



	Unit	1990	1995	2000	2005	2010	2015	2020	2022
Flared natural gas	millions of m <sup>3</sup>	36	33	36	18.7	12.1	10.5	14.1	10.4
Refined crude-oil quantity	millions of t	107	96.5	107.6	114.6	95.4	93.4	84.0	90.0

Flaring takes place in extraction and pumping systems and at refineries. In refineries, flaring operations are subdivided into regular operations and start-up / shut-down operations in connection with disruptions.

Table 2: Emission factors applied for flaring emissions in natural gas extraction, in [kg/ 1000 m<sup>3</sup>]

	Value
<b>NM VOC</b>	0.005
<b>NO<sub>x</sub></b>	1.269
<b>SO<sub>2</sub></b>	8.885
<b>CO</b>	0.726

Table 3: Emission factors applied for flaring emissions at petroleum production facilities

	Unit	Value
<b>NO<sub>x</sub></b>	kg/t	0.008
<b>SO<sub>2</sub></b>	kg/t	0.010
<b>CO</b>	g/t	0.1

Table 4: Emission factors applied for flaring emissions at refineries: normal flaring operations

	Unit	Value
<b>NM VOC</b>	kg/m <sup>3</sup>	0.004
<b>CO</b>	kg/m <sup>3</sup>	0.001
<b>SO<sub>2</sub></b>	kg/m <sup>3</sup>	0.003
<b>NO<sub>x</sub></b>	g/m <sup>3</sup>	0.4

Table 5: Emission factors applied for flaring emissions at refineries: disruptions of flaring operations, in [kg/t]

	Value
<b>NM VOC</b>	0.001
<b>CO</b>	0.001
<b>SO<sub>2</sub></b>	0.007
<b>NO<sub>x</sub></b>	0.004

The emission factors have been derived from the 2004 and 2008 emissions declarations Theloke et al. 2013 <sup>1)</sup>. In 2019, they were updated for CH<sub>4</sub>, N<sub>2</sub>O, CO, NM VOC, NO<sub>x</sub> and SO<sub>2</sub>, on the basis of Bender & von Müller, 2019 <sup>2)</sup>.

Venting emissions are taken into account in category 1.B.2.b.iii. The SO<sub>2</sub> emissions are obtained from the activity data for the flared natural gas (Table 178) and an emission factor of 0.140 kg / 1,000 m<sup>3</sup>, a factor which takes account of an average H<sub>2</sub>S content of 5 % by volume. The emission factors are determined on the basis of emissions reports, crude-oil-refining capacity and total capacity utilisation at German refineries. The guide for this work consists of the evaluation assessment of Theloke et al. (2013) <sup>3)</sup>.

## Recalculations



For more details please refer to the super-ordinate chapter [1.B - Fugitive Emissions from fossil fuels](#)

## Planned improvements

Currently no improvements are planned.

## References

---

<sup>1), 3)</sup> Theloke, J., Kampffmeyer, T., Kugler, U., Friedrich, R., Schilling, S., Wolf, L., & Springwald, T. (2013). Ermittlung von Emissionsfaktoren und Aktivitätsraten im Bereich IPCC (1996) 1.B.2.a. i-vi - Diffuse Emissionen aus Mineralöl und Mineralölprodukten (Förderkennzeichen 360 16 033). Stuttgart.

<sup>2)</sup> Bender, M., & von Müller, G. (2019). Konsolidierung der Treibhausgasemissionsberechnungen unter der 2. Verpflichtungsperiode des Kyoto-Protokolls und der neuen Klimaschutz-Berichterstattungs-pflichten an die EU (FKZ 3716 41 107 0).