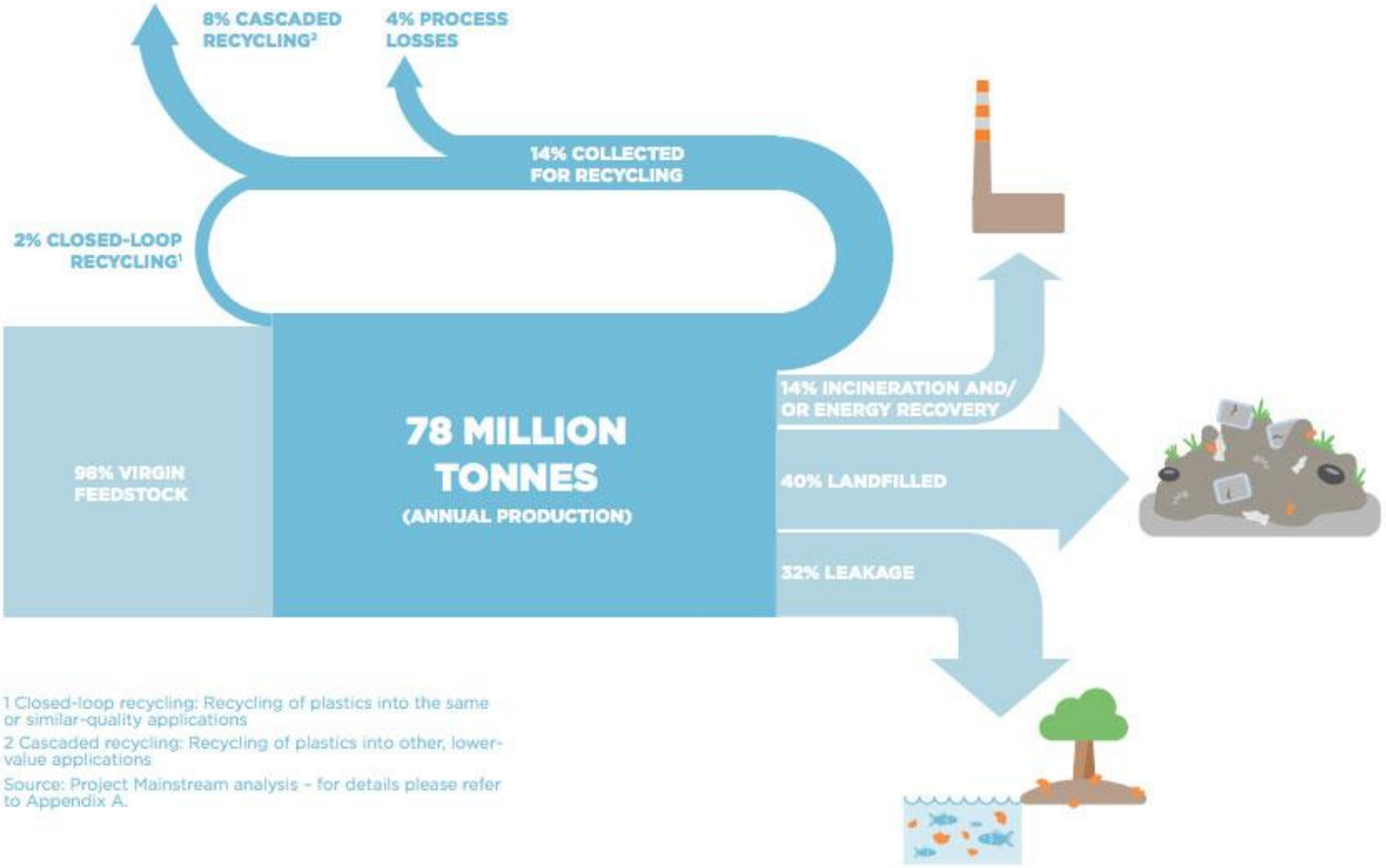
Microplastics in Cosmetics:
A RapidlyEmerging Environmental Concern

