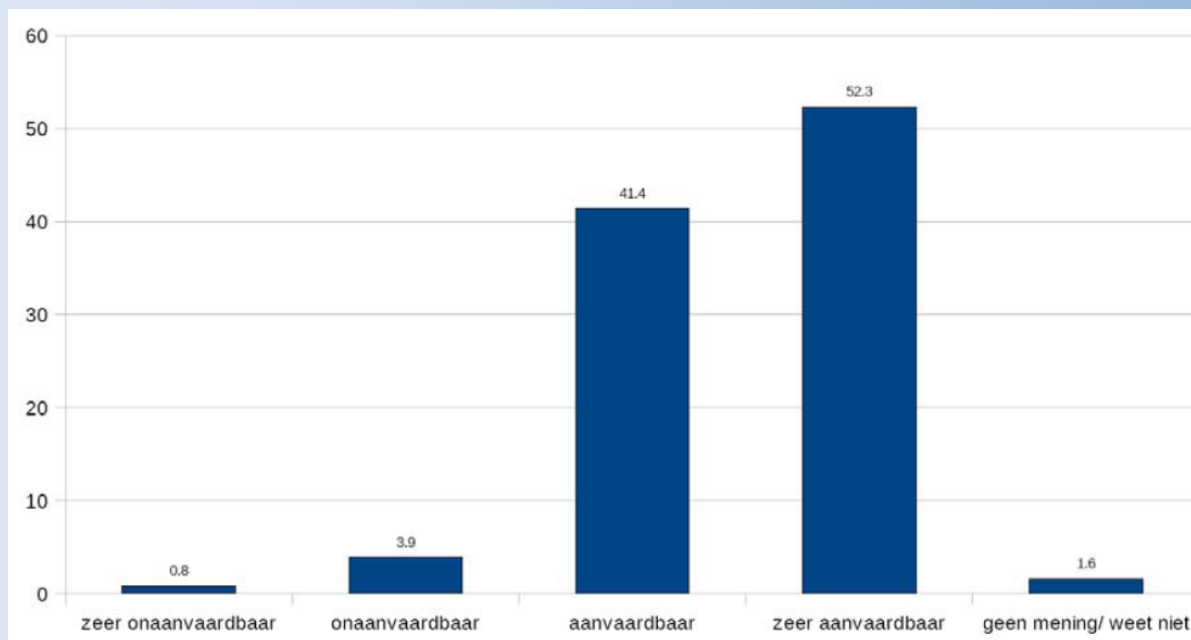
## People who saw the wind mills:

- Were interviewed on locations with broad viewing angles towards the turbines & within viewing distance
- Were interviewed in sunny or cloudy weather conditions, with no rain
- Were interviewed with optimal *or* fuzzy visibility



