

Microplastics in Paints, Coatings and Inks (intentional and non-intentional use)



Mikhail Durkin, CCB / Marijana Tobén, BUND FoE Germany

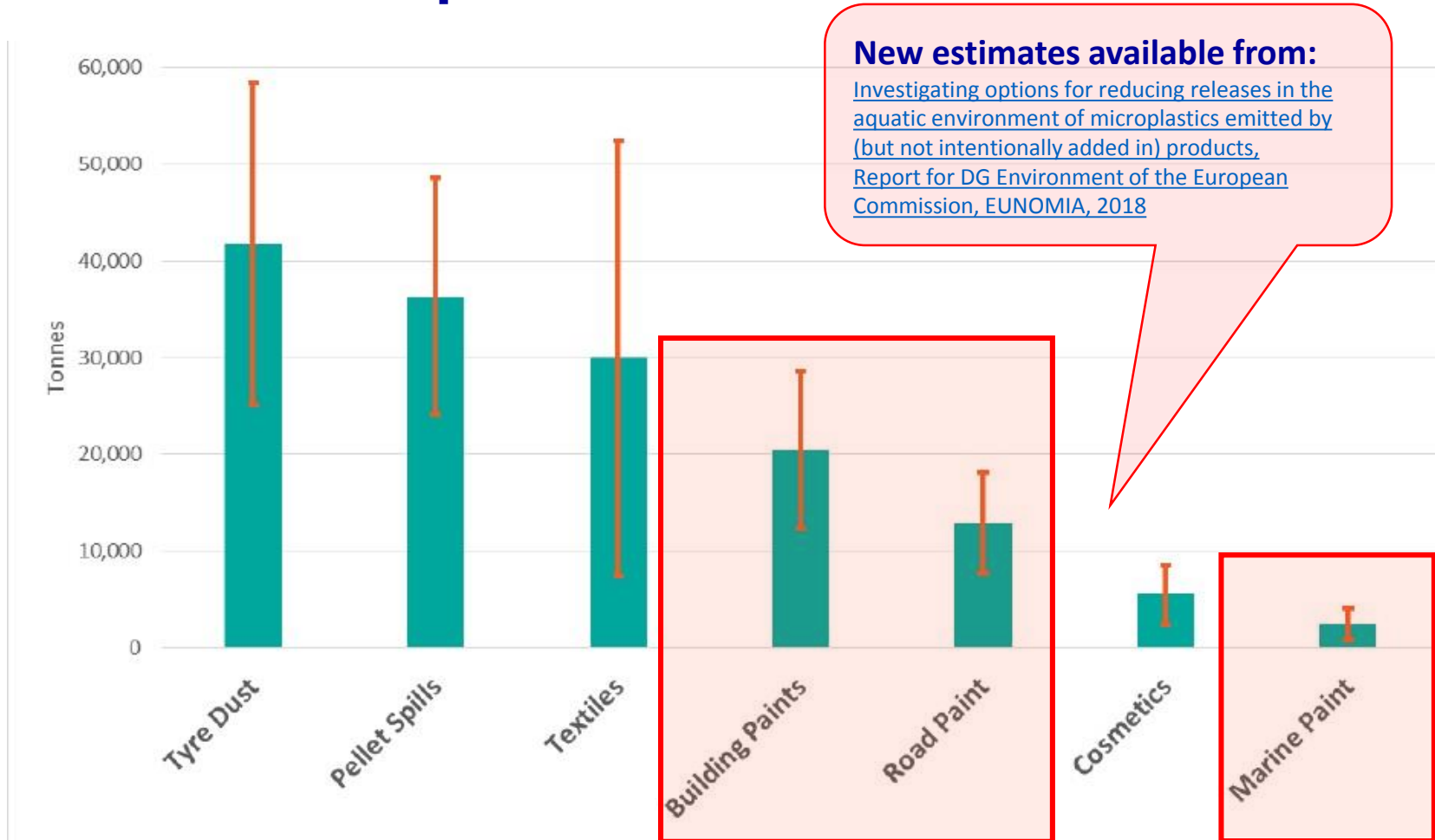
Stakeholder workshop on intentional uses of
microplastic particles - Sector-specific discussions

