Products, Carbon & Chemicals

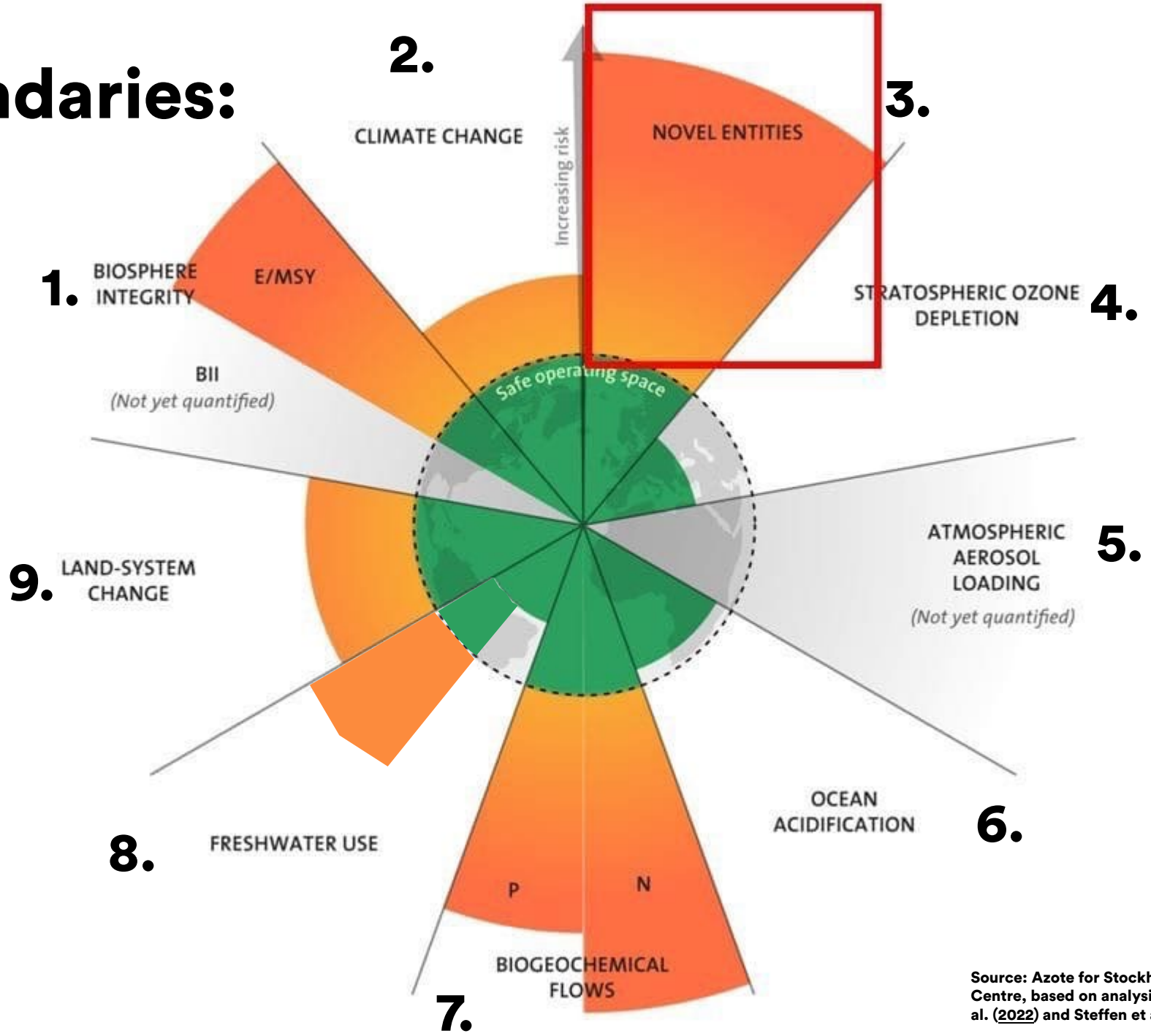
Martha Lewis, Head of Materials **Henning Larsen**

9 February 2023

The Alliance for Sustainable Building Products
Healthy Buildings Conference and Expo 2023

Triple planetary crisis

Planetary boundaries:



Source: Azote for Stockholm Resilience Centre, based on analysis in Persson et al. (2022) and Steffen et al. (2015)

Henning Larsen | Unboxing Carbon Material Catalog

The Catalog

We collect all data developed inhouse and on the course in a catalog, hoping that it will be used across the industry to minimize our collective footprint.

Read more and download the latest version available.

www.henninglarsen.com

CARBON COMPARISONS 1 M2 OF INTERIOR CLADDING
TYPES OF INTERIOR CLADDING

25.6 kg CO2e
LESS yellow brick, Egernsund Wienerberger
type: yellow-firing clay, biogas
thickness: 108mm
density: 1463 kg/m3
lifetime: 150 years
EPD no: MD-21029-EN

41.8 kg CO2e
Yellow Brick, Randers Tegl
type: Yellow-firing clay, Vindø Brickyard
thickness: 108 mm
density: 1800 kg/m3
lifetime: 150 years
EPD no: MD-20030-EN

47.9 kg CO2e
Grey Bricks, Randers Tegl
type: grey, yellow, and red firing clay
thickness: 108mm
density: 1825 kg/m3
lifetime: 150 years
EPD no: MD-17002-EN_rev1

50.1 kg CO2e
Yellow Brick, Matzen Tegl
type: Yellow-firing clay
thickness: 108 mm
density: 1600 kg/m3
lifetime: 150 years
EPD no: MD-20044-EN

59.7 kg CO2e
D-bricks, Petersen Tegl A/S
type: yellow- and red-firing clay, German and British clay
thickness: 108 mm
density: 1825 kg/m3
lifetime: 150 years
EPD no: MD-19006-EN

60.1 kg CO2e
Yellow Brick, Randers Tegl
type: yellow-firing clay, Hammershøj Brickyard
thickness: 108 mm
density: 1825 kg/m3
lifetime: 150 years
EPD no: MD-18015-EN

Impacts from production only, A1 - A3
Transport and end of life not included
Data from 3. party verified EPDs valid on