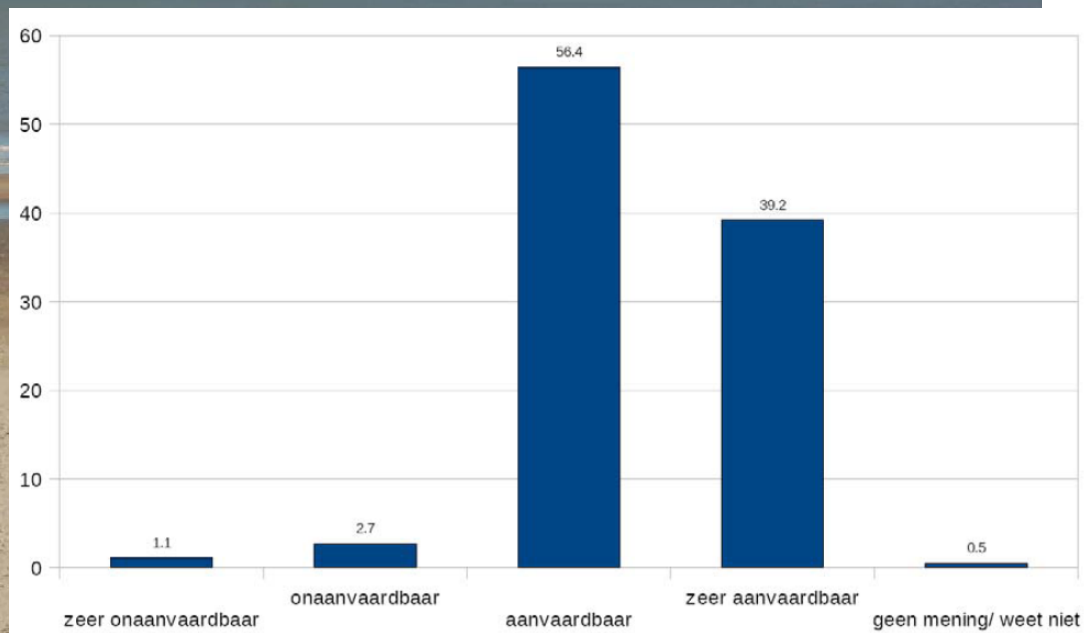
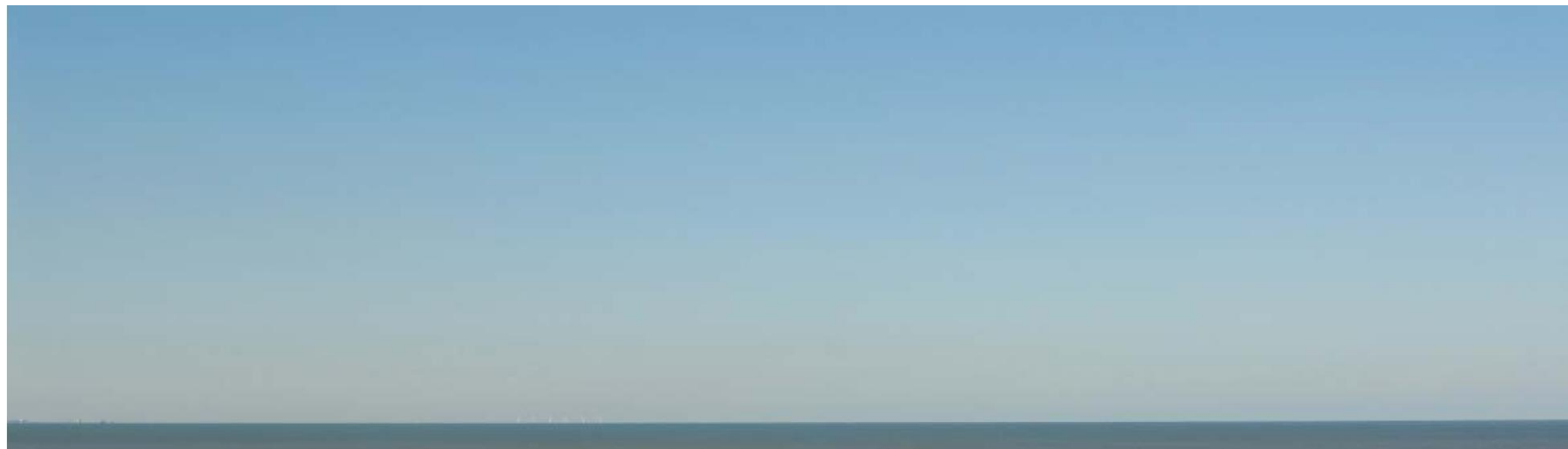
*People who see (a part of) the C-Power turbines during the interview*

# Perception of first constructed wind mills



*Acceptance of the real view on (part of) the six C-Power turbines during the interview*

