



MEMORANDUM

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Adding OWEZ and PAWP to the KEC 3.0 calculations

1 Introduction

In the context of the Roadmap for the roll-out of the SER agreement, numbers of collision victims have been calculated in the context of the Framework for Assessing Ecological and Cumulative effects (KEC) for all future wind farms in the southern North Sea (hereinafter: KEC 1.1; Rijkswaterstaat 2015). In the context of these calculations, all wind farms were then 'filled' with a standard 3 MW turbine rather than the turbines actually planned. These numbers of collision victims were then assessed using the Potential Biological Removal (PBR) for the relevant population of the species in the southern North Sea. The calculated numbers of victims exceeded the PBR for the three large gull species: Lesser Black-backed Gull, Herring Gull and Great Black-backed Gull.

The 2030 Offshore Wind Energy Roadmap was published in March 2018. It also includes plans for the construction of offshore wind farms in the period leading up to 2030. In order to make this ongoing roll-out of offshore wind energy in accordance with the Energy Agenda possible, new bird densities were calculated during the update of the KEC 1.1 study and victim numbers were determined for wind farms in line with the scenario in the 2030 Roadmap (hereinafter: KEC 3.0; Gyimesi *et al.* 2018). However, the existing Dutch wind farms Offshore Windpark Egmond aan Zee (OWEZ) and Princess Amalia Windpark (PAWP) were not included in those calculations because these farms are expected to be decommissioned between 2023 and 2030. The present memorandum is a supplement to the KEC update with the aim of providing a picture of the changes in the number of collision victims if the OWEZ and PAWP wind farms are actually included in the KEC 3.0 calculations.

The study was carried out for the species Northern Gannet, Great Skua, Great Black-backed Gull, Lesser Black-backed Gull, Herring Gull, Black-legged Kittiwake, Bewick's Swan, Brent Goose, Common Shelduck, Curlew and Black Tern. The collision models include the latest distribution data (prior to 2017) and knowledge about the flight behaviour of birds in offshore areas. On the basis of these calculations, the total numbers of collision victims were compared with the prevailing PBR values for the species concerned.

2 Methods

In the present memorandum, the same distribution data and methods for calculating victims and PBR were used as in the KEC 3.0 (Gyimesi *et al.* 2018) and applied to the OWEZ and PAWP wind farms for both the national and international scenarios. As in the KEC update, the calculations for these wind farms will be applied to six different seabirds and five different migratory birds. There are 36 turbines in OWEZ with a capacity of 3 MW and 60 turbines in PAWP with a capacity of 2 MW. The turbine specifications used are the same as in the KEC 3.0 calculations.

3 Results

3.1 Seabirds

3.1.1 International scenario

According to the method applied for the international scenario in the KEC 3.0 calculations, there will be a total of 46 collision victims in OWEZ and 77 collision victims in PAWP for the five seabird species considered (Table 3.1). Most seabird victims will be in the large gull species (Great Black-backed Gull, Lesser Black-backed Gull and Herring Gull). The seabird species affected most is the Lesser Black-backed Gull, with 19 victims in OWEZ and 36 in PAWP (41% and 47% respectively of the total number of victims per wind farm for the species studied). The expectation is that there will be fewer than ten victims among Black-legged Kittiwakes and two among Northern Gannets in the two parks. There will be no Great Skua victims in either farm.

Table 3.1 *Estimated annual number of victims determined using the extended Band model (Band 2012) in a number of seabird species in Offshore Windpark Egmond aan Zee (OWEZ) and the Princess Amalia Windpark (PAWP) in the international scenario according to the KEC 3.0 calculations*

	Great Skua	Northern Gannet	Black-legged Kittiwake	Great Black-backed Gull	Lesser Black-backed Gull	Herring Gull
OWEZ	0	2	3	9	19	13
Prinses Amaliawindpark	0	2	5	14	36	20

3.1.2 National scenario

Calculations were also carried out using the approach for the national scenario in the Netherlands. In comparison to the international scenario, the calculations for wind farms were made using new bird densities for the period 2000-2017 in accordance with agreements for the present study (Bravo Rebolledo & Gyimesi 2018). In the national scenario, the total number of collision victims for the seabird species studied differs little from calculations for the international scenario: 46 victims in OWEZ and 84 in PAWP (Table 3.2). In concrete terms, victim numbers for the Herring Gull and Great Black-backed Gull could be higher in the national scenario and the victim numbers could be the same or higher in other species in the international scenario (Table 3.2).