30-31 May 2018, ECHA, Helsinki

co-funded by
EU LIFE Programme



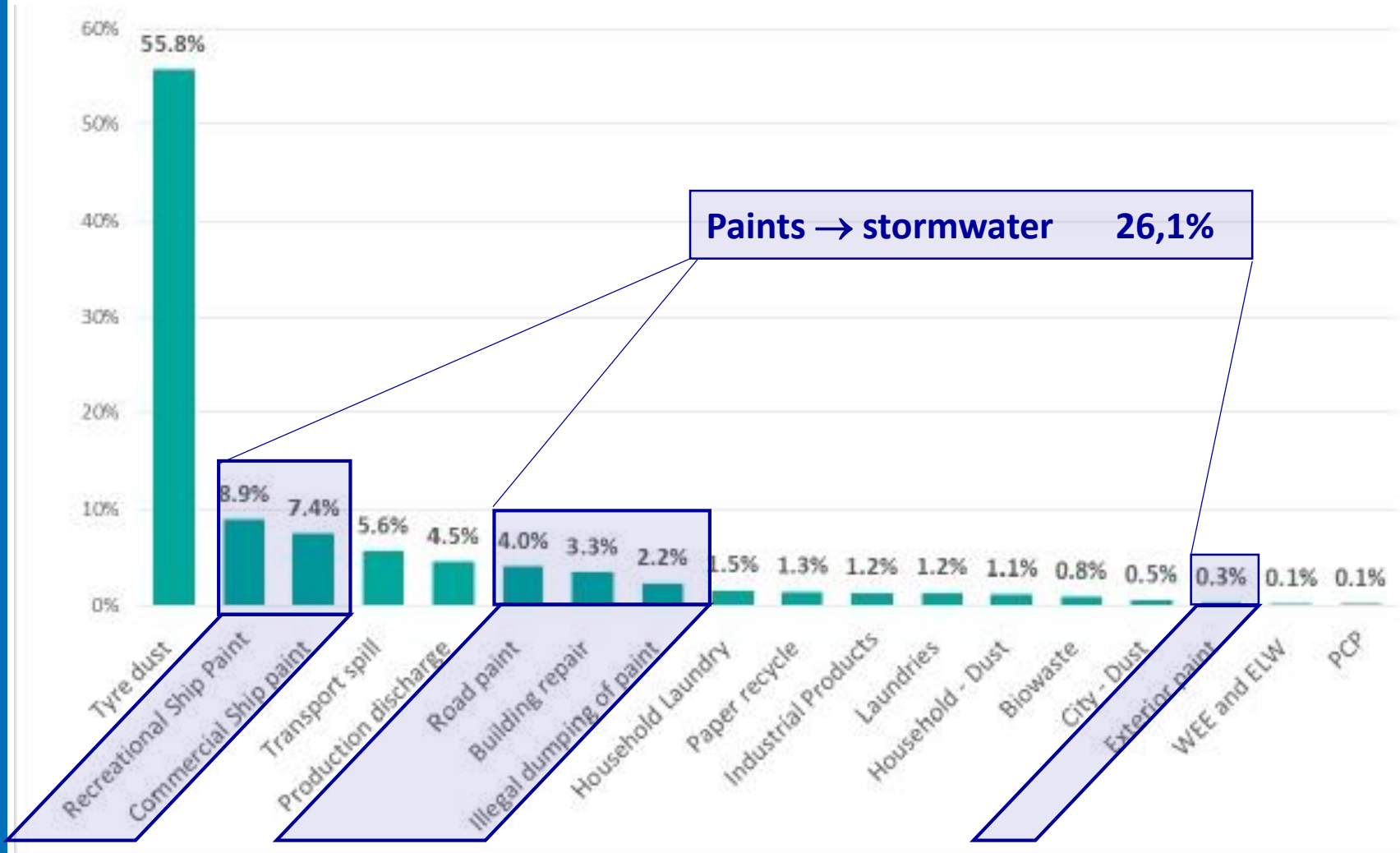
Annual Microplastic Emissions to the Marine Environment: Estimates for Europe



[Study to support the development of measures to combat a range of marine litter sources. Report for European Commission DG Environment, 2016](#)

co-funded by
EU LIFE Programme

Estimates of Primary Microplastics Proportions (Norway)