# Perception of first constructed wind mills

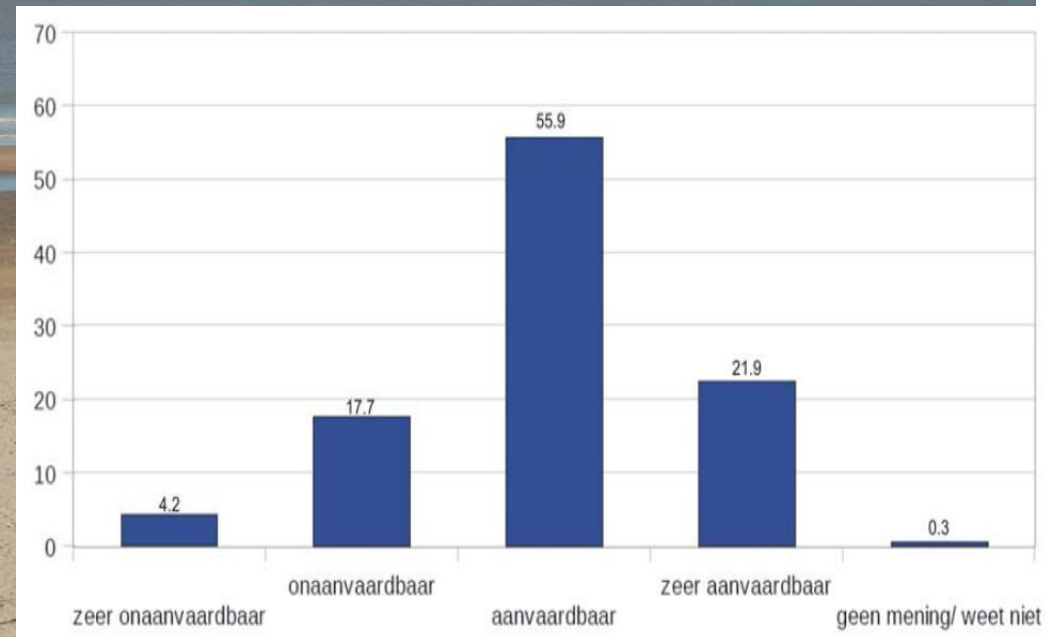


*Acceptance of simulation of the first six C-Power turbines*