May 2017
Manila

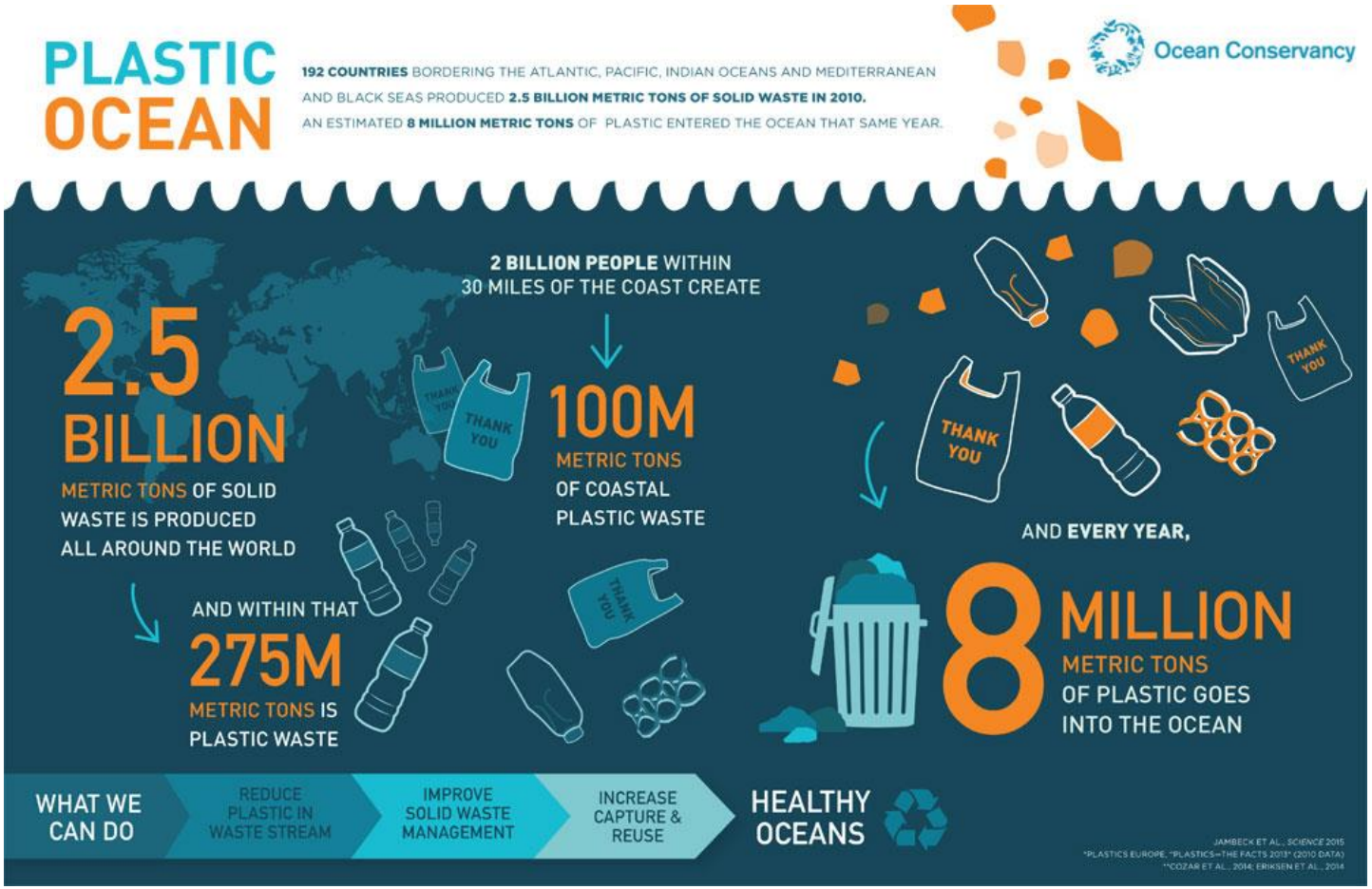
Microplastics in Cosmetics

- Why are microplastics a concern?
  - Marine litter
    - Increased global concern around ocean plastics
    - Impacts on fish, other marine life and the food chain
    - Ability to collect persistent toxic pollutants
- What is a microplastic?
  - Microplastics vs. microbeads
- Where are microplastics used in cosmetics?
- Ban The Microbead NGO/ UNEP Campaign (2012-2013)
- Industry Voluntary Efforts
  - US Personal Care Products Council & Cosmetics Europe (2015)
  - ASEAN Cosmetics Association Statement (Jan 2017)
- Global Regulation
- Finding safer alternatives
- References and Resources

Ellen MacArthur Foundation: Circular Economy
New Plastics Economy Report January 2016



Rising Concern Around Ocean Plastic



Plastics to Outweigh Fish by 2050?