June XX, 2021

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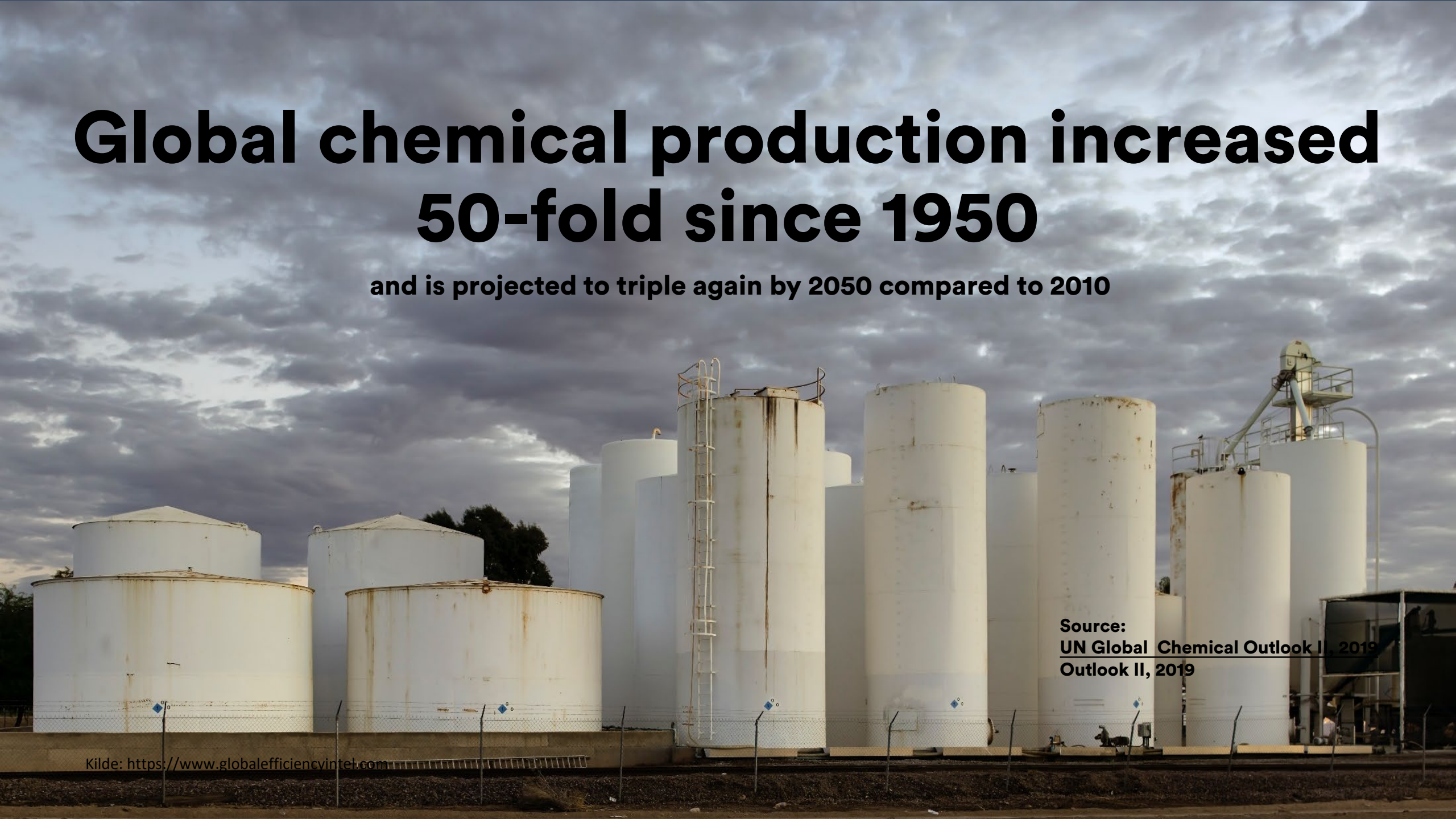
Novel Entities

Global chemical production increased 50-fold since 1950

and is projected to triple again by 2050 compared to 2010

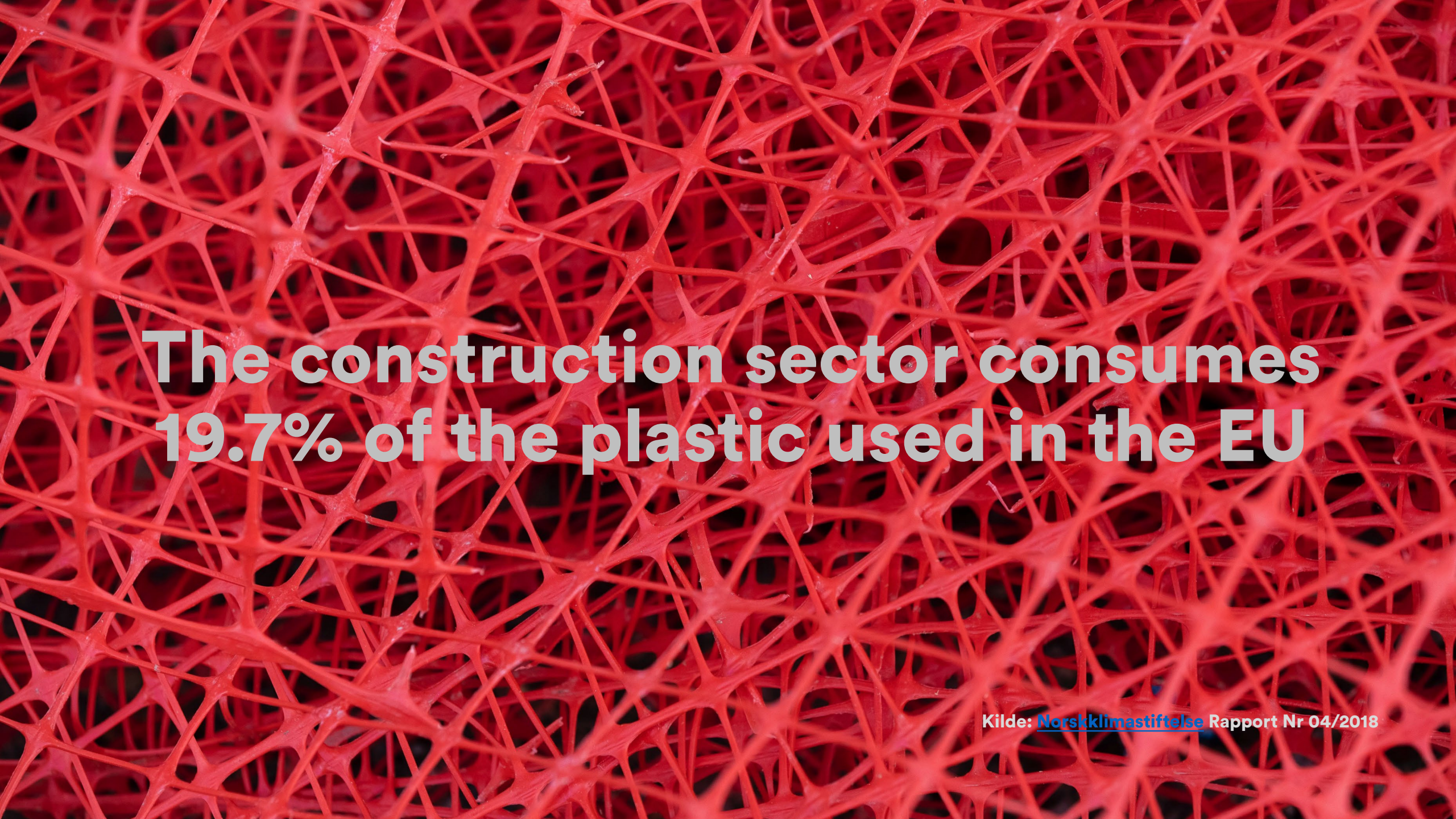


Source:
UN Global Chemical Outlook II, 2019
Outlook II, 2019

Kilde: https://www.globalefficiencyintel.com

Construction sector consumes 28% of global chemical production.