Table 3.2 Estimated annual number of victims determined using the extended band model (Band 2012) in a number of seabird species in Offshore Windpark Egmond aan Zee (OWEZ) and the Princess Amalia Windpark (PAWP) in the national scenario according to the KEC 3.0 calculations

	Great Skua	Northern Gannet	Black-legged Kittiwake	Great Black-backed gull	Lesser Black-backed gull	Herring Gull
OWEZ	0	2	2	9	18	15
Prinses Amaliawindpark	0	2	4	17	33	28

3.1.3 Cumulative effects

The inclusion of the wind farms OWEZ and PAWP in the KEC 3.0 calculations will not change the cumulative number of Great Skua victims: no victims are expected in OWEZ and PAWP for this species. The change will also be marginal for the Northern Gannet and Black-legged Kittiwake. In the case of the three large gull species, several dozen additional victims per species are expected on an annual basis as a result of the inclusion of OWEZ and PAWP in the calculations (Table 3.3).

Table 3.3 Estimated cumulative number of victims annually in existing and future wind farms among a number of seabird species determined with the extended Band model (Band 2012)

	Great Skua	Northern Gannet	Black-legged Kittiwake	Great Black-backed gull	Lesser Black-backed gull	Herring Gull
International scenario	4	215	355	179	2,046	776
National scenario	0	33	64	190	598	252

3.1.4 Comparison with KEC 1.1

As for the KEC 3.0 calculations, the victim numbers presented above for OWEZ and PAWP represent a significant decrease in comparison to the KEC 1.1 calculations for the same wind farms. The update results in approximately 60-80% fewer casualties for all species in these two wind farms by comparison with the original KEC calculations, while these wind farms have not been scaled up to a larger capacity like many other wind farms in the KEC 3.0 update (Gyimesi *et al.* 2018). Although the turbine specifications used in the present memorandum for a 3 MW turbine (cf. Gyimesi & Fijn 2015) differ slightly from those in the KEC 1.1 calculations (100 m rotor diameter and 75 m tower height, as opposed to 90 m and 70 m respectively), the main cause of the changes in the numbers is the fact that there has been a significant reduction in the calculated seabird densities. In the KEC 3.0, these densities are a comparable order of magnitude lower (56%-94% in large gulls) in comparison to the KEC 1.1 values, as are those for the victim numbers. For example, the density adopted for Lesser Black-backed Gulls in OWEZ in the KEC 1.1 was an average of 3.7 birds/km² over the year, whereas the present calculations have adopted 0.23 birds/km². On the basis of previous surveys in these wind farms, these updated densities provide a much more realistic average. For example, Leopold *et al.* (2011) determined an annual average of 0.7 birds/km² for the Lesser Black-backed Gull during the OWEZ baseline measurement. Krijgsveld *et al.* (2011) also found an average of only 0.1 birds/km² for this species during observations in this wind farm. There is a similar trend for the other species for the densities determined for KEC 1.1 and KEC 3.0.

3.2 Migratory birds

The present study also calculated new estimates for the number of collision victims in OWEZ and PAWP for the migratory bird species Bewick's Swan, Brent Goose, Common Shelduck, Curlew and Black Tern. No victims should be expected on an annual basis in these wind farms among either Bewick's Swan or Black Tern (Table 3.4). The calculations indicate that there will be some victims among the other migratory bird species, with the highest number being expected for Brent Goose.