- **IF** current production and use trends continue
- 95 percent of ***plastic packaging*** is lost to the economy every year after single use, costing an estimated $80-120 billion (£56-84 billion)
- 5 percent is recycled effectively, around 40 percent is buried in landfill, and a third of all plastic produced each year finds its way into the world's oceans.
- equivalent to dumping the contents of one garbage truck a minute into the marine environment.


HOW LONG UNTIL IT'S GONE?
Estimated decomposition rates of common marine debris items
Waxed Carton
3 months
Plastic Grocery Bag
10 – 20 years
Plywood
1 – 3 years
Disposable Diaper
450 years
Cigarette Butt
1 – 5 years
Foamed Buoy
50 years
Wool Socks
1 – 5 years
Plastic Bottle
450 years
Photo-degradable
Beverage Holder
6 months
Aluminium Can
200 years
Fishing Line
600 years
Styrofoam Cup
50 years
Tin Can
50 years
Plastic Beverage Holder
400 years
Glass Bottle
undetermined
Cotton Shirt
2 – 5 months

PLASTICS IN THE MARINE ENVIRONMENT:
WHERE DO THEY COME FROM? WHERE DO THEY GO?

eunomia

LAND BASED - INLAND - 0.50 Mtpa

LAND BASED - COASTAL
9
Million tonnes per annum

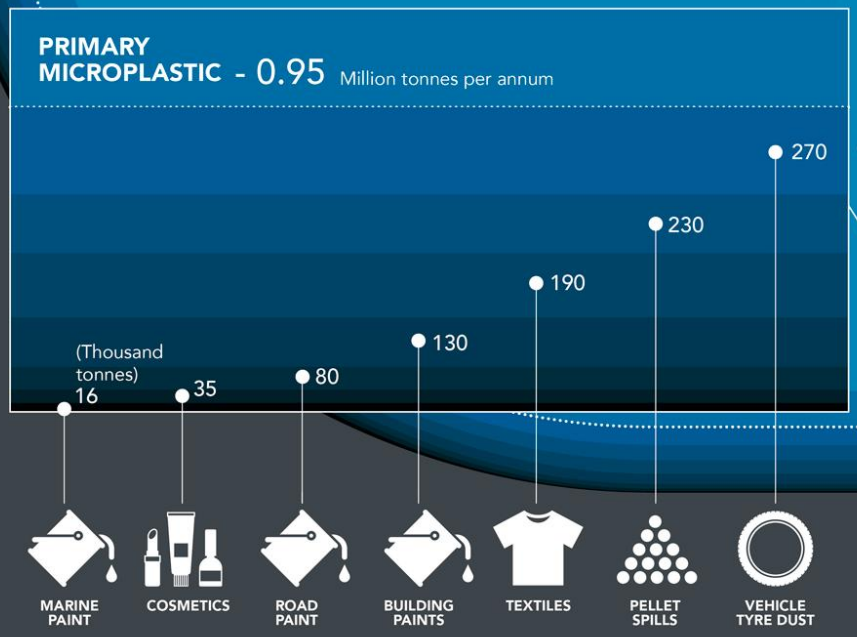
AT SEA
1.75
- **FISHING LITTER** - 1.15
- **SHIPPING LITTER** - 0.60

TOTAL PLASTIC ENTERING THE MARINE ENVIRONMENT
12.2
Million tonnes per annum

BEACHES
2,000kg/ km² (5% of total)

OCEAN SURFACE
18kg/ km²
(1% of total)*

PRIMARY MICROPLASTIC - 0.95 Million tonnes per annum



SEA FLOOR
70kg/ km² (94% of total)

*Peak concentration found in North Pacific gyre. Average concentration globally is <1kg per km²

What is a microplastic?