# Perception, impact & acceptance of future scenarios

1/ three licensed projects



# Perception, impact & acceptance of future scenarios

1/ three licensed projects

atmospheric

beautiful

wasted/affected

unique

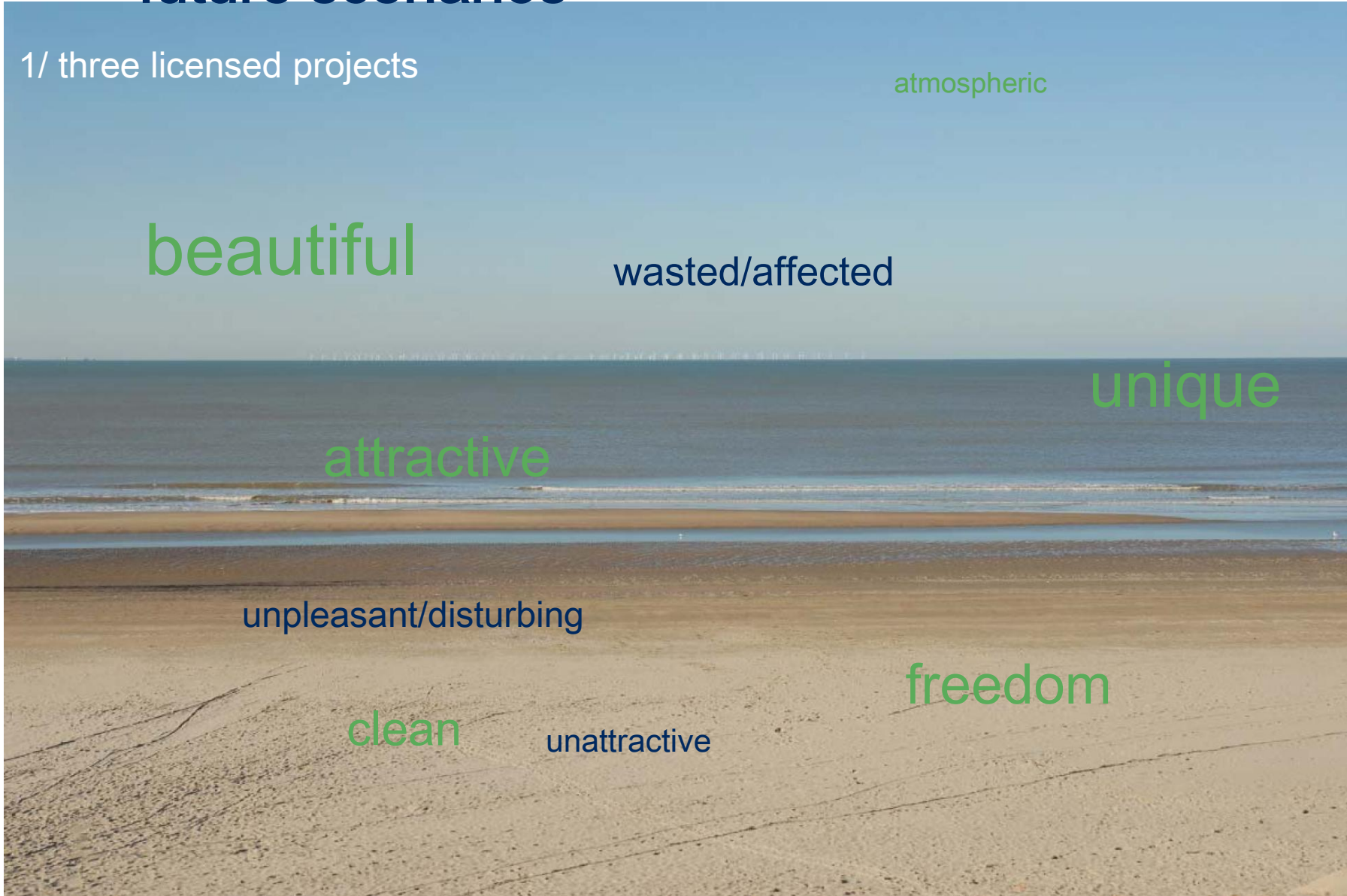
attractive

unpleasant/disturbing

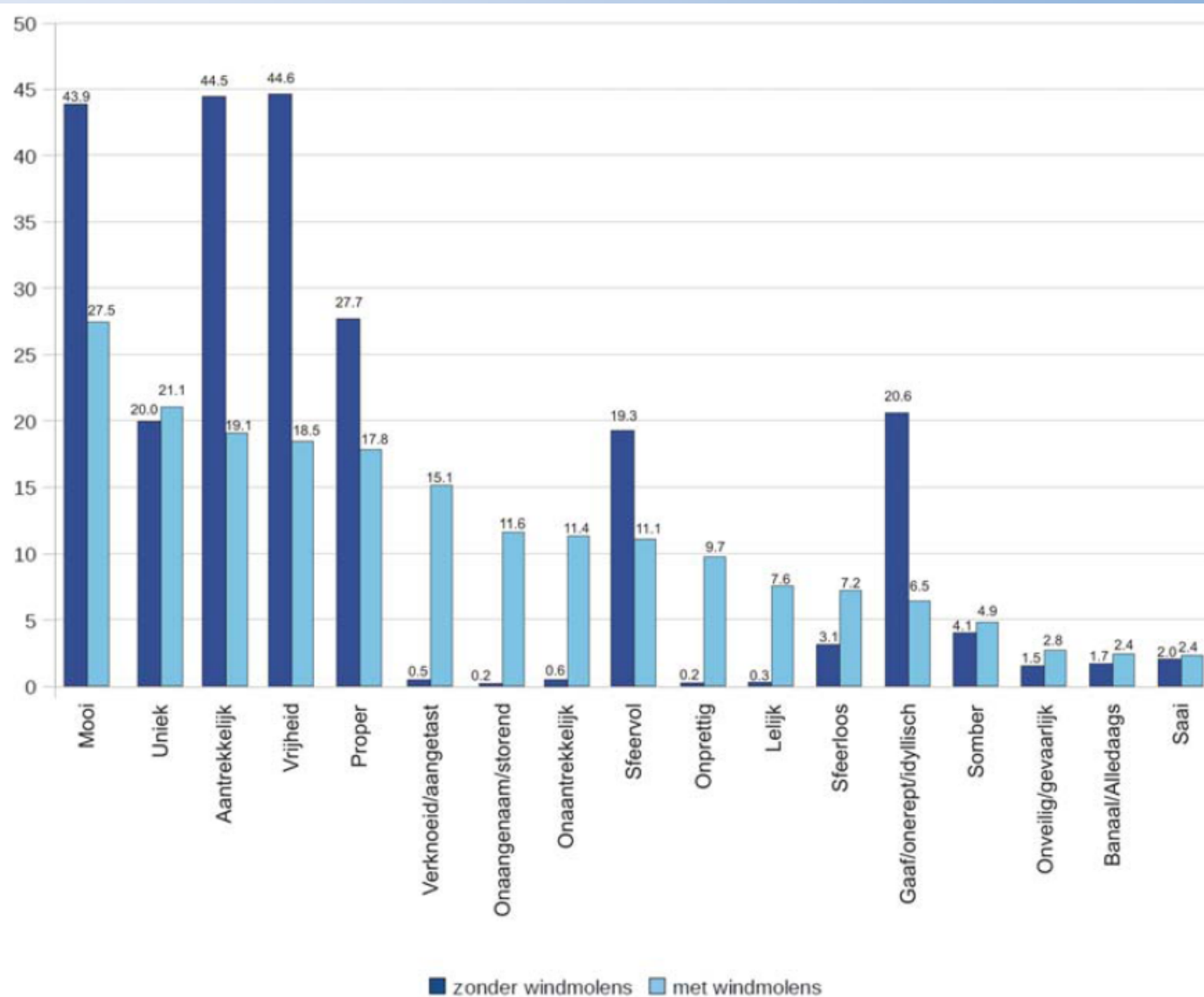
freedom

