Online Resource 1:

CTP characterisation factors for CO_2, CH_4 and N_2O

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Assessment of urgent impacts of greenhouse gas emissions – the Climate Tipping Potential (CTP)

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CTP characterisation factors for CO_2, CH_4 and N_2O with emission times from 2012 to the target time, for all RCP scenarios applying an atmospheric GHG target level of 450 ppm CO_2e

The CTP characterisation factors given in Table O1-O4 are based on the equations and input values given in the main article, with an atmospheric GHG target level of 450 ppm CO_2e. The characterisation factors are calculated for the four RCP scenarios made available by Meinshausen et al. (2011), based on data from: RCP3PD (van Vuuren et al. 2007), RCP4.5 (Clarke et al. 2007; Smith and Wigley 2006; Wise et al. 2009), RCP6 (Fujino et al. 2006), RCP8.5 (Riahi et al. 2007). The CTP values are given as ppt (parts per trillion) of remaining capacity, ppt_{rc}.

Table O1: CTP characterisation factors using scenario RCP3PD

Year of emission	N_2O [ppt_{rc} kg N_2O^{-1}]	CH_4 [ppt_{rc} kg CH_4^{-1}]	CO_2 [ppt_{rc} kg CO_2^{-1}]
2012	$1.10\cdot10^{0}$	$2.62\cdot10^{-1}$	$3.78\cdot10^{-3}$
2013	$1.18\cdot10^{0}$	$2.88\cdot10^{-1}$	$4.07\cdot10^{-3}$
2014	$1.27\cdot10^{0}$	$3.17\cdot10^{-1}$	$4.39\cdot10^{-3}$
2015	$1.37\cdot10^{0}$	$3.51\cdot10^{-1}$	$4.76\cdot10^{-3}$
2016	$1.48\cdot10^{0}$	$3.90\cdot10^{-1}$	$5.17\cdot10^{-3}$
2017	$1.61\cdot10^{0}$	$4.35\cdot10^{-1}$	$5.64\cdot10^{-3}$
2018	$1.75\cdot10^{0}$	$4.88\cdot10^{-1}$	$6.17\cdot10^{-3}$
2019	$1.92\cdot10^{0}$	$5.49\cdot10^{-1}$	$6.79\cdot10^{-3}$
2020	$2.10\cdot10^{0}$	$6.21\cdot10^{-1}$	$7.50\cdot10^{-3}$
2021	$2.32\cdot10^{0}$	$7.05\cdot10^{-1}$	$8.32\cdot10^{-3}$
2022	$2.58\cdot10^{0}$	$8.07\cdot10^{-1}$	$9.30\cdot10^{-3}$
2023	$2.88\cdot10^{0}$	$9.30\cdot10^{-1}$	$1.05\cdot10^{-2}$
2024	$3.25\cdot10^{0}$	$1.08\cdot10^{0}$	$1.19\cdot10^{-2}$
2025	$3.72\cdot10^{0}$	$1.28\cdot10^{0}$	$1.37\cdot10^{-2}$
2026	$4.31\cdot10^{0}$	$1.53\cdot10^{0}$	$1.61\cdot10^{-2}$
2027	$5.08\cdot10^{0}$	$1.87\cdot10^{0}$	$1.91\cdot10^{-2}$
2028	$6.13\cdot10^{0}$	$2.33\cdot10^{0}$	$2.34\cdot10^{-2}$
2029	$7.59\cdot10^{0}$	$2.98\cdot10^{0}$	$2.94\cdot10^{-2}$
2030	$9.73\cdot10^{0}$	$3.96\cdot10^{0}$	$3.83\cdot10^{-2}$
2031	$1.30\cdot10^{1}$	$5.49\cdot10^{0}$	$5.25\cdot10^{-2}$
2032	$1.91\cdot10^{1}$	$8.33\cdot10^{0}$	$7.94\cdot10^{-2}$
2033	$3.46\cdot10^{1}$	$1.57\cdot10^{1}$	$1.51\cdot10^{-1}$
2034	-	-	-