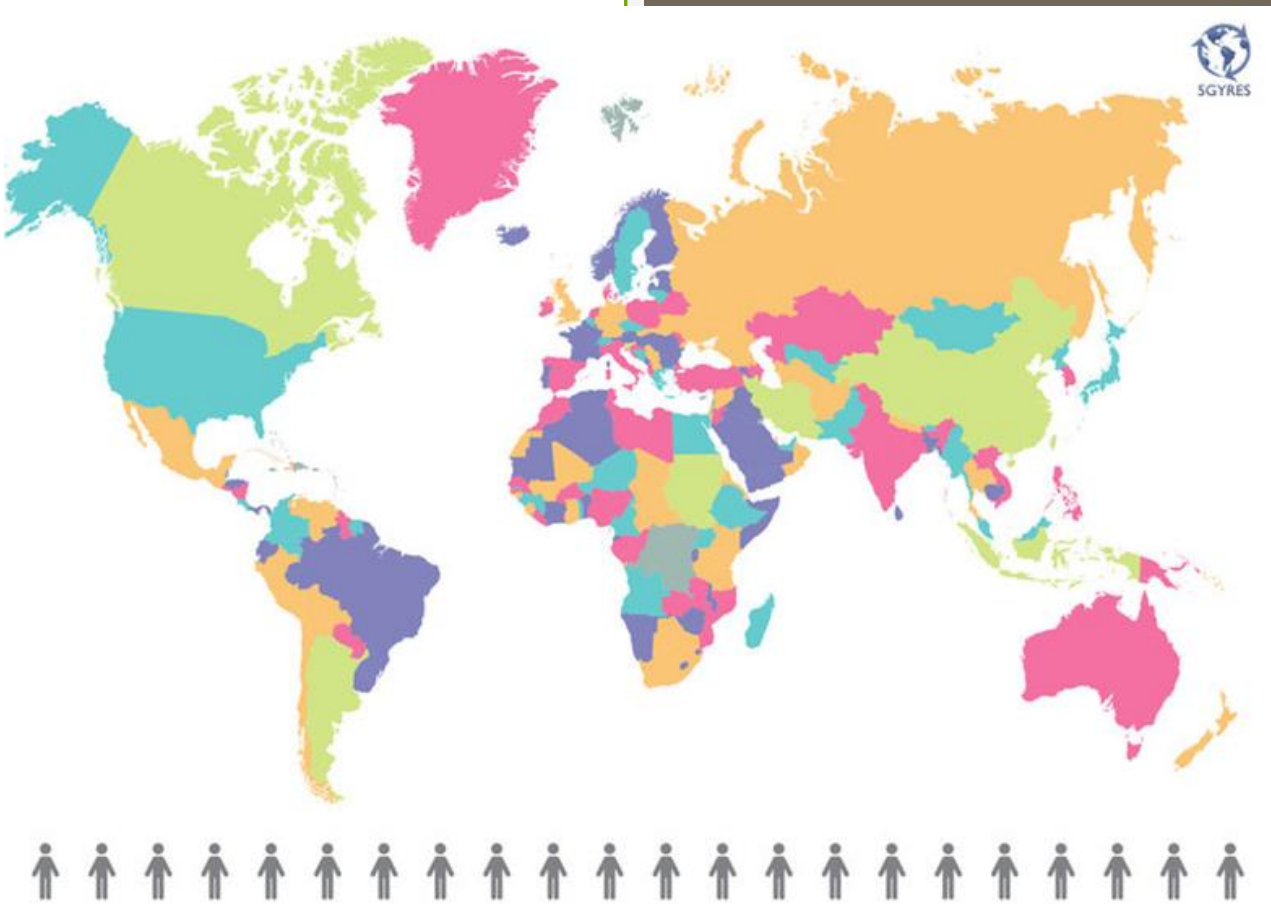
- ***Microbead vs. microplastic***
  - **Microplastic**: small plastic particles in the environment ***smaller than 5 mm***, often a breakdown product of larger plastic pieces
  - **Microbead**: primarily polyethylene solid spheres intentionally added for functional performance
    - polypropylene and polystyrene are also common, but many polymers and co-polymers are utilized
- For marine pollution, ***1 micron to 5 mm*** microplastic is of concern
  - **5 mm** is the most common upper size limit used among marine litter researchers
  - Some prefer a definition of <1 mm for 'microplastic'
  - *Under latter definition, any cosmetic formulation containing particles greater than 1 mm in size would be said to contain 'meso- or macroplastic', which are also indicators for marine litter under the EU Marine Strategy Framework Directive.*