Source:
UN Global Chemical Outlook II, 2019
Photo by Dorsa Masghati on Unsplash



Kilde: Norskklimastiftelse Rapport Nr 04/2018

Source:
Plastic Paints the Environment, Paruta et al., EAEnvironmental Action 2022

58% of microplastic leaked to the oceans is from paint

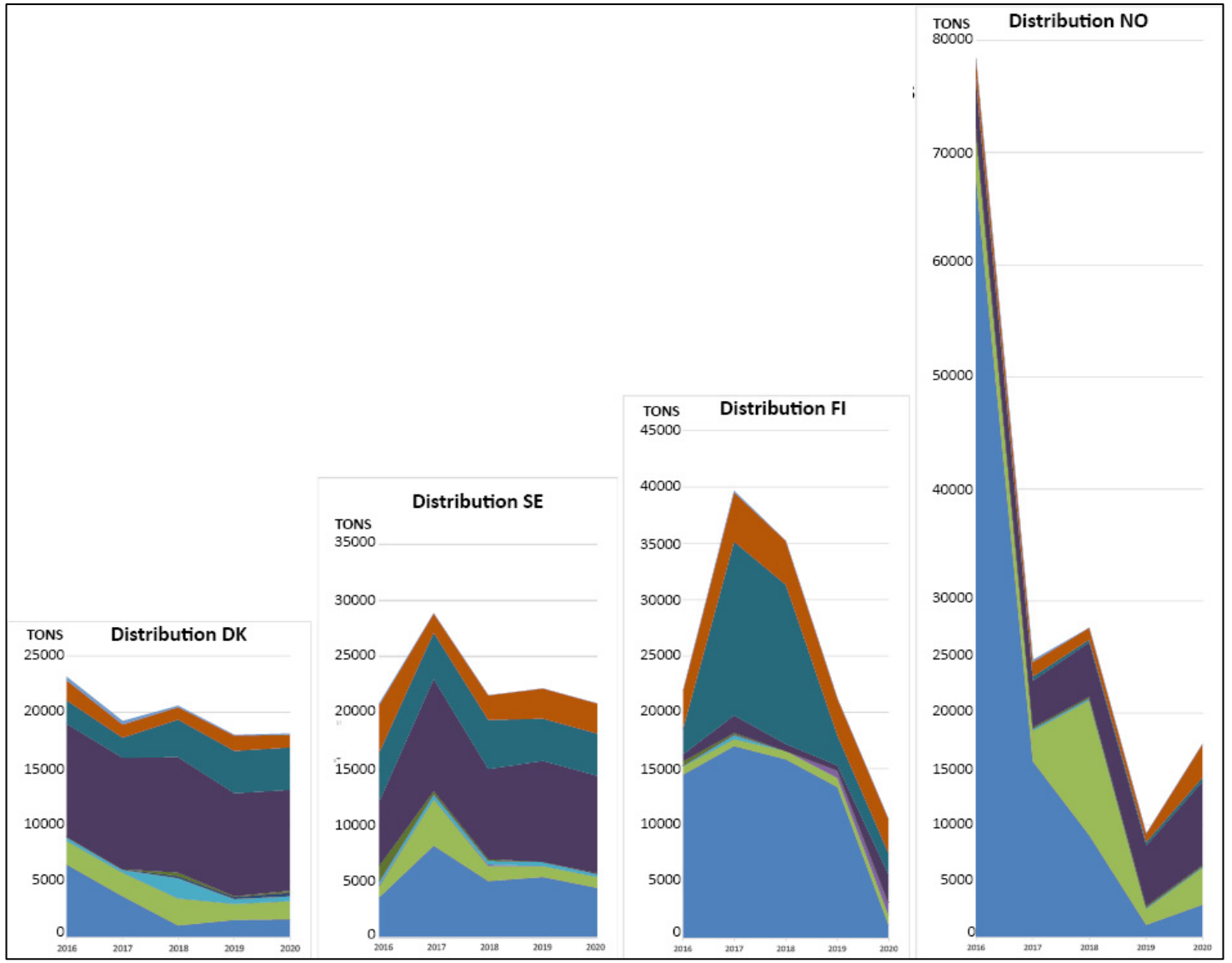
Hazardous Chemical Usage

(EU REACH) (DENMARK)

Tons per year of SVHC & LOUS Substances

Declared in Construction Products

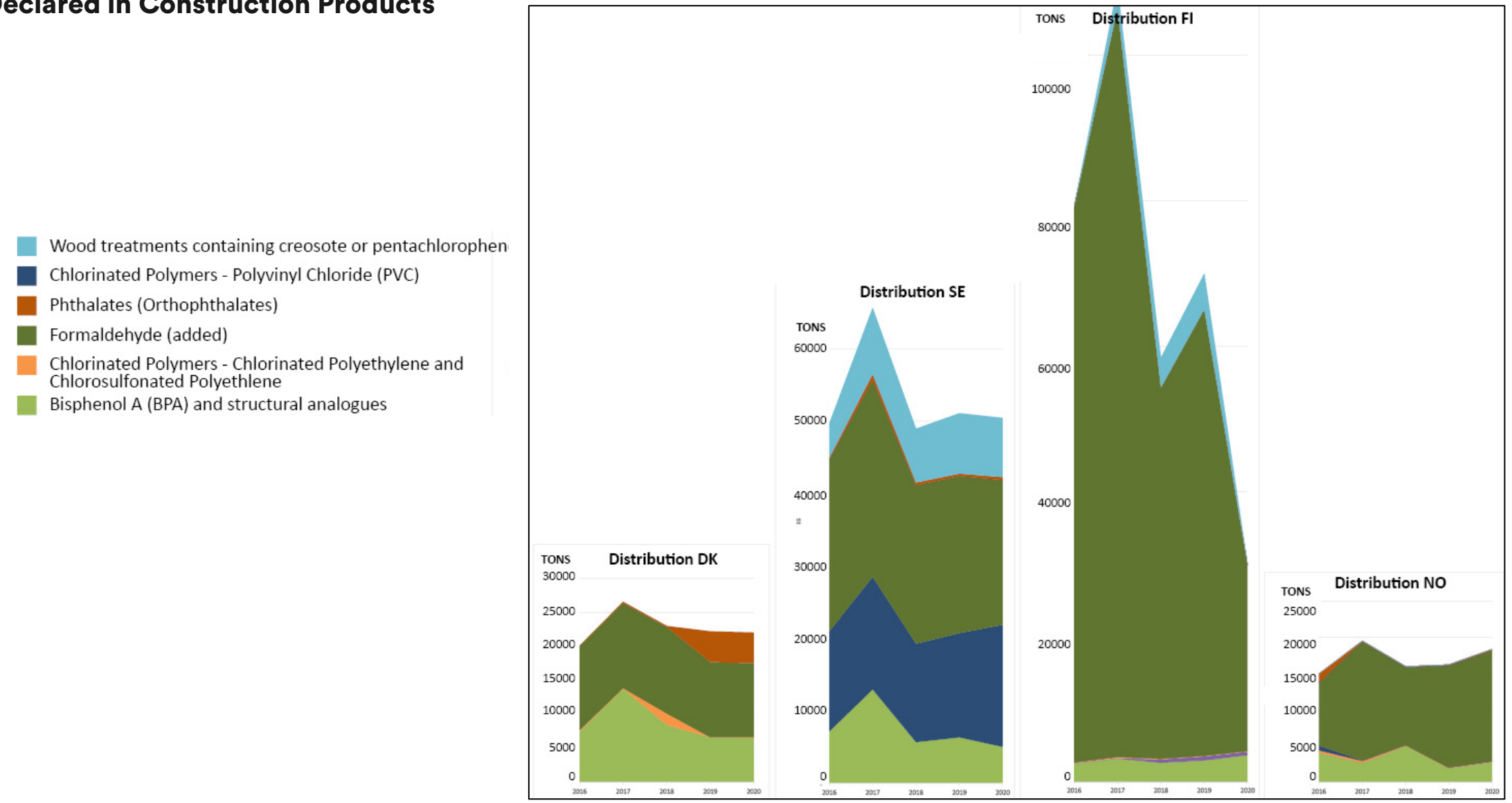
- Surface treatment
- Paints, lacquers and varnished
- Solvents
- Non-agricultural pesticides and perservatives
- Fillers
- Construction materials
- Adhesives, binding agents