[Study to support the development of measures to combat a range of marine litter sources. Report for European Commission DG Environment, 2016](#)

co-funded by
EU LIFE Programme

Types of polymer based paints and coatings



Bund für
Umwelt und
Naturschutz
Deutschland

co-funded by
EU LIFE Programme



Type	Application / Use
1. Organic binding agents	adhesive coatings
2. Chlorinate rubber coatings (polyethylene, polypropylene or polyisoprene)	underwater coatings on ships
3. Vinyl coatings (Polyolefins, poly (vinyl halides) and vinyl halide copolymers, poly (vinyl esters), poly (vinyl alcohol), poly (vinyl acetals), poly (vinyl ethers), and polystyrene)	polishing agents, weather-resistant coatings
3.1 Coatings with Thermoplastic Fluoropolymers Poly (vinylidene fluoride), PVDF	binder for indoor and outdoor paints and textured finishes
3.2 Polystyrene and Styrene Copolymers	exterior-use paints, paints for concrete and road-marking
4. Acrylic coatings	emulsion paints for ceilings, walls, and building fronts
5. Alkyd coatings	corrosion protection and decoration in virtually all sectors
6. Polyurethane coatings	surface coatings in virtually all sectors
7. Silicon coatings	surface coatings
8. Epoxy	surface coatings

Marine paints and coatings



<http://pressurejet.com/ViewLarge.aspx?Aimg=111220090042729.jpg>



<http://billingsblasting.com/applications/boat-bottom-blasting/>

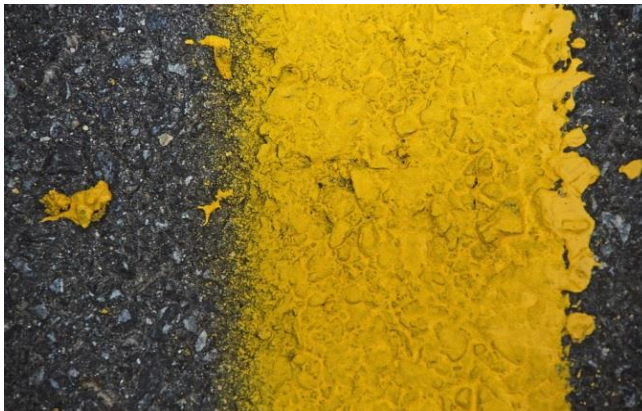
[Microplastic pollution originating from Textiles and Paints: Environmental impacts and solutions, CCB, 2017](#)

- Global **consumption** ca. 452 Ktons/year
- Global **release** (of paints used) - ca. 3.7%
- **MP losses:** 3-9% - for commercial and 10-50% for leisure boats (DIY)
 - 0.5 kg dust per m² blasted
 - 6% loss during lifetime (1.8% during painting, 1% - weathering and 3.2% during maintenance)
- Plastic/polymer **content** – up to 50%
 - Anticorrosive - vinyl, lacquer, urethane, or epoxy-based coatings.
 - Primers - one- and two-pack epoxy.
 - Finishes one and two-pack polyurethanes
 - Varnishes – often polyurethane based
- **Functions:** anticorrosion and antifouling
- **Alternatives for products and processes:**
 - Butenolide biodegradable (ϵ -caprolactone) based polyurethane
 - wetblasting, hull washing

Road paints



https://static.independent.co.uk/s3fs-public/styles/article_large/public/thumbnails/image/2013/07/29/1718-doubleyellow-pa.jpg



https://cdn.pixabay.com/photo/2012/12/05/15/27/tar-68772_960_720.jpg

[Microplastic pollution originating from Textiles and Paints: Environmental impacts and solutions, CCB, 2017](#)

- Global **consumption** ca. 588 Ktons/year, with over 31% for Europe
- Global **release** (of paints used) - ca. 7%
- **MP losses**: 23-43% (up to 100%), depending on use and climate
- **Types**
 - paint, thermoplastics, preformed polymer tape and epoxy coatings
 - Thermoplastic Acrylic Polymer and thermoplastic Styrene/Acrylic Polymer
- **Functions**: durable, adhesive, elastic, scratch and crack resistance, toughness
- **Alternatives for products and processes**:
 - using water-borne instead of solvent-borne polymer dispersions
 - No clear alternative for polymer-free paints
 - glass beads?