Marine Microplastic Concerns

- Plastic litter causes physical harm to marine mammals, fish and invertebrates and instances of death by entanglement, asphyxiation or blockage of organs
- Plastic particles tend to accumulate persistent, bioaccumulating and toxic contaminants such as PCBs, DDT and PBDEs
- Direct & indirect internal effects (ingestion):
  - Macro–size (2.5 – 100 cm) - – whales, seals, dolphins, turtles & birds
  - ***Meso-size (1 mm – 2.5 cm) – birds, fish & invertebrates***
  - ***Micro-size (1 µm – 1 mm) – fish, invertebrates &other filter feeders***
  - ***Nano-size (<1 µm) – invertebrates & other filter feeders***
- *From 2015 Issue Brief on Marine Litter: Microplastics, International Oceanographic Commission, UNESCO*

United Nations
Educational, Scientific and
Cultural Organization

Concerns Specific to Microbeads



More than **7.3 TRILLION** microbeads will enter the marine environment before the Microbead Free Act becomes effective in 2018.

THAT'S NEARLY 1,000 MICROBEADS FOR EVERY PERSON ON THE PLANET.

http://pubs.acs.org/doi/pdfplus/10.1021/acs.est.5b03909 http://www.worldometers.info/world-population/


1/4 OF FISH CONTAINED Plastic
One quarter of the fish sampled from fish markets in California and Indonesia contained plastic pieces and fibers in their guts.
source: http://www.nature.com/articles/srep14340
5GYRES.ORG

Concerns for Fish as Food

- About 85% of fish caught is used for human consumption.
- The remainder is converted into fishmeal (mainly for high-protein feed) and fish oil (as a feed additive in aquaculture).
- In 2013, fish accounted for about 17% of the global population's intake of animal protein.
- In 2013, **fish provided 3.1 billion people with almost 20% of their intake of animal protein.**
- **Asia has the highest consumption of seafood** as a continent, combining high per-person consumptions with large populations.
  - *Marine Stewardship Council and UN FAO*

Cosmetics2015Factsheet.pdf - Adobe Acrobat

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FACT SHEET

How big are these plastics?

- There is more to 'microbeads' than meets the eye – while some are large enough to be easily visible to the naked eye, other microbeads on the market for PCCP formulations are as small as 1 µm. Others are even smaller than that (nano-particulates).
- The size of the particulates applied depends on the function in the cosmetic formulation. Many of the particulates in PCCPs today are between 1 and 50 µm in size.

Microplastic particle sizes

PARTICLE	SIZE RANGE
Microbead	1 – 1000 X 10^{-6} m
Microspheres	1 – 1000 X 10^{-6} m
Microcapsule	1 – 2 X 10^{-6} m
Nanospheres/capsules	10 – 1000 X 10^{-9} m

What are they used for?

- **Plastics are used as ingredients in PCCPs for a variety of purposes** such as sorbent phase for delivery of active ingredients, film formation, exfoliation, viscosity regulation and many others. 'Microbead' is one of many terms applied to plastic PCCP ingredients; they may also be called microplastics, microspheres, nanospheres, plastic particulates etc.