clean

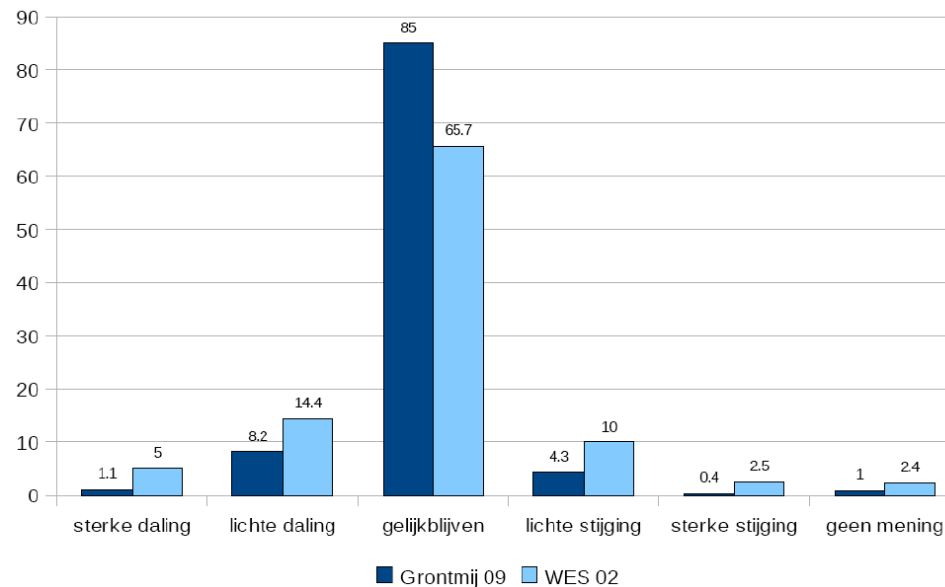
unattractive



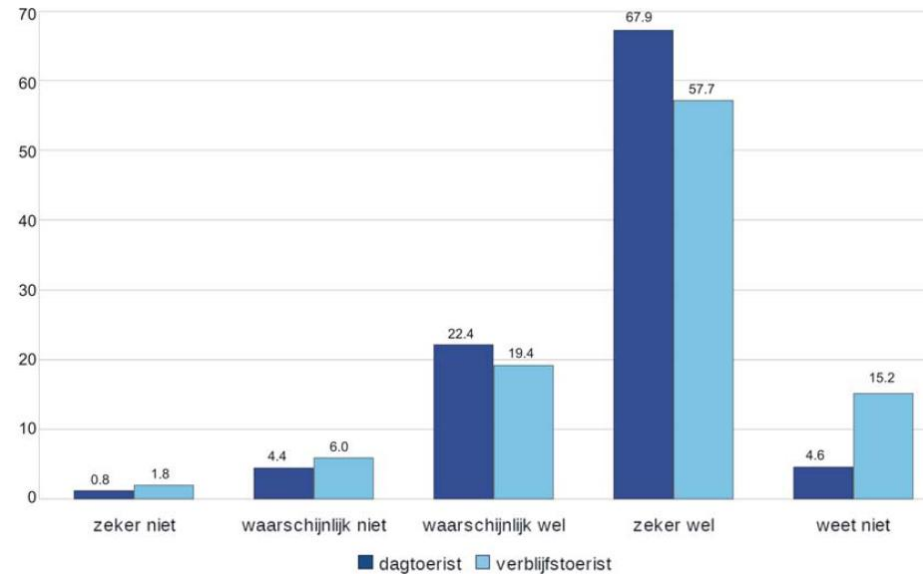
# Perception, impact & acceptance of future scenarios