SPIN database, 2022

Tons per year of LBC Red List Substances

Declared in Construction Products

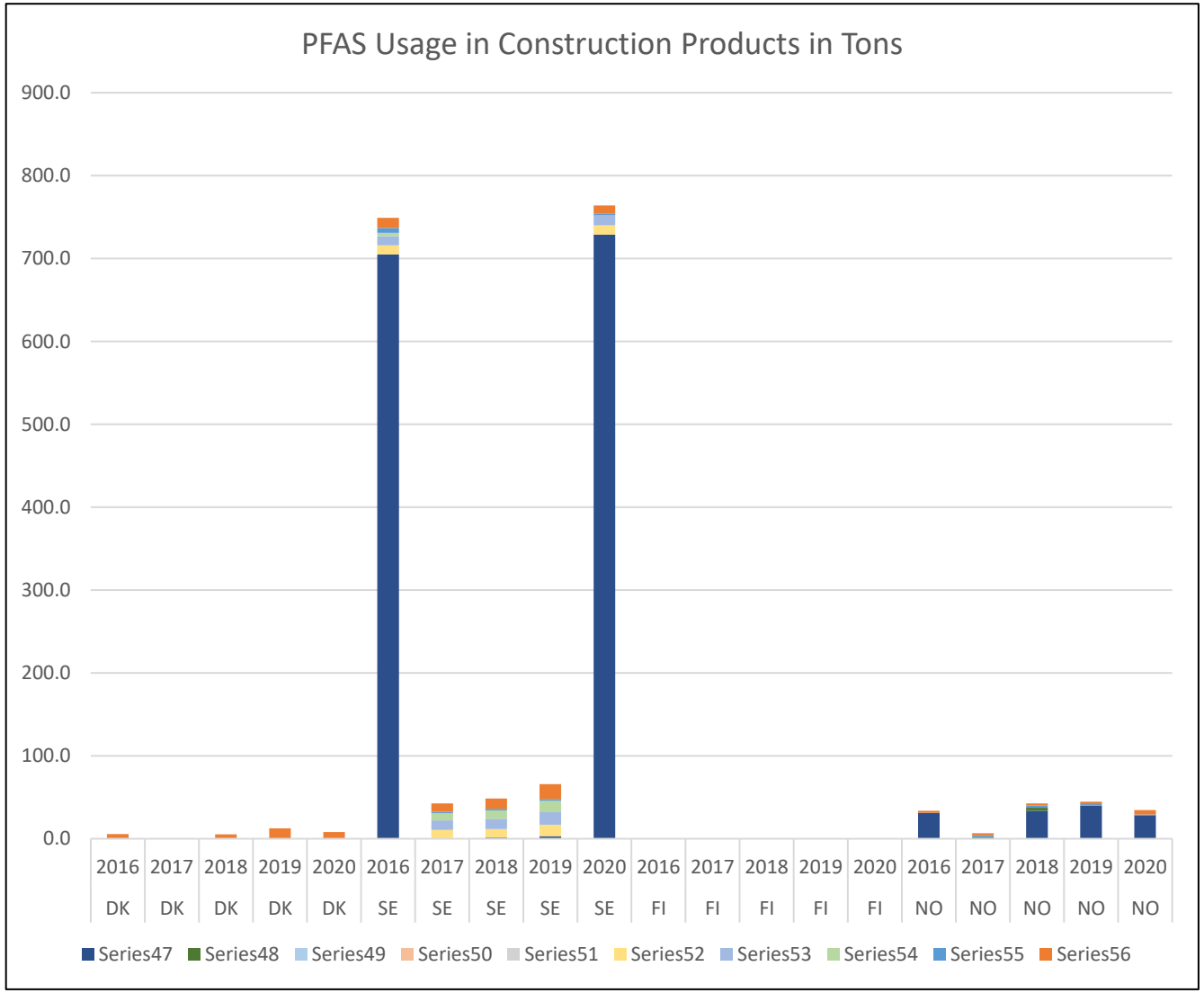


SPIN database, 2022

Use of PFAS in construction products

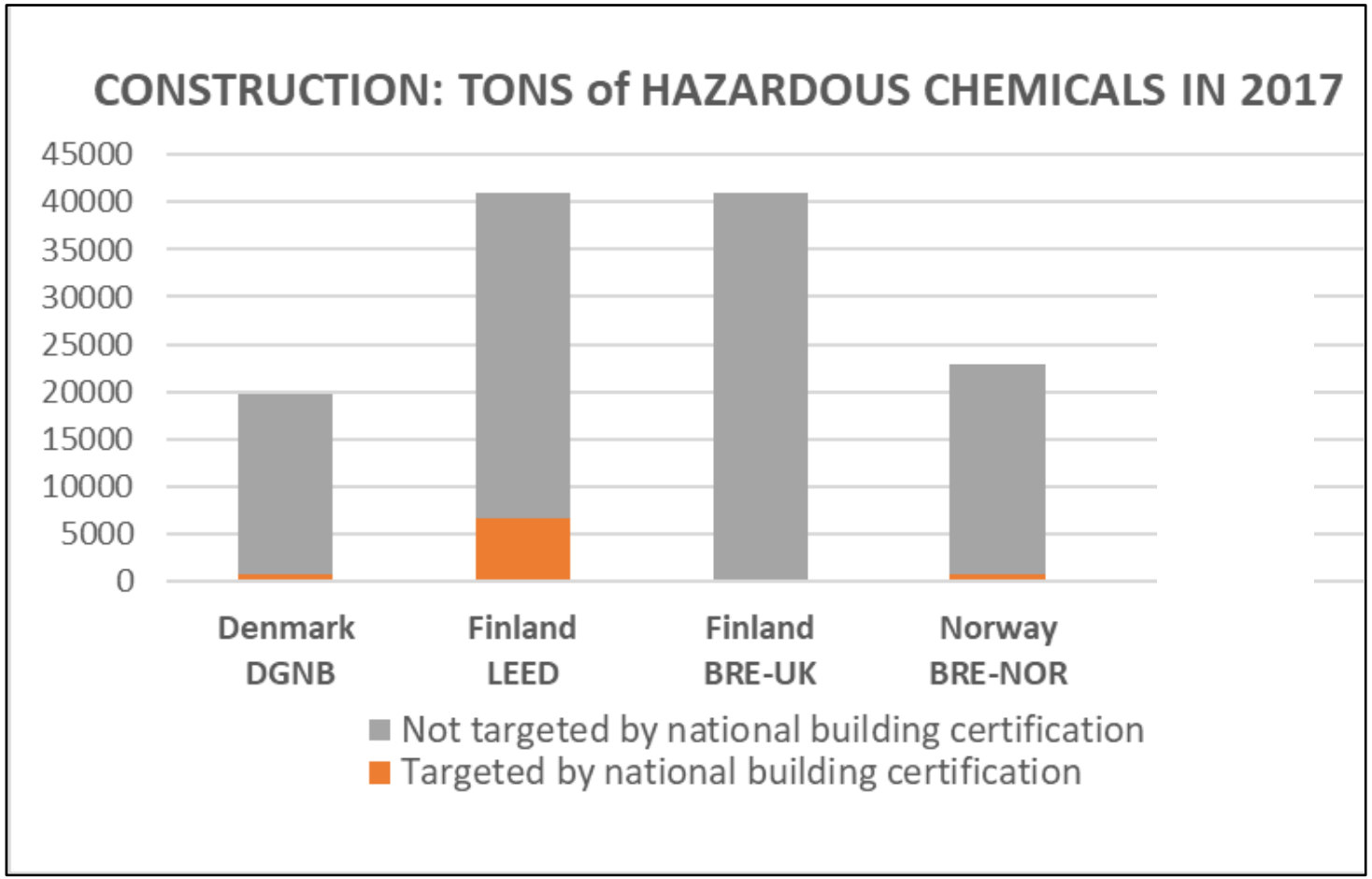
Used in paints, adhesives, flame retardants

- Increased risk of kidney or testicular cancer
- Increased cholesterol levels
- Decreased vaccine response in children
- Changes in liver enzymes
- Increased risk of high blood pressure or pre-eclampsia in pregnant women
- Small decreases in infant birth weights



SPIN database, 2022

Certification systems are NOT screening for the hazardous chemicals in use in Nordic Countries



Martha Lewis 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **588** 032064

How to navigate

Eliminate substances in products based on properties

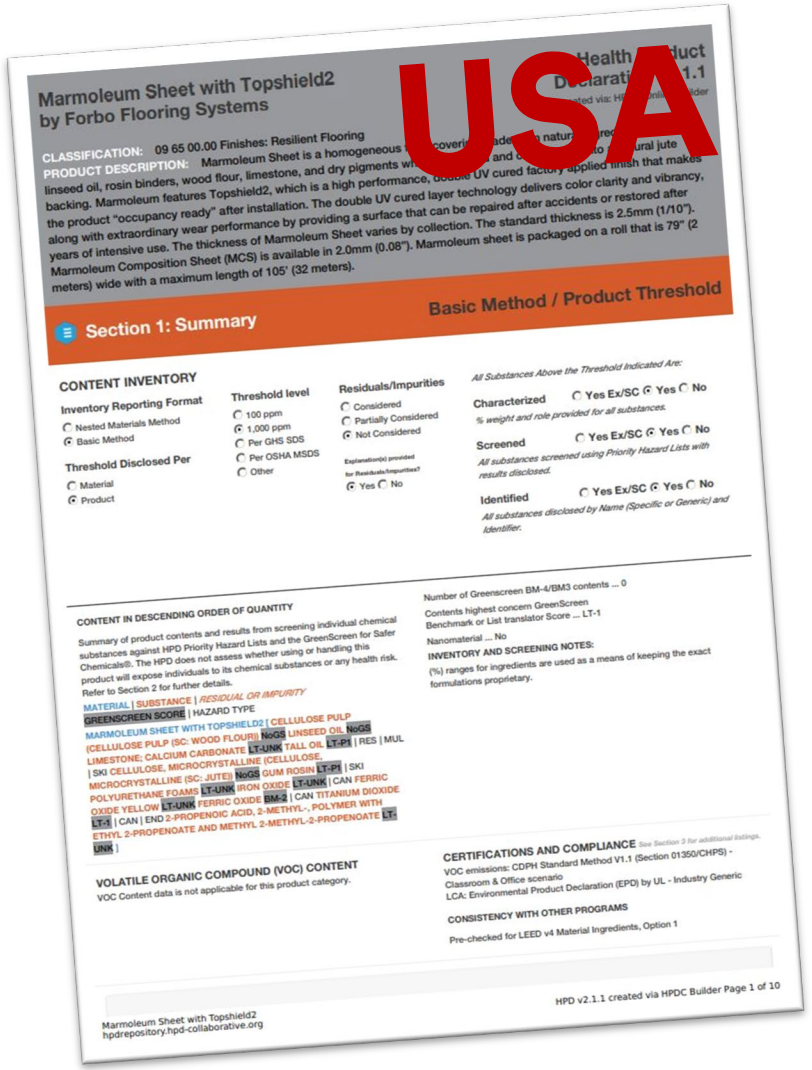
Phase-out properties as defined by the Swedish Chemicals Agency