POLYMER	EXAMPLES OF FUNCTIONS IN PCCP FORMULATIONS
Nylon-12 (polyamide-12)	Bulking, viscosity controlling, opacifying (e.g. wrinkle creams)
Nylon-6	Bulking agent, viscosity controlling
Poly(butylene terephthalate)	Film formation, viscosity controlling

Common Uses of Microplastics in Cosmetics

- Film formation, viscosity regulation, skin conditioning, emulsion stabilizing and many others.
- Found in many products including soap, shampoo, deodorant, toothpaste, wrinkle creams, moisturizers, shaving cream, sunscreen, facial masks, makeup (e.g. lipstick or eye shadow), and children's bubble bath
- Can be present in <<1% or up to 90%
  - *Review of Microplastics in Cosmetics*, July 2014, Dutch Ministry of Infrastructure and Environment

Uses of Microplastics In Cosmetics…

- …viscosity regulators, emulsifiers, film formers, opacifying agents, liquid absorbents binders, bulking agents
- … for an 'optical blurring' effect (e.g. of wrinkles), glitters, skin conditioning, exfoliants, abrasives,
- …oral care such as tooth polishing, gellants in denture adhesives, for controlled time release of various active ingredients,
- …sorptive phase for delivery of fragrances, vitamins, oils, moisturizers, insect repellents, sun filters and a variety of other active ingredients,
- …prolonging shelf life by trapping degradable active ingredients in the porous particle matrix (effectively shielding the active ingredient from bacteria, which are too big to enter particle pores).

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Poly(butylene terephthalate)	Film formation, viscosity controlling
Poly(ethylene isoterephthalate)	Bulking agent
Poly(ethylene terephthalate)	Adhesive, film formation, hair fixative; viscosity controlling, aesthetic agent, (e.g. glitters in bubble bath, makeup)
Poly(methyl methylacrylate)	Sorbent for delivery of active ingredients
Poly(pentaerythrityl terephthalate)	Film formation
Poly(propylene terephthalate)	Emulsion stabilizing, skin conditioning
Polyethylene	Abrasive, film forming, viscosity controlling, binder for powders
Polypropylene	Bulking agent, viscosity increasing agent
Polystyrene	Film formation
Polytetrafluoroethylene (Teflon)	Bulking agent, slip modifier, binding agent, skin conditioner
Polyurethane	Film formation (e.g. facial masks, sunscreen, mascara)
Polyacrylate	Viscosity controlling

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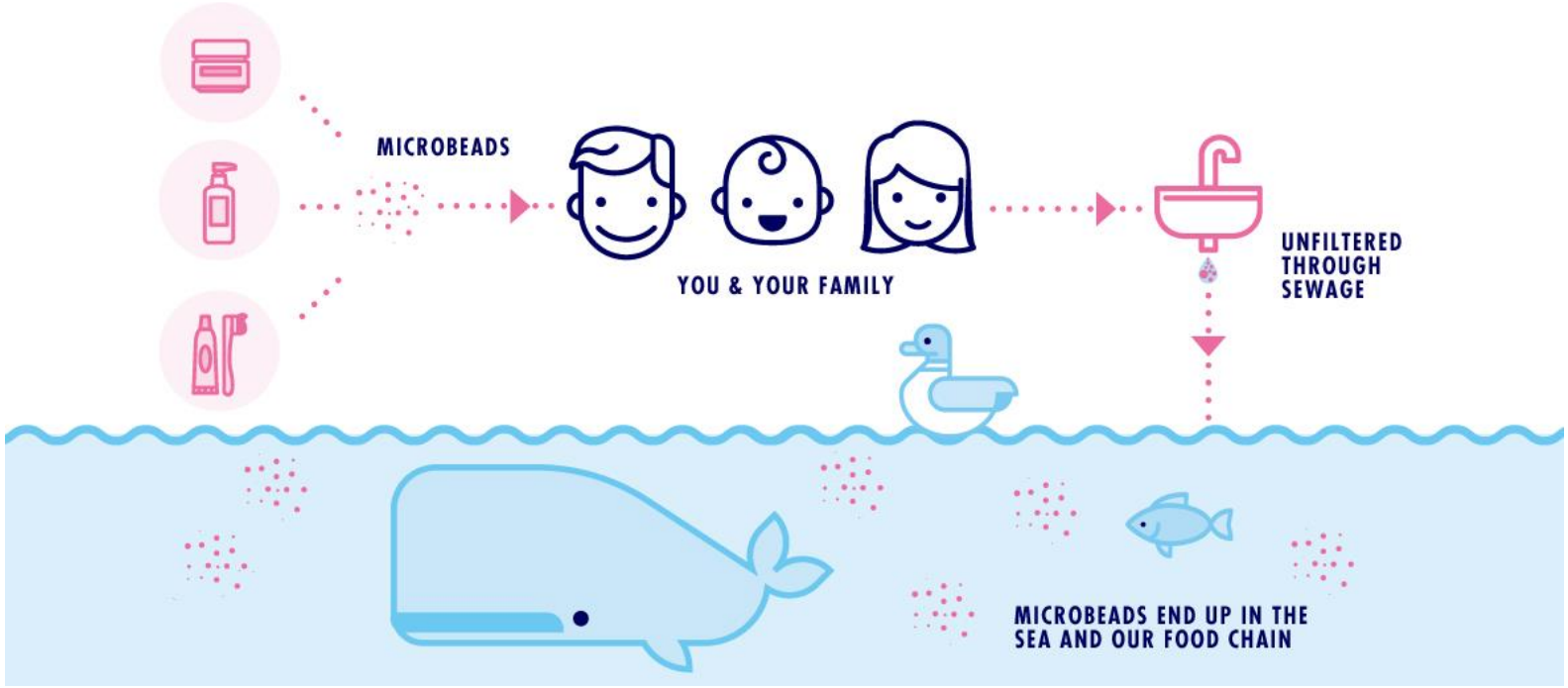
Polyacrylate	Viscosity controlling
Acrylates copolymer	Binder, hair fixative, film formation, suspending agent
Allyl stearate/vinyl acetate copolymers	Film formation, hair fixative
Ethylene/propylene/styrene copolymer	Viscosity controlling
Ethylene/methylacrylate copolymer	Film formation
Ethylene/acrylate copolymer	Film formation in waterproof sunscreen, gellant (e.g. lipstick, stick products, hand creams)
Butylene/ethylene/styrene copolymer	Viscosity controlling
Styrene acrylates copolymer	Aesthetic, coloured microspheres (e.g. makeup)
Trimethylsiloxysilicate (silicone resin)	Film formation (e.g. colour cosmetics, skin care, sun care)

