

1.A.4.c ii - Agriculture/Forestry/Fishing: Off-Road Vehicles and Other Machinery

Short description

Under sub-category 1.A.4.c ii - Agriculture/Forestry/Fishing: Off-road Vehicles and other Machinery fuel combustion activities and resulting emissions from off-road vehicles and machinery used in agriculture and forestry are reported separately.



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| NFR-Code | Source category | Method | AD | EF | Key Category Analysis | | | | |
|-----------------------------------------|------------------------------------------------------|---------------------------------------------------------------------|----------|----------|-----------------------|---------------------------------------------|---|---|--|
| 1.A.4.c ii | | Agriculture/Forestry/Fishing: Off-Road Vehicles and Other Machinery | T1, T2 | NS, M | CS, D, M | L & T: BC / L: NO,,x,,, PM,,2.5,,, PM,,10,, | | | |
| including mobile sources sub-categories | | | | | | | | | |
| 1.A.4.c ii (a) | Off-road Vehicles and Other Machinery: Agriculture] | T1, T2 | NS, M | CS, D, M | - | | | | |
| 1.A.4.c ii (b) | | Off-road Vehicles and Other Machinery: Forestry] | = T1, T2 | | = NS, M | = CS, D, M | = | - | |

Methodology

Activity data

Sector-specific consumption data is included in the primary fuel-delivery data are available from NEB

For **HCB** and **PCBs**, no emission factors are available at the moment.

Due to the separate reporting of mobile fuel combustion in agriculture and forestry as well as the differentiation into 2- and 4-stroke gasoline engines, a broad set of emission factors is applied here. For further information on the tier1 default EF as well as annual IEF modelled in TREMOD-MM please refer to the sub-chapters linked above. Here, as no such specific EF are available for biofuels, the values used for diesel oil and gasoline are applied to biodiesel and bio-ethanol, too.

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Discussion of emission trends

NFR 1.A.4.c ii is key source for emissions of **NO_x**, **BC**, **PM_{2.5}**, and **PM₁₀**.

++ Unregulated pollutants (NH₃, HMs, POPs, ...)

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For all unregulated pollutants, emission trends directly follow the trend in fuel consumption.

++ Regulated pollutants

+++ Nitrogen oxides (NO_x), Sulphur dioxide (SO₂)

For all regulated pollutants, emission trends follow not only the trend in fuel consumption but also reflect the impact of fuel-quality and exhaust-emission legislation.

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+++ Particulate matter (Black Carbon, PM_{2.5}, PM₁₀, and TSP)

Over-all PM emissions are by far dominated by emissions from diesel oil combustion with the falling trend basically following the decline in fuel consumption between 2000 and 2005. Nonetheless, the decrease of the over-all emission trend was and still is amplified by the expanding use of particle filters especially to eliminate soot emissions.

Additional contributors such as the impact of TSP emissions from the use of leaded gasoline (until 1997) have no significant effect onto over-all emission estimates.

[gallery size="medium" : 1A4cii_EM_PM.PNG](#) [gallery](#)

+++ Heavy-metal emissions: Cadmium

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As all other heavy-metal and POP emissions, emissions of cadmium for this NFR category are calculated based on default EF from ⁹⁾.

Here, the extreme steps in emission estimates result from two effects:

(i) the annual amounts of gasoline fuels allocated to NFR 1.A.4.c ii depend on the amounts delivered to the military also covered in NEB line 67. (see [superordinate chapter](#)] for further information). This

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| | = 2010 | = 2011 | = 2012 | = 2013 | = 2014 | = 2015 | = 2016 | = 2017 | = 2018 |
|---------------|---------|---------|--------|--------|--------|---------|---------|---------|---------|
| ~ Gasoline | > 1,563 | > 1,425 | > 399 | > 391 | > 421 | > 1,698 | > 1,615 | > 1,631 | > 1,592 |
| ~ Biogasoline | > 60 | > 58 | > 18 | > 17 | > 18 | > 74 | > 70 | > 68 | > 72 |

Table: Tier1 default emission factors applied to NRMM, in g/TJ

[illegible]

Recalculations

Table 6: Revised activity data 2015-2017, in terajoules

| | | | | |
|-------------------|----------|----------|----------|--|
| | = 2015 | = 2016 | = 2017 | |
| = diesel fuels | | | | |
| ~ Submission 2020 | > 57,036 | > 59,309 | > 61,176 | |
| ~ Submission 2019 | > 57,034 | > 59,306 | > 60,819 | |

since the specific shares of (i), (ii) and (iii) cannot be separated, and since the contributions of lubricant and engine wear might be dominant, the same emission factors are applied to biodiesel and bioethanol.

bibliography : 1 : AGEb, 2019: Working Group on Energy Balances (Arbeitsgemeinschaft Energiebilanzen (Hrsg.), AGEb): Energiebilanz für die Bundesrepublik Deutschland; URL: <https://ag-energiebilanzen.de/7-0-Bilanzen-1990-2017.html>, (Aufruf: 29.11.2019), Köln & Berlin, 2019. : 2 : BAFA, 2019: Federal Office of Economics and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA): Amtliche Mineralöl-daten für die Bundesrepublik Deutschland; URL: https://www.bafa.de/SharedDocs/Downloads/DE/Energie/Mineraloel/moel_amtliche_daten_2018_dezember.html, Eschborn, 2019. : 3 : Knörr et al. (2019b): Knörr, W., Heidt, C., Gores, S., & Bergk, F.: ifeu Institute for Energy and Environmental Research (Institut für Energie- und Umweltforschung Heidelberg gGmbH, ifeu): Aktualisierung des Modells TREMOD-Mobile Machinery (TREMOD MM) 2019, Heidelberg, 2019. : 4 : EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook – 2019, Copenhagen, 2019. : 5 : Rentz et al., 2008: Nationaler Durchführungsplan unter dem Stockholmer Abkommen zu persistenten organischen Schadstoffen (POPs), im Auftrag des Umweltbundesamtes, FKZ 205 67 444, UBA Texte | 01/2008, January 2008 - URL: <http://www.umweltbundesamt.de/en/publikationen/nationaler-durchfuehrungsplan-unter-stockholmer> : 6 : Knörr et al. (2009): Knörr, W., Heldstab, J., & Kasser, F.: Ermittlung der Unsicherheiten der mit den Modellen TREMOD und TREMOD-MM berechneten Luftschadstoffemissionen des landgebundenen Verkehrs in Deutschland; final report; URL: <https://www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/3937.pdf>, FKZ 360 16 023, Heidelberg & Zürich, 2009. **bibliography**

¹⁾ (bibcite 1)

²⁾ (bibcite 2)

³⁾ (bibcite 3)

⁴⁾ (bibcite 3)

⁵⁾ (bibcite 3)

⁶⁾ (bibcite 4)

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⁸⁾ (bibcite 5)

⁹⁾ (bibcite 4)

¹⁰⁾ (bibcite 6)

¹¹⁾ (bibcite 4)