# NFR 11 - Other Sources

## 11.C Other Natural Sources

### Short description

| NFR-Code | Name of category | Method | AD | EF | Key Category |
|---|---|---|---|---|---|
| 11.C | **Lightning** | T1 | NS | D | |

Lightning and corona discharge during thunderstorm events cause atmospheric chemical reactions to take place at high voltages and high temperatures. These reactions cause the production of NOx in the atmosphere.

### Methodology

The calculation of NOx emissions from lightning uses strike counts from the German weather service and default emission factors from the EMEP/EEA guidebook.

For the complete time series, the emissions are calculated as follows:

**EM** = **AD** (number of lightning strikes) * **EF** (kg emission per strike)

#### Activity data

The number of lightning strikes in Germany is taken from a commercial system called “BLIDS” run by Siemens. The data has been cross-referenced with information from the German weather service. Consistent strike count data is available from 1992 onward and has been back-populated to cover the full time series since 1990. The following table shows the strike figures over time.

Table 1: Lightning strikes in Germany from 1990 onwards

| Year | Strike count [1000 strikes] |
|---|---|
| 1990 | 443 |
| 1991 | 443 |
| 1992 | 370 |
| 1993 | 274 |
| 1994 | 429 |
| 1995 | 394 |
| 1996 | 218 |
| 1997 | 255 |
| 1998 | 428 |
| 1999 | 589 |
| 2000 | 1,026 |
| 2001 | 591 |
| 2002 | 1,023 |
| 2003 | 813 |
| 2004 | 741 |
| 2005 | 802 |
| 2006 | 1,001 |
| 2007 | 1,139 |
| 2008 | 990 |
| 2009 | 917 |

| Year | Strike count [1000 strikes] |
|---|---|
| 2010 | 589 |
| 2011 | 687 |
| 2012 | 656 |
| 2013 | 542 |
| 2014 | 623 |
| 2015 | 550 |
| 2016 | 432 |
| 2017 | 443 |
| 2018 | 446 |
| 2019 | 329 |
| 2020 | 399 |
| 2021 | 512 |

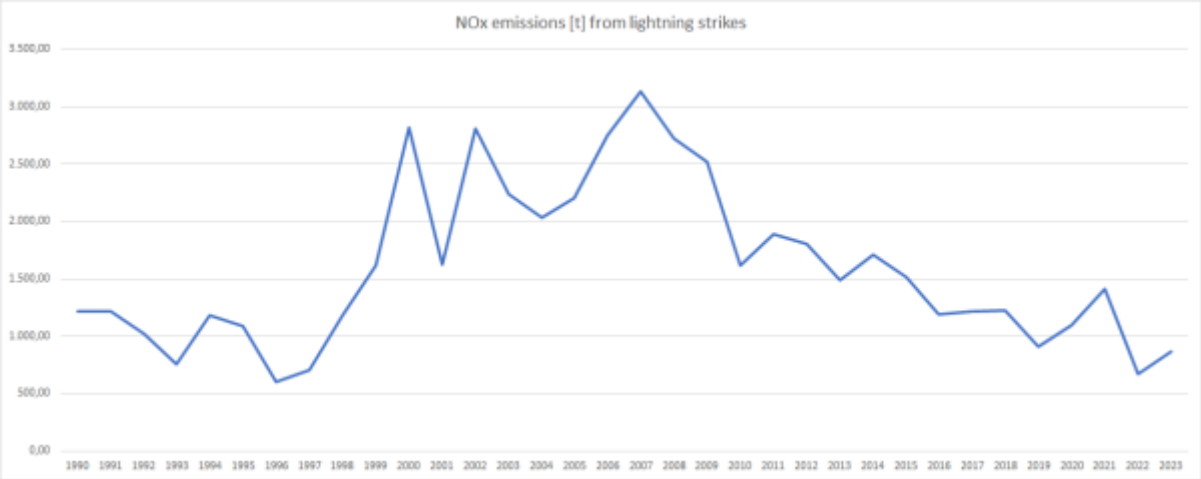
**Emission factor**

For the calculation of emissions in this category, the Guidebook emission factor of 2.75 kg NOx per strike is used.

### Emission Trend

The emission value is solely dependent on the strike count and varies between 1 to 2 kilotons of NOx per year.

Figure 1: NFR 11.C, NOx emissions from lightning




## Recalculations

As these activities and emissions are reported for the first time, no specific recalculations occur against a previous submission.

### Uncertainties

The AD from BLIDS does have a low uncertainty of ± 3%. The uncertainties for the emission factors are estimated to be relatively high, being a default value. Hence the overall uncertainty for the emission estimation of NOx from lightning is qualified estimated by expert judgement to be high (>50%).

## Quality checks

No sector-specific quality checks are done.

## Planned Improvement

Currently no improvements are planned.