Table O2: CTP characterisation factors using scenario RCP4.5

Year of emission	N_2O [ppt_{rc} kg N_2O^{-1}]	CH_4 [ppt_{rc} kg CH_4^{-1}]	CO_2 [ppt_{rc} kg CO_2^{-1}]
2012	$8.98 \cdot 10^{-1}$	$2.50 \cdot 10^{-1}$	$3.16 \cdot 10^{-3}$
2013	$9.57 \cdot 10^{-1}$	$2.74 \cdot 10^{-1}$	$3.39 \cdot 10^{-3}$
2014	$1.03 \cdot 10^{0}$	$3.02 \cdot 10^{-1}$	$3.65 \cdot 10^{-3}$
2015	$1.10 \cdot 10^{0}$	$3.35 \cdot 10^{-1}$	$3.95 \cdot 10^{-3}$
2016	$1.19 \cdot 10^{0}$	$3.74 \cdot 10^{-1}$	$4.31 \cdot 10^{-3}$
2017	$1.30 \cdot 10^{0}$	$4.20 \cdot 10^{-1}$	$4.72 \cdot 10^{-3}$
2018	$1.43 \cdot 10^{0}$	$4.75 \cdot 10^{-1}$	$5.22 \cdot 10^{-3}$
2019	$1.58 \cdot 10^{0}$	$5.42 \cdot 10^{-1}$	$5.82 \cdot 10^{-3}$
2020	$1.76 \cdot 10^{0}$	$6.25 \cdot 10^{-1}$	$6.56 \cdot 10^{-3}$
2021	$1.99 \cdot 10^{0}$	$7.30 \cdot 10^{-1}$	$7.49 \cdot 10^{-3}$
2022	$2.28 \cdot 10^{0}$	$8.67 \cdot 10^{-1}$	$8.71 \cdot 10^{-3}$
2023	$2.68 \cdot 10^{0}$	$1.05 \cdot 10^{0}$	$1.04 \cdot 10^{-2}$
2024	$3.24 \cdot 10^{0}$	$1.32 \cdot 10^{0}$	$1.28 \cdot 10^{-2}$
2025	$4.10 \cdot 10^{0}$	$1.73 \cdot 10^{0}$	$1.65 \cdot 10^{-2}$
2026	$5.58 \cdot 10^{0}$	$2.44 \cdot 10^{0}$	$2.32 \cdot 10^{-2}$
2027	$8.72 \cdot 10^{0}$	$3.95 \cdot 10^{0}$	$3.80 \cdot 10^{-2}$
2028	-	-	-