Exterior and interior / building paints



https://cdn.pixabay.com/photo/2015/02/11/16/29/ukraine-632618_340.jpg



<http://www.micropaints.in/images/slide/micro-plastic-emulsion.png>
https://www.auro.de/bilder/produkte/produktbilder_en/148-swedish-red-exterior-wood-paint-natural-paints.jpg?m=1422431059

Microplastic pollution originating from Textiles and Paints: Environmental impacts and solutions, CCB, 2017

- **EU market** ca. 300 Ktons/year
- **Release factors**
 - climate factors, painted texture, application (blasting & re-painting)
- **Types**
 - Solvent-borne based on synthetic resins (e.g., acrylate- styrene copolymers).
 - Polyurethane coating
- **Functions:**
 - anticorrosion and decomposition, decorative, durable
 - Service life – ca. 10 years
- **Alternatives for products and processes:**
 - Pure silicate paints
 - Inorganic binders, e.g. potassium silicate
 - Traditional water-based mineral paints!
 - Re-thinking ecolabels' criteria
 - Eco-friendly painting practices

Considerations to be addressed



- ‘Green chemistry’ initiatives should be promoted for developing polymer-free less harmful paints/coatings
- Application of eco-friendler paints should become mandatory for all sectors – forcing to seek for green chemistry solutions.
- Pure silicate paints for painting new buildings should be considered as alternative to polymer dispersions.
- Waste water collection and treatment systems should become mandatory for all shipyards - to treat contaminated effluents before discharge
- Washing water effluents from sandblasting or high pressure wash should not allowed for direct discharge to nearby waters.
- DIY paints and painting practices should be specifically addressed, as it may generate 100% particle releases

References



Bund für
Umwelt und
Naturschutz
Deutschland

co-funded by
EU LIFE Programme



- Bentley, J. (1999). Organic film formers. *Paint and surface coatings: theory and practice*, 19.
- Boucher, J., Friot, D., & Boucher, J. (2017). Primary microplastics in the oceans: a global evaluation of sources. *IUCN, Gland, Switzerland*.
- Chai, C., de Brito, J., Gaspar, P. L., & Silva, A. (2013). Predicting the service life of exterior wall painting: techno-economic analysis of alternative maintenance strategies. *Journal of Construction Engineering and Management*, 140(3), 04013057.
- Emission Scenarion documents on coating industry (Paints, Laquers and Varnishes). Nordisk ministerråd (1995). Reduksjon av utslipp fra skipsverft. (Report, in Norwegian). Tema Nord 1995:609
- Freitag, W., & Stoye, D. (Eds.). (1998). *Paints, coatings and solvents*. John Wiley & Sons.
- Grand View Research, Inc. (2016). Traffic Road Marking Coating Market Analysis By Product (Paint, Thermoplastic, Preformed Polymer Tape, Epoxy) And Segment - Forecasts To 2022.
- Lambourne, R., & Strivens, T. A. (Eds.). (1999). *Paint and surface coatings: theory and practice*. Elsevier.
- Lassen, C., Hansen, S. F., Magnusson, K., Hartmann, N. B., Rehne Jensen, P., Nielsen, T. G., & Brinch, A. (2015). *Microplastics: occurrence, effects and sources of releases to the environment in Denmark*. Danish Environmental Protection Agency.
- Ma, C., Zhang, W., Zhang, G., & Qian, P. Y. (2017). Environmentally friendly anti-fouling coatings based on biodegradable polymer and natural antifoulant. *ACS Sustainable Chemistry & Engineering*.
- Tønning, K., & Poulsen, M. D. (2007). *Nanotechnology in the Danish Industry: Survey on Production and Application*. Environmental Protection Agency
- [Microplastic pollution originating from Textiles and Paints: Environmental impacts and solutions, CCB, 2017](#)
- [Study to support the development of measures to combat a range of marine litter sources. Report for European Commission DG Environment, 2016](#)
- [Investigating options for reducing releases in the aquatic environment of microplastics emitted by \(but not intentionally added in\) products, Report for DG Environment of the European Commission, EUNOMIA, 2018](#)

Thank you for your attention!

Let's paint green!



<https://www.plasticsmakeitpossible.com/wp-content/uploads/2011/08/Paint-article1-725x482.jpg>

Östra Ågatan 53, SE-753 22 Uppsala, Sweden

+46 73-977 07 93; mikhail.durkin@ccb.se www.ccb.se