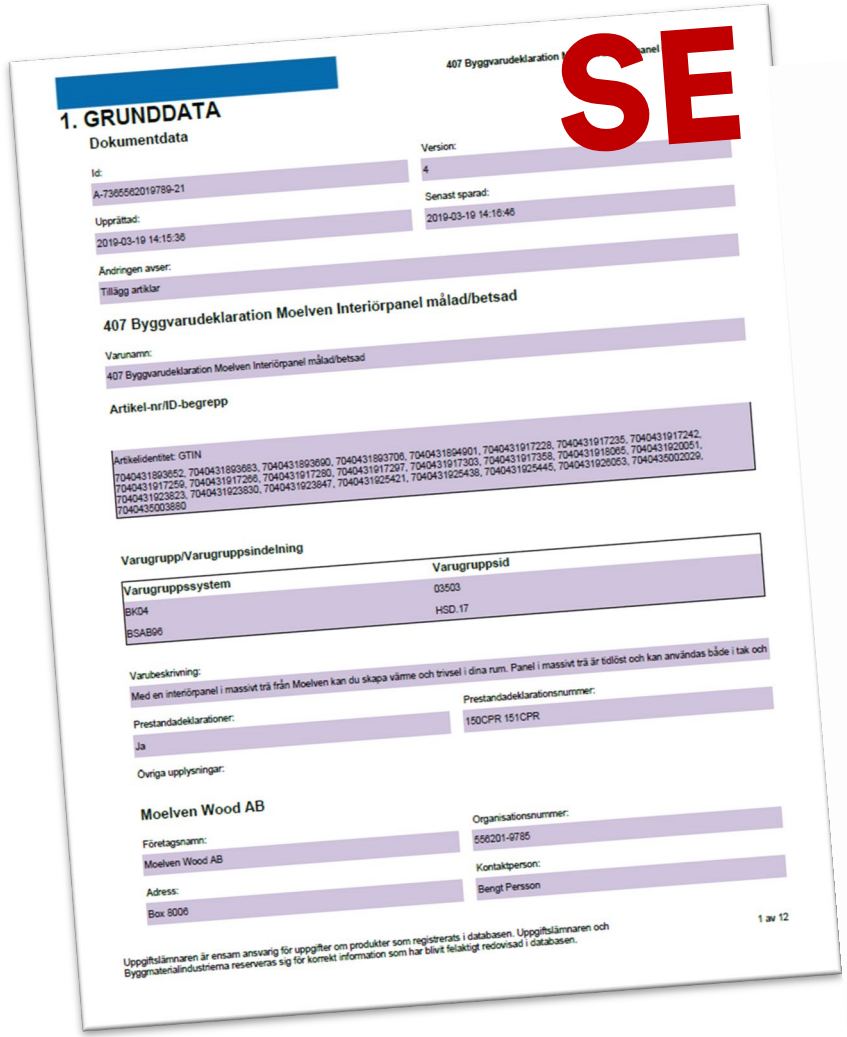
Properties	Classification according to the CLP regulation for determination of the intrinsic properties	Maximum concentration in BREEAM-SE
Carcinogenic	(Carcinogenicity, Category 1A and 1B) **H350**: May cause cancer...*	0.1%
Mutagenic	(Germ cell mutagenicity, Category 1A and 1B) **H340**: May cause genetic defects...*	0.1%
Toxic to reproduction	(Reproductive toxicity, Category 1A and 1B) **H360**: May damage fertility or the unborn child...*	0.3%
Endocrine disrupter	Substances classified in categories 1 and 2 in the EDs database (List from the European commission available at http://ec.europa.eu/environment/archives/docum/pdf/bkh_annex_01.pdf)	0.1%
Particularly hazardous metals (Cd, Hg, Pb)	Mercury, cadmium, lead and compounds of these metals are all phase-out substances. Specific criteria are not because the presence of these metals is enough.	Cd 0.01% Hg 0.1% Pb 0.1%
PBT /vPvB – Persistent, Bioaccumulating, Toxic / very Persistent, very Bioaccumulating	Criteria available at www.kemi.se	0.1%
Ozone-depleting substances (0,1%)	(Hazardous to the ozone layer) **EUH059**: Hazardous to the ozone layer **H420**: Harms public health and environment by destroying ozone in the upper atmosphere.	0.1%
Strongly allergenic	(Resp. Sens category 1) **H334:** may cause allergy or asthma symptoms or breathing difficulties if inhaled. (Skin Sens. category 1A) **H317**: May cause an allergic skin reaction.	
Particularly persistent substances (PFAS)	Per- and polyfluoroalkyl substances, PFAS, have due to their extreme persistence comparable hazardous properties to those of particularly hazardous substances defined in Sweden's environmental quality objectives A Non-Toxic Environment. PFAS should therefore from a precautionary perspective be treated similarly to other particularly hazardous substances and be phased out.	

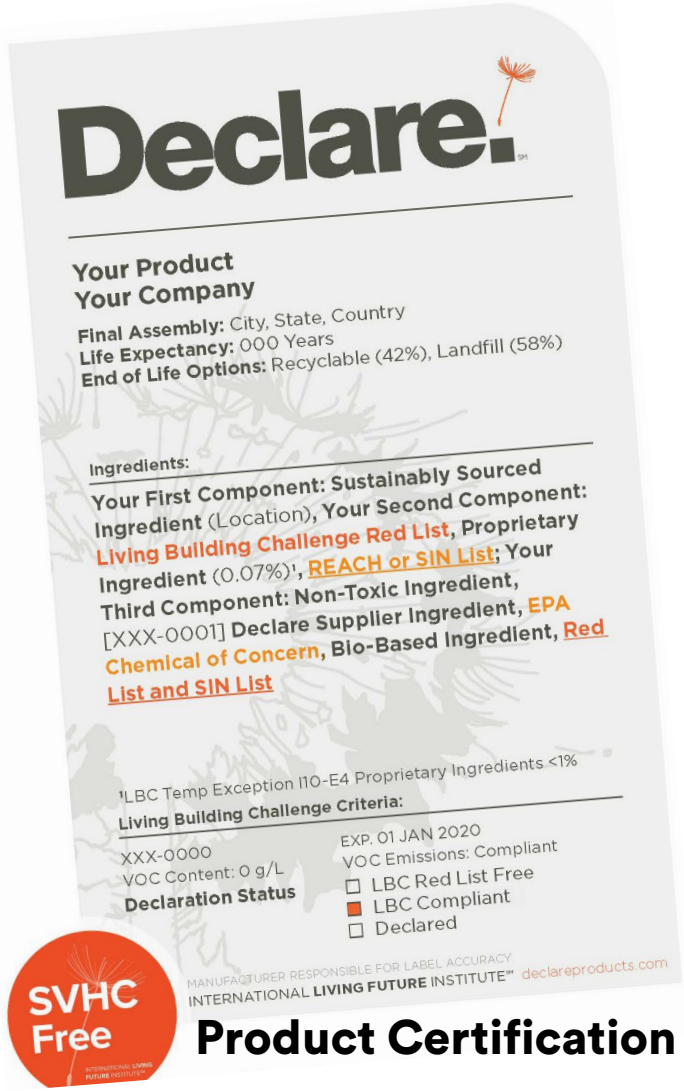
Risk-reduction properties defined by the Swedish Chemicals Agency