Table 3.4 Number of collision victims for a number of migratory bird species in Offshore Windpark Egmond aan Zee (OWEZ) and the Princess Amalia Windpark (PAWP) in the national scenario according to the KEC 3.0 calculations. The numbers of victims were determined for Bewick's Swan and the Brent Goose with the extended Band Model (Band 2012) and for the other species with the basic Band model (Band et al. 2007). The cumulative numbers of victims in all wind farms in the central and southern North Sea are also presented.

species	OWEZ	PAWP	cumulative international
Bewick's Swan	0.04	0.05	6
Brent Goose	4	7	121
Common Shelduck	1	2	370
Curlew	2	3	501
Black Tern	0.1	0.2	38

3.3 Comparison with PBR

In line with the KEC 3.0 approach, calculations for OWEZ and PAWP were performed in the present document that made it possible to compare the newly calculated cumulative numbers of collision victims with the species-specific PBR values. **Table 3.5** does this for the **international seabird populations** and **Table 3.6** focuses on the **Dutch seabird populations**.

The calculations show that the addition of the OWEZ and PAWP wind farms to the international scenario results in only a small increase in the fraction of the PBR for the Lesser Black-backed Gull and Herring Gull victims; the change is not significant for the other species (Table 3.5). In the national scenario, the numbers of collision victims in OWEZ and PAWP obviously represent a larger proportion of the total number of victims in Dutch wind farms, with the largest change (an increase of 0.1) being in the fraction of the total number of victims by comparison with the PBR for Herring Gulls. Nevertheless, the cumulative numbers of victims in both the international and national populations remain below the PBR standard.

Current calculations indicate that the cumulative number of victims in **migratory bird species**, including OWEZ and PAWP, does not change the fraction of the PBR in comparison to the numbers described in the KEC update (Gyimesi *et al.* 2018). For the sake of completeness, the PBR numbers and cumulative numbers of victims are presented as a fraction of the PBR for migratory bird species in Table 3.7.

Table 3.5 Number of seabird victims as a result of collisions with wind turbines in existing and future wind farms in the central and southern North Sea, also stated as a fraction of the PBR for the **central and southern North Sea population**. The population sizes were determined on the basis of density maps based on ESAS or MWTL surveys made in the period 1991-2017. Recovery factors (*rf*) indicate the recovery capacity of a species determined on the basis of IUCN conservation status and current population trends (IUCN 2018).

species	international population	victims in international wind farms (incl. NL)	rf value	PBR	victims as a fraction of PBR
Great Skua	86,392	4	0.5	1,464	0.003
Northern Gannet	507,215	215	1.0	22,354	0.01
Black-legged Kittiwake	830,413	355	0.1	2,373	0.15
Great Black-backed Gull	434,508	804	0.5	11,799	0.07
Lesser Black-backed Gull	367,543	2,046	0.5	9,481	0.22
Herring Gull	473,144	776	0.1	2,235	0.35

Table 3.6 Number of seabird victims as a result of collisions with wind turbines in existing and planned wind farms on the Dutch Continental Shelf, also stated as a fraction of the PBR for the Dutch population. The population sizes were determined on the basis of density maps based on ESAS or MWTL surveys made in the period 2000-2017. Recovery factors (rf) indicate the recovery capacity of a species determined on the basis of IUCN conservation status and current population trends (IUCN 2018).

species	Dutch population	victims in Dutch wind farms	rf value	PBR	victims as a fraction of PBR
Great Skua	1,633	0.2	0.5	28	0.006
Northern Gannet	76,338	33	1.0	3,364	0.01
Black-legged Kittiwake	124,176	64	0.1	581	0.11
Great Black-backed Gull	84,326	190	0.5	2,290	0.08
Lesser Black-backed Gull	96,588	598	0.5	2,492	0.24
Herring Gull	91,493	252	0.1	432	0.58

Table 3.7 Number of seabird victims as a result of collisions with wind turbines in existing and future wind farms in the central and southern North Sea, also stated as a fraction of the PBR for the flyway population. Population sizes were determined using population estimates (BirdLife International 2004) and current population trends (IUCN 2018).

species	PBR international	Victims as a fraction of PBR
Bewick's Swan	73	0.08
Brent Goose	8175	0.01
Common Shelduck	3856	0.10
Curlew	783	0.64
Black Tern	39	0.98

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