# Perception, impact & acceptance of future scenarios



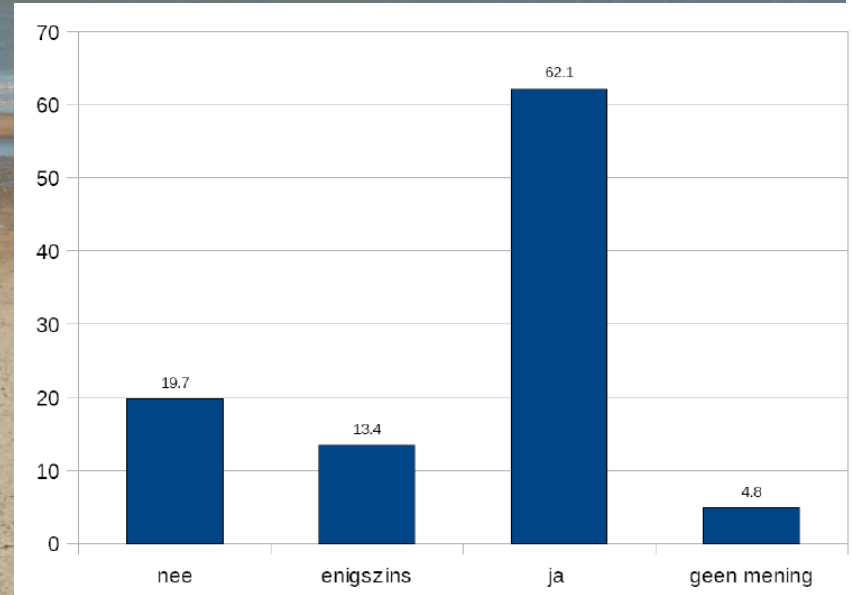
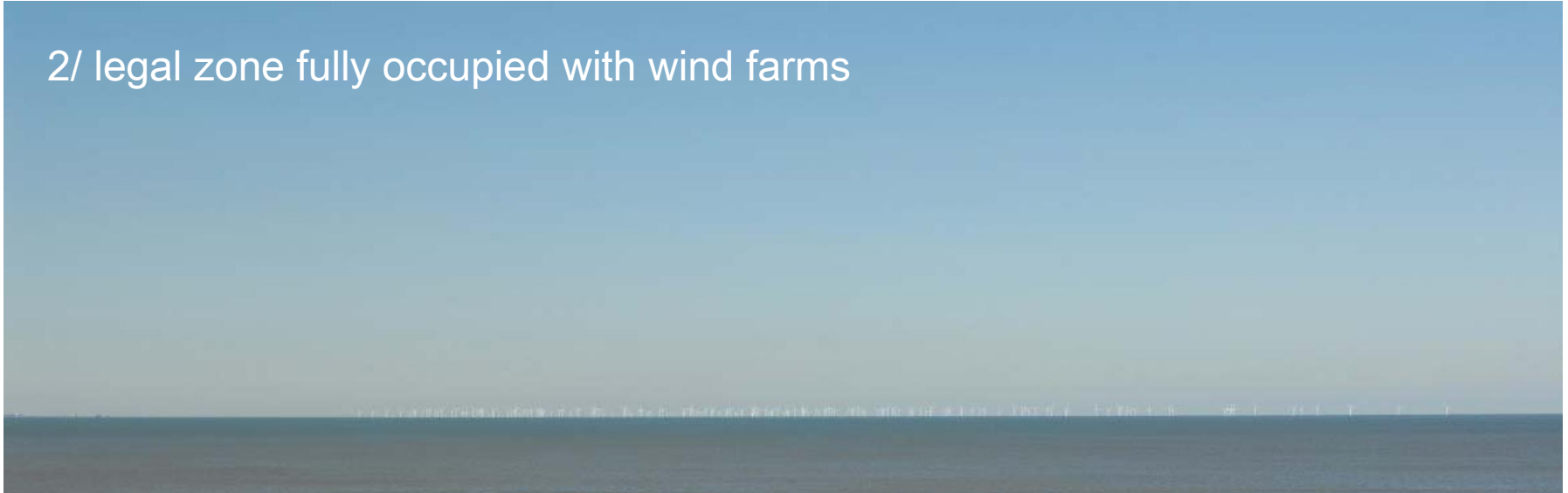
*Will this view impact the number of visitors to the coast?*



*Will the interviewed tourists keep on visiting the coastal town when the wind farms are completed?*

