

**The 19th meeting of the Editorial Board of the IPCC Emission Factor Database (EFDB)  
(Online meeting, April-May 2021)**

**Note  
on issues related to cement carbonation**

IPCC TFI TSU received the following materials on cement carbonation:

- from Dr. Miguel Ángel Sanjuán:
  - i. Sanjuan M.A. et al. Carbon Dioxide Uptake by Cement-Based Materials: A Spanish Case Study, Applied Sciences, 2020, 10, 339, <http://dx.doi.org/10.3390/app10010339>
- from Mr. Tomas Gustafsson:
  - ii. Andersson et al. Carbonation as a method to improve climate performance for cement based material, Cement and concrete research 124 (2019), <https://doi.org/10.1016/j.cemconres.2019.105819>
  - iii. CO<sub>2</sub> uptake in cement-containing products. Background and calculation models for IPCC implementation. Authors: Håkan Stripple, Christer Ljungkrantz, Tomas Gustafsson, Ronny Andersson. Report number: B 2309. ISBN: 978-91-88787-89-7. Commissioned by: Cementa AB and IVL research foundation. IVL Swedish Environmental Research Institute 2018. <https://www.ivl.se/publikationer/publikation.html?id=5656>

In addition, the TFI TSU received a data proposal on “CO<sub>2</sub> uptake through carbonation in cement products, annual uptake factor. Simplified method. As per cent of the annual national CO<sub>2</sub> emission from calcination of consumed cement clinker” based on the above-mentioned report (iii).

These materials were considered during the 19<sup>th</sup> meeting of the Editorial Board of the IPCC Emission Factor Database (EFDB).

The Editorial Board would like to note the following:

- Absorption of CO<sub>2</sub> by carbonation of cement materials (concrete, mortar) was considered by the authors of the 2006 IPCC Guidelines, but they concluded it was premature to include it in national GHG inventories, because of its too large uncertainty. In 2015-2016, the IPCC carried out comprehensive technical assessment of the IPCC Inventory Guidelines with cooperation of many experts from all over the world through an on-line survey and a series of expert meetings. However, this issue of carbonation of cement materials was still not identified as a high priority issue for refinement of the 2006 IPCC Guidelines. Therefore, any guidance about cement carbonation is not included in the "2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories" published in 2019, either.
- The task of the Editorial Board is to evaluate data proposals (emission factors) to be included in EFDB in accordance with its terms of reference (TOR). The TOR clarifies, in relation to one of the three acceptance criteria “applicability”, that “Data for a source or sink not explicitly identified by the IPCC Guidelines can also be included in accordance with the IPCC guidelines.” With this in mind, the Editorial Board noted that data on CO<sub>2</sub> uptake through carbonation in cement products may be accepted for inclusion in the EFDB, on condition that they meet all the acceptance criteria (robustness, applicability and documentation) and they are in accordance with the IPCC guidelines.
- Carbon dioxide absorption is indeed happening by cement-based materials over multiple years during their lifetimes. Various factors influence the absorption process, such as exposure of concrete structures to the air, different covers, porosity of concrete, moisture content, cement type and additives, the actual lifetime, etc. The submitted documents contain methodological approaches and emission factors regarding estimation

of total carbon removals by cement-based materials during their lifetime or life cycle. Also, the proposed data (23% of CO<sub>2</sub> emission from calcination of consumed cement clinker) represents total amount of CO<sub>2</sub> which is removed by the cement-based material concerned over multiple years during its lifetime.

- On the other hand, according to the 2006 IPCC Guidelines, national greenhouse gas inventories should ensure that “the time series reflect actual changes in emissions” (Chapter 1, Section 1.1 “Concepts” in Volume 1). The accurate estimates of actual emissions and removals taking place during each single year are crucial for the national greenhouse gas inventories.
- Therefore, the Editorial Board concludes that the proposed data which represents total CO<sub>2</sub> removals during the entire lifetime of cement are not appropriate for inclusion in the EFDB because it is not in accordance with the above-mentioned key concept stipulated in the 2006 IPCC Guidelines. On the other hand, however, the Editorial Board finds the submitted materials interesting and helpful as a basis for future methodological development to estimate annual actual CO<sub>2</sub> uptake through carbonation in cement-based materials. The Editorial Board would like not to draw any conclusions on methodology and emission factors for cement carbonation and would like to make the original papers available to EFDB users through the Extra-page of the EFDB website (<https://www.ipcc-nggip.iges.or.jp/EFDB/otherdata.php>).