Properties	Classification according to the CLP regulation for determination of the intrinsic properties	Maximum concentration in BREEAM-SE
Very high acute toxicity	Acute toxicity, Category 1 and 2 **H330**: Fatal if inhaled **H310**: Fatal in contact with skin **H300**: Fatal if swallowed (Specific target organ toxicity after single exposure) **H370**: Cause damage to organs.	1%
Allergenic	Classification Skin sensitisation in Category 1 or 1B (Skin Sens. 1/1B) **H317**: May cause an allergic skin reaction.	1%
High chronic toxicity	(Specific target organ toxicity after repeated exposure) **H372**: Cause damage to organs trough prolonged or repeated exposure.	1%
Mutagenic (1 %)	(Germ cell mutagenicity, Category 2) **H341**: Suspected of causing genetic defects	1%
Environmentally hazardous, long-term effects	(Hazardous to the aquatic environment, Chronic Category 1 and 4) **H410**: Very toxic to aquatic life with long lasting effects. **H413**: May cause long lasting harmful effects to aquatic life	H410: 2.5% H413: 25%
Potential PBT / vPvB	Criteria available at: www.kemi.se	0.1%
Carcinogenic	Classification Carcinogenicity in Category 2 **H351**: Suspected of causing cancer.	
Toxic to reproduction	Classification Reproductive toxicity in Category 2 or additional Category for effects on or through breast-feeding: **H361**: Suspected of damaging fertility or the unborn child. **H362**: May cause harm to breast-fed children.	

