Preparing the ground for an operational handling of long-term emissions in LCA - DTU Orbit (08/11/2017)

Preparing the ground for an operational handling of long-term emissions in LCA

Currently, there is no meaningful methodology for the estimation of environmental impacts from long-term heavy metal emissions in a life cycle assessment (LCA) context, when an assessment of landfill and mining technologies is performed. In this paper, the aims are to investigate the main issues hindering the standardisation of a methodology to account for potential impacts from long-term metal emissions, and to describe the characteristics of a robust framework for an operational impact assessment methodology.In order to demonstrate the issues around potential impacts from long-term emissions in LCA and derive a scientific basis for developing an adequate LCA methodology to address these impacts, a two-part review on long-term metal emissions is performed that (a) identifies a suitable time-dependent life cycle inventory (LCI) while underlining the problems in existing emission prediction attempts and (b) describes the existing LCA approaches for accounting of toxic potential impacts from these emissions while explaining the reason that the identified proposals have not been adopted from the LCA community. These approaches are then compared upon the basis of a common LCI and their differences are highlighted.A suitable dynamic LCI is identified for landfill emissions, which calculates Ni, Zn, Cd and Pb emissions as a function of time, based on assumed developments of the leachate pH. The results of the application of the different impact assessment methods on that LCI differ by up to 8 orders of magnitude. Therefore, the decision-making process supported by an LCA becomes very confusing. None of the approaches consider future changes in the receiving environment and are accompanied with any uncertainty considerations.In order to move towards a robust environmental assessment of long-term emissions, it is necessary to (i) represent future potential impacts more accurately by estimating time-dependent characterisation factors (CFs) corresponding to changing environmental conditions, (ii) develop more robust estimations by addressing uncertainty and (iii) refer to actual potential impacts, by taking into account the current and future background concentrations.

General information

State: Published
Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, Department of Environmental Engineering, Residual Resource Engineering, ELSA-PACT
Authors: Bakas, I. (Intern), Hauschild, M. Z. (Intern), Astrup, T. F. (Intern), Rosenbaum, R. K. (Ekstern)
Number of pages: 12
Pages: 1444-1455
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information

Journal: International Journal of Life Cycle Assessment
Volume: 20
Issue number: 10
ISSN (Print): 0948-3349
Ratings:

BFI (2017): BFI-level 2

Web of Science (2017): Indexed yes

BFI (2016): BFI-level 2

Scopus rating (2016): CiteScore 3.43 SJR 1.328 SNIP 1.423

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 2

Scopus rating (2015): SJR 1.504 SNIP 1.554 CiteScore 3.49

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 2

Scopus rating (2014): SJR 1.736 SNIP 1.738 CiteScore 3.65

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 2

Scopus rating (2013): SJR 1.666 SNIP 1.979 CiteScore 3.35

ISI indexed (2013): ISI indexed yes

Web of Science (2013): Indexed yes

BFI (2012): BFI-level 2

Scopus rating (2012): SJR 1.515 SNIP 1.701 CiteScore 2.89

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 2

Scopus rating (2011): SJR 1.581 SNIP 1.716 CiteScore 2.82

ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.447 SNIP 1.861
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.201 SNIP 1.592
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.863 SNIP 1.33
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.8 SNIP 1.22
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.6 SNIP 1.387
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.633 SNIP 1.742
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.64 SNIP 1.439
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.509 SNIP 1.733
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.295 SNIP 0.977
Scopus rating (2001): SJR 0.478 SNIP 1.481
Scopus rating (2000): SJR 1.101 SNIP 1.864
Scopus rating (1999): SJR 0.421 SNIP 1.289
Original language: English
Electronic versions:
Bakas_et_al_2015_IJLCA_pre_print_for_Orbit.pdf
DOIs:
10.1007/s11367-015-0941-4
Source: FindIt
Source-ID: 275941602
Publication: Research - peer-review › Journal article – Annual report year: 2016