Table O3: CTP characterisation factors using scenario RCP6

Year of emission	N_2O [ppt_{rc} kg N_2O^{-1}]	CH_4 [ppt_{rc} kg CH_4^{-1}]	CO_2 [ppt_{rc} kg CO_2^{-1}]
2012	$8.52 \cdot 10^{-1}$	$2.12 \cdot 10^{-1}$	$2.94 \cdot 10^{-3}$
2013	$8.99 \cdot 10^{-1}$	$2.30 \cdot 10^{-1}$	$3.12 \cdot 10^{-3}$
2014	$9.51 \cdot 10^{-1}$	$2.50 \cdot 10^{-1}$	$3.31 \cdot 10^{-3}$
2015	$1.01 \cdot 10^{0}$	$2.73 \cdot 10^{-1}$	$3.53 \cdot 10^{-3}$
2016	$1.07 \cdot 10^{0}$	$2.99 \cdot 10^{-1}$	$3.78 \cdot 10^{-3}$
2017	$1.15 \cdot 10^{0}$	$3.28 \cdot 10^{-1}$	$4.06 \cdot 10^{-3}$
2018	$1.23 \cdot 10^{0}$	$3.63 \cdot 10^{-1}$	$4.38 \cdot 10^{-3}$
2019	$1.33 \cdot 10^{0}$	$4.03 \cdot 10^{-1}$	$4.75 \cdot 10^{-3}$
2020	$1.44 \cdot 10^{0}$	$4.51 \cdot 10^{-1}$	$5.19 \cdot 10^{-3}$
2021	$1.57 \cdot 10^{0}$	$5.08 \cdot 10^{-1}$	$5.72 \cdot 10^{-3}$
2022	$1.73 \cdot 10^{0}$	$5.78 \cdot 10^{-1}$	$6.35 \cdot 10^{-3}$
2023	$1.93 \cdot 10^{0}$	$6.65 \cdot 10^{-1}$	$7.14 \cdot 10^{-3}$
2024	$2.18 \cdot 10^{0}$	$7.75 \cdot 10^{-1}$	$8.13 \cdot 10^{-3}$
2025	$2.50 \cdot 10^{0}$	$9.19 \cdot 10^{-1}$	$9.43 \cdot 10^{-3}$
2026	$2.93 \cdot 10^{0}$	$1.11 \cdot 10^{0}$	$1.12 \cdot 10^{-2}$
2027	$3.54 \cdot 10^{0}$	$1.39 \cdot 10^{0}$	$1.37 \cdot 10^{-2}$
2028	$4.44 \cdot 10^{0}$	$1.81 \cdot 10^{0}$	$1.75 \cdot 10^{-2}$
2029	$5.89 \cdot 10^{0}$	$2.48 \cdot 10^{0}$	$2.38 \cdot 10^{-2}$
2030	$8.47 \cdot 10^{0}$	$3.70 \cdot 10^{0}$	$3.53 \cdot 10^{-2}$
2031	$1.38 \cdot 10^{1}$	$6.25 \cdot 10^{0}$	$6.01 \cdot 10^{-2}$
2032	-	-	-

Table O4: CTP characterisation factors using scenario RCP8.5

Year of emission	N_2O [ppt_{rc} kg N_2O^{-1}]	CH_4 [ppt_{rc} kg CH_4^{-1}]	CO_2 [ppt_{rc} kg CO_2^{-1}]
2012	$9.13 \cdot 10^{-1}$	$2.77 \cdot 10^{-1}$	$3.27 \cdot 10^{-3}$
2013	$9.84 \cdot 10^{-1}$	$3.08 \cdot 10^{-1}$	$3.55 \cdot 10^{-3}$
2014	$1.07 \cdot 10^{0}$	$3.45 \cdot 10^{-1}$	$3.88 \cdot 10^{-3}$
2015	$1.17 \cdot 10^{0}$	$3.89 \cdot 10^{-1}$	$4.28 \cdot 10^{-3}$
2016	$1.29 \cdot 10^{0}$	$4.45 \cdot 10^{-1}$	$4.78 \cdot 10^{-3}$
2017	$1.45 \cdot 10^{0}$	$5.15 \cdot 10^{-1}$	$5.41 \cdot 10^{-3}$
2018	$1.65 \cdot 10^{0}$	$6.07 \cdot 10^{-1}$	$6.23 \cdot 10^{-3}$
2019	$1.93 \cdot 10^{0}$	$7.32 \cdot 10^{-1}$	$7.35 \cdot 10^{-3}$
2020	$2.32 \cdot 10^{0}$	$9.10 \cdot 10^{-1}$	$8.96 \cdot 10^{-3}$
2021	$2.91 \cdot 10^{0}$	$1.18 \cdot 10^{0}$	$1.15 \cdot 10^{-2}$
2022	$3.93 \cdot 10^{0}$	$1.65 \cdot 10^{0}$	$1.58 \cdot 10^{-2}$
2023	$6.02 \cdot 10^{0}$	$2.63 \cdot 10^{0}$	$2.50 \cdot 10^{-2}$
2024	$1.29 \cdot 10^{1}$	$5.87 \cdot 10^{0}$	$5.64 \cdot 10^{-2}$
2025	-	-	-

The CTP characterisation factors given here have been developed to be readily applicable in LCA, as supplement to the long-term global warming impacts expressed through the GWP.

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