Product declarations are necessary







Health Product Declaration HPD

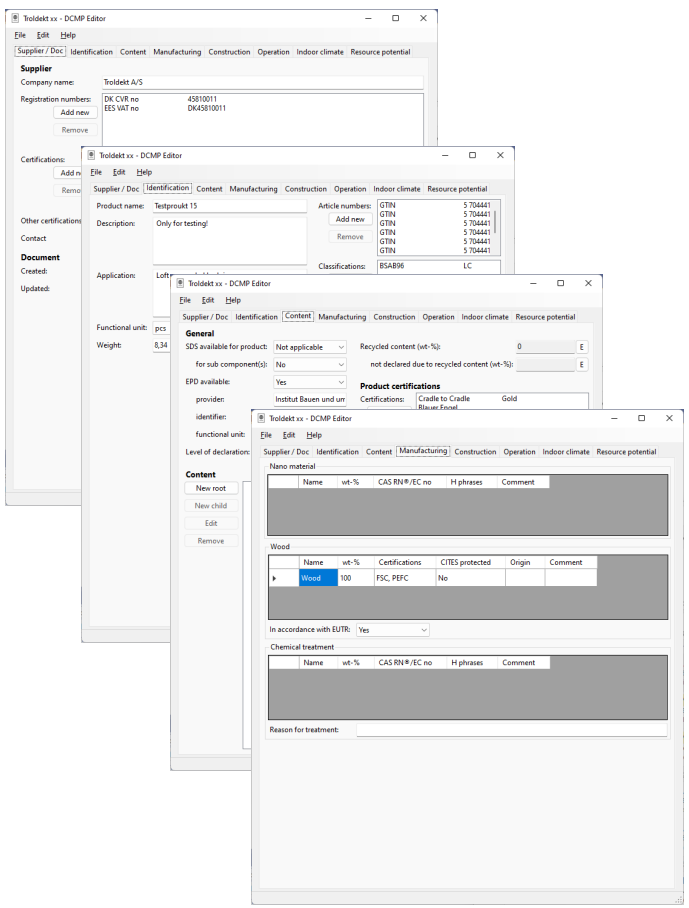
Byggevaredeklaration BVD

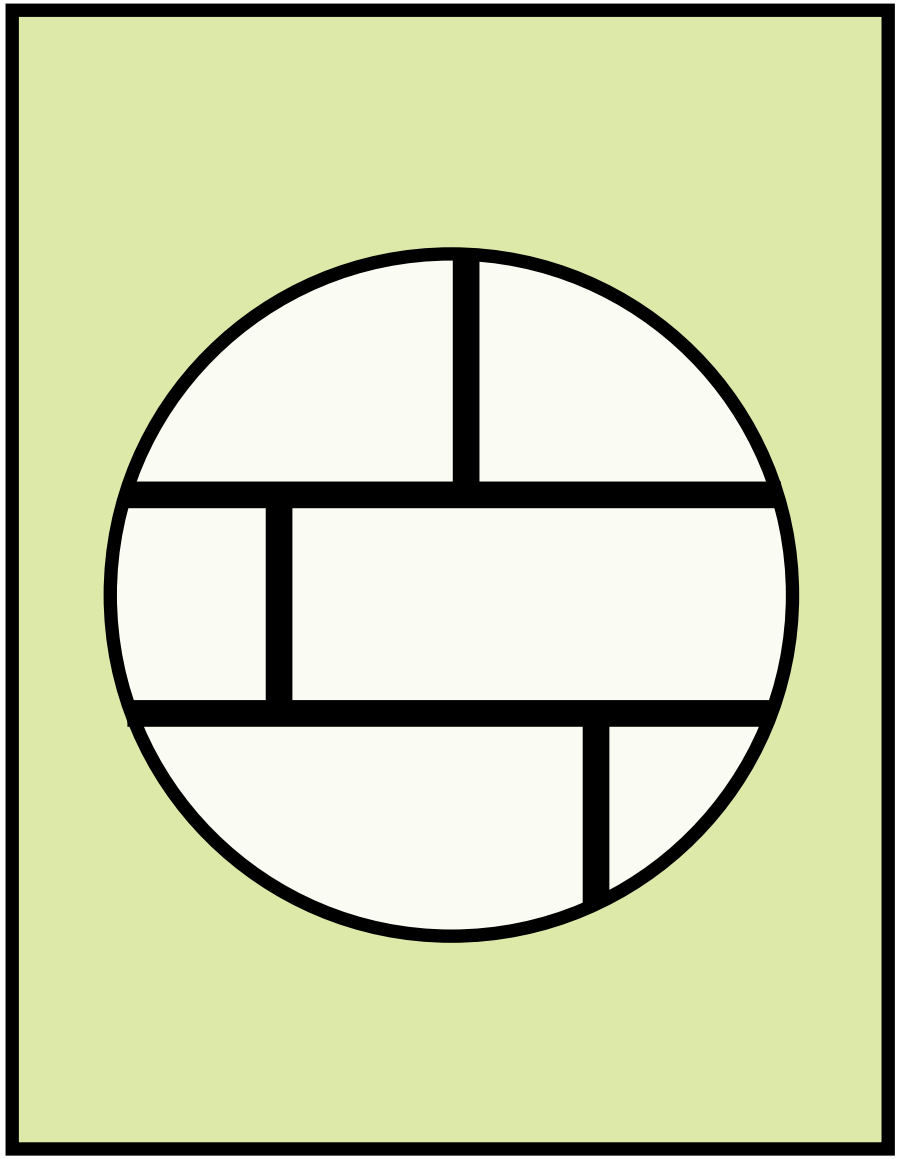
SVHC Free

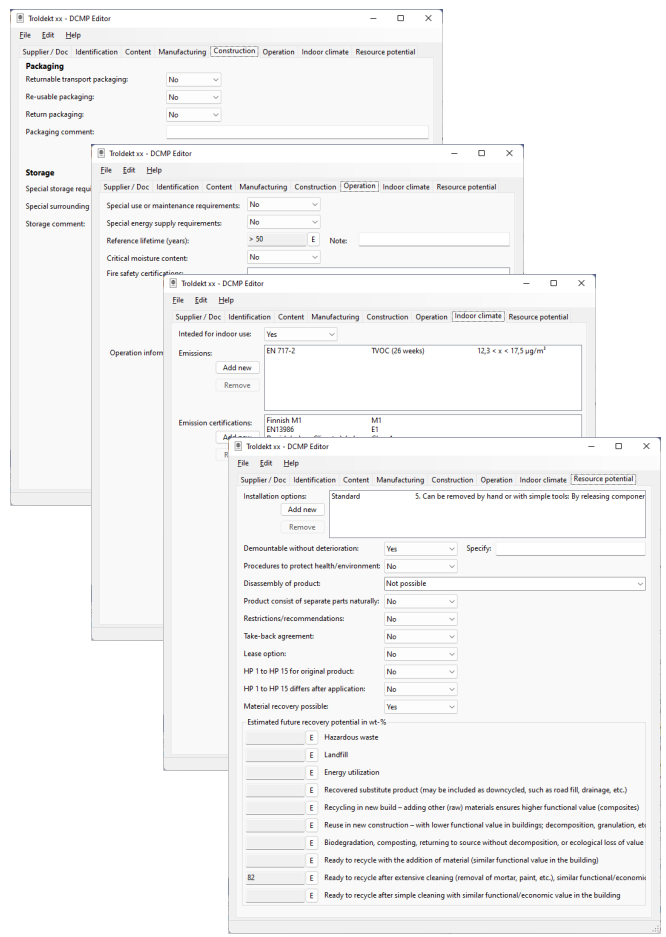
Product Certification


To minimize adverse impacts on human health and the environment, material declarations are necessary
Henning Larsen

Digital Construction Material Passport -tool launched Jan. 2023







Circular Build Forum

www.materialpass.org

NREP SundaHus Henning Larsen

Education: PFAS in building products

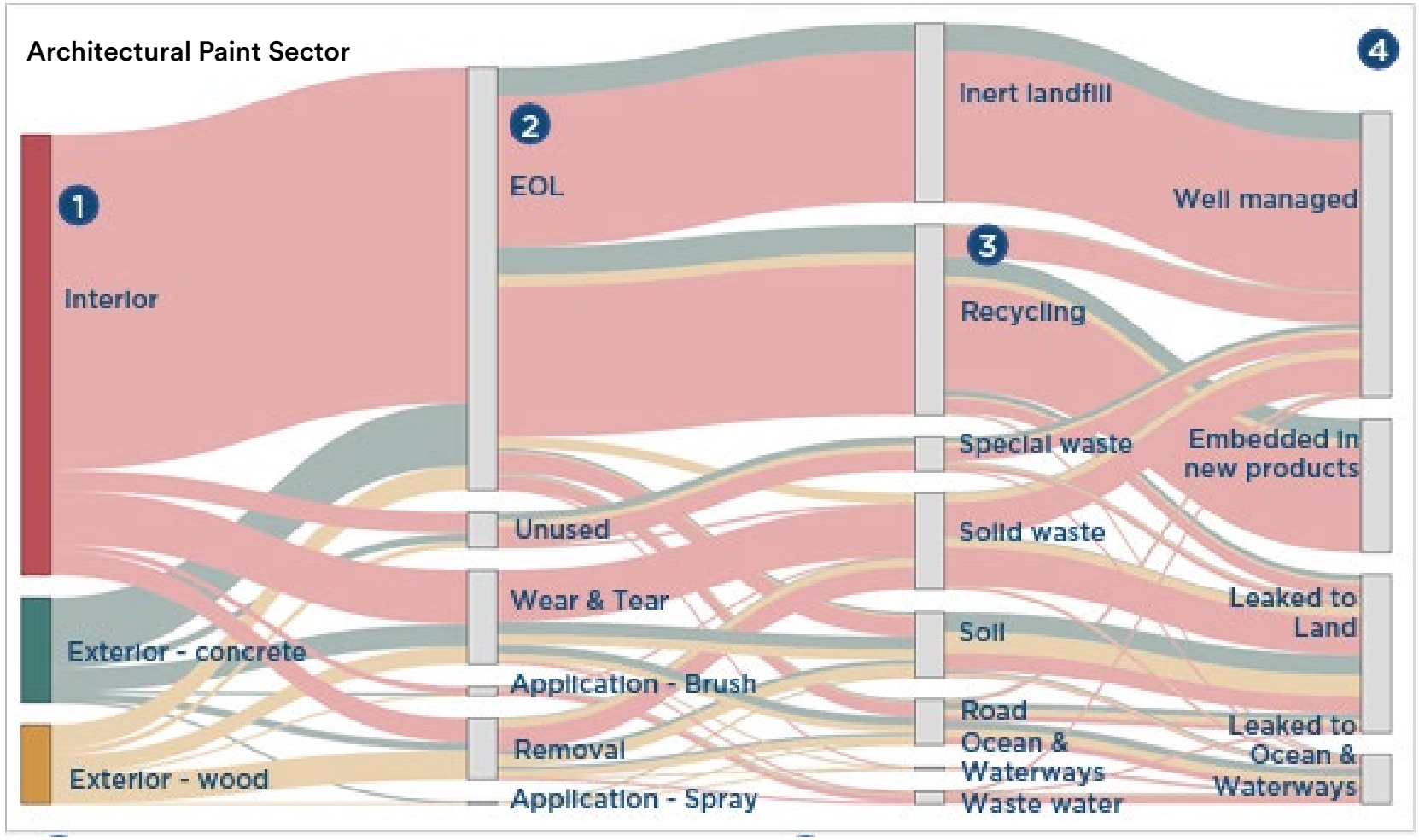
PFAS ”Forever Chemicals” in:

- Roofing
- Coatings
- Flooring
- Sealants and Adhesives
- Glass
- Fabrics
- Wires and Cables
- Tape
- Timber-Derived Products
- Solar Panels
- Artificial Turf
- Seismic Damping Systems

Source:
Green Science Policy Institute, 2021

Education: Architectural paint - polymer based

Is 48% of global paint-related plastic pollution



46%

21%

25%

8%

3,573. kt leakage / year

Source:
Plastic Paints the Environment, Paruta et al., EAEnvironmental Action 2022

Specify: linseed oil, clay, lime, silicate, casein paint

Instead of paints with plastic binders

Reassess our material economy

Henning Larsen

. . . from mineral to biobased

LTL Architects, Manual of Biogenic House Sections, 2022

Rammed earth photo credit: Dominique Gauzin-Müller <

Reassess the triple bottom line: