

August 30, 2022

Dear Editors,

We are writing as representatives of the [International Geosynthetics Society](#) (IGS) in response to the paper published in Science of The Total Environment, Volume 804, 15 January 2022: *Weathering of geotextiles under ultraviolet exposure: A neglected source of microfibers from coastal reclamation*, by Bai et al..

The International Geosynthetics Society (IGS) is a learned society dedicated to the scientific and engineering development of geotextiles, geomembranes, related products, and associated technologies. We are registered as a non-profit corporation.

Sustainability is at the heart of what we do. IGS publications, events, lectures and research highlight the many ways that geosynthetics contribute to the United Nations Sustainable Development Goals (Touze,2021).

We are concerned that this paper incorrectly undermines these efforts and lacks scientific rigor. Indeed, a thrust of the publication *Weathering of geotextiles...* appears to be that geotextiles are a high-volume source of ocean microplastics. While our society agrees that microplastics should be avoided, the numerical values, assumptions made and conclusions drawn in the paper are seriously flawed (NOC, 2021) and result in unrealistic amounts (Dixon, 2017). A first element to support this statement is related with the assumptions made regarding the mass per unit area of geotextile and the lifetime of geotextiles. A second element is related to the amount of exposed geotextiles (to UV). Those statements are supported by the developments presented in the following two sections.

1 - Mass per unit area of geotextiles

In Section 3.4, the authors mention the following assumptions:

- An amount of fibers released in the range 0.696 to 2.267×10⁶ particles per square millimeter or 0.696 to 2.267×10¹² particles per square meter
- A typical linear density of 0.03 mg per mm, thus 3×10⁻⁵ kg/m
- An assumed average fiber length of 100nm per particle

Therefore, although not outlined in the paper, the author calculates a production rate, PR, in kg of microplastics per m² of geotextile due to exposure in the range:

$$0.696 \cdot 10^{12} \times 3 \cdot 10^{-5} \times 100 \cdot 10^{-9} \leq PR \leq 2.267 \cdot 10^{12} \times 3 \cdot 10^{-5} \times 100 \cdot 10^{-9} \quad (1)$$

Thus

$$2.088 \leq PR \leq 6.801 \quad (2)$$

Those figures are unrealistic for two reasons:

- Most geotextiles manufactured are less than 2kg/m² (Heerten, 2012) and therefore there is not enough geotextile mass available to produce this amount of microplastics.
- If the geotextiles were of sufficient mass, this calculation estimates that the entire mass of the geotextile would degrade to 100% microplastics within 1 year. This is not realistic (Koerner, 2012).

2 - Amount of geotextiles exposed to UV

The paper states in Section 3.4, "At present , the number of geotextiles used globally has reached 14 billions square meters, out of which only 2% are natural fibers. Due to different degradation mechanisms of various types of geotextiles, only the number of microfibers released by PET geotextiles under coastal reclamation was estimated. PET geotextile production accounted for up to 5% of the total production of geotextiles worldwide. For the purpose of use, geotextiles used for drainage accounted for 17% of the global market share in 2019 (Wu et al., 2020). As there was no reliable information available on the specific subject, it was assumed that 17% of PET geotextiles were used for drainage in coastal reclamation areas. It was roughly estimated that about 0.24–0.79 million tons of potential microfibers may be discharged into the environment from PET geotextiles every year."

Based on the assumptions mentioned above, the authors obtain an amount of PET geotextiles used globally and exposed equal to

$$14,000,000,000 \times 98\% \times 5\% \times 17\% = 116,620,000m^2 \quad (3)$$

Combining the previous estimates from Equations 2 and 3, the authors obtain a Global Microplastics Production as presented in Equation 4:

$$\frac{2.088-6.801kg}{m^2}/year \times \frac{1ton}{1000kg} \times 116,620,000m^2 = 0.24 - 0.79 \text{ million tons/year} \quad (4)$$

We do not agree on those figures (Freedonia, 2020). Indeed, to perform these calculations, the authors assume that all geotextiles used in drainage applications (17%), made of PET (5%), are used exposed and in coastal protection applications.

Extremely small quantities of geotextile are used for drainage in coastal reclamation areas (Bouzza, 2012). A small quantity of geotextile is used in the applications of erosion control (Rimoldi, 2021) and other coastal protections (Boucher, 2017). A vast majority of these materials are buried (Koerner, 2012), or otherwise protected by covering (Palmeria, 2021). The authors make a grave error in both extending their research from one site with specific conditions to global quantities of emissions and with the assumptions that are used to accomplish this.

We recognize that this document is likely not published in the language that it was originally authored in, however the assumptions and claims made in the document are inconsistent and incomprehensible.

We would ask that the document be significantly modified or withdrawn from publication. At a minimum, we request that this letter and our society's opinion be included with the publication as a warning to readers that there is a serious objection to this work.

Regards,

Boyd Ramsey and Preston Kendall

CHAIRS – IGS SUSTAINABILITY COMMITTEE

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