# Perception, impact & acceptance of future scenarios

2/ legal zone fully occupied with wind farms



*Acceptance of the view*

# Perception, impact & acceptance of future scenarios

if the wind farm has a less disturbing lay out



if the wind farm produces cheap energy for you



if there's no damage to nature



if the wind farms can create job opportunities



if people can buy shares



if the wind farm can be visited

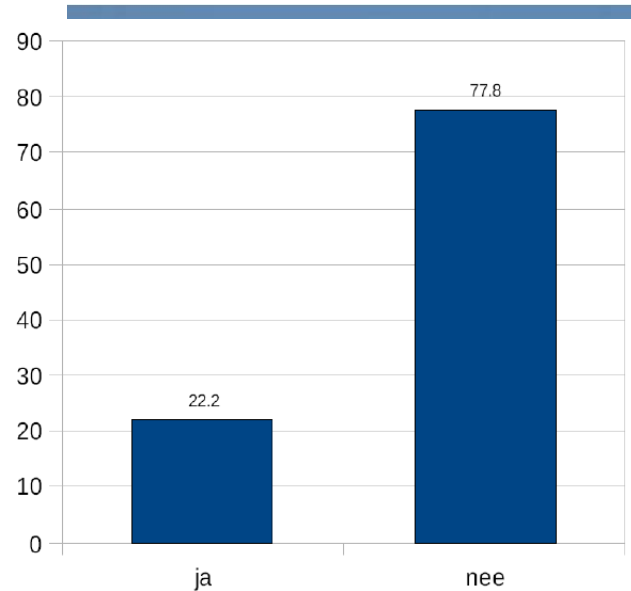


*Conditions wich could make the view more acceptable*

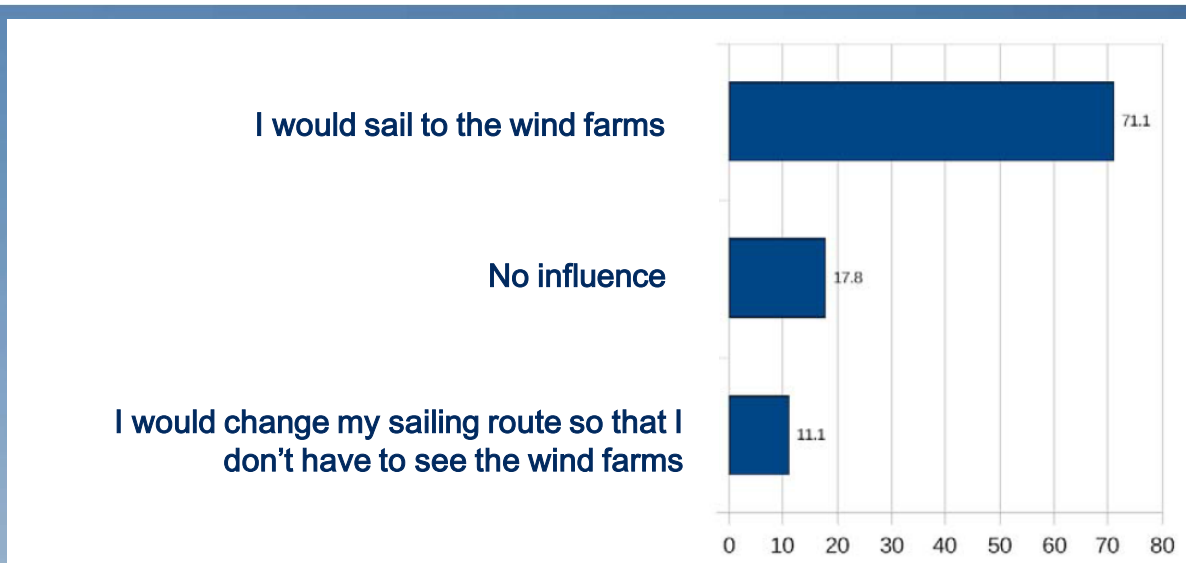
■ view more acceptable    ■ this doesn't matter    ■ I don't know /no opinion



# Perception, impact & acceptance of future scenarios



*Limits sailing activities?*



*Impact on choice of sailing routes*



# Acceptance of wind farms

- 95,6% (very) acceptable: simulation of 6 C-Power turbines;
- 77,8 % (very) acceptable: simulation of 3 licensed projects;
- 90,3 % (very) acceptable: simulation of night view;
- 56% (very) acceptable: simulation of view at sea;
- More positive attitude towards wind farms and towards the simulations in comparison with 2002  
*(2002: 62,2% (very) acceptable: simulation of wind farm 6 km distance from coast)*
- Important factors: distance to the wind farms, number of turbines, viewing angle/setting of the turbines
- Age, sex, education: not important factors
- Type of 'use' of the coast is quite important: local inhabitants are more reserved, second residents are more positive

# Recommendations

- Importance of visibility in acceptance: distance (+weather conditions), orientation towards coastal towns, number of visible turbines
- The 'critical limit' is different for different people;
- 3 licensed projects have limited visibility – vertical horizon occupation is less than 1% of the human viewing field
- Some points of view have a rather large horizontal horizon occupation, for a person looking in the direction of the wind turbines (Ostend, Blankenberge)

# Recommendations

- Attention to a geometrical setting of the turbines viewed from viewing points with largest horizontal occupation
- Attention to height, distance between the turbines & spatial pattern
- Setting as compact as possible
- Attention needs to be focused on the coastal sites that have the largest viewing angle towards the legal zone for wind farms (Blankenberge-De Haan-Oostende)
- Monitoring of public perception and acceptance