- "Beat the Microbead" launched in 2012 by the North Sea Foundation and the Plastic Soup Foundation
- An app allowed Dutch consumers to check whether personal care products contain microbeads by scanning a product's barcode
- United Nations Environment Programme and UK based NGO Fauna and Flora International joined the partnership to expand the app for international audiences (Summer 2013)
- App available in seven languages and has been very popular, convincing a number of large multinationals such as Unilever, Johnson & Johnson and the Body Shop to announce their intent to stop using microbeads.

“Beat the Microbead” Campaign



Personal Care Products Council

Cosmetics Europe
the personal care association

Industry Voluntary Efforts

- US Personal Care Products Council actively supported US Microbead-Free Waters Act (2015)
- October 2015, Cosmetics Europe recommended to its members to discontinue, by 2020, the use of synthetic, solid, plastic particles used for exfoliating and cleansing
  - Despite the extremely small role they play in microplastic litter
  - Built on voluntary initiatives already taken by individual member companies
    - 2016 survey showed 80+% reduction in usage in member companies
- Company examples:
  - L'Oreal: planning to phase out polyethylene microbeads from exfoliates, cleansers and shower gels by 2017
  - Crest: phase-out from toothpaste to be completed by 2017
  - Johnson & Johnson: began phase out in 2015, complete in 2017

Johnson & Johnson

Crest

L'ORÉAL

ASEAN Cosmetics Association January 2017 Statement on Microbeads

- The ASEAN Cosmetic Association following the recommendation from various Environmental or Health Agencies and Industry Associations around the World, recommends that the use of plastic microbeads be discontinued in rinse off personal care products.
- ***Plastic microbeads are synthetic polymer solid beads ranging from 0.1 micron to 5 mm in size used for cleansing and exfoliating in rinse off personal care products like facial wash, body wash, toothpaste, etc***.
- While there is no safety concerns for end users, plastic microbeads used in cosmetic products may have an environmental impact. According to scientists this is small as the quantities used are small but as a matter of precaution and to prevent further impact the ASEAN Cosmetic Association ***would like to recommend the discontinuation of the use of plastic microbeads in rinse off personal care products.***
- Consumer health and safety is of paramount importance to the cosmetic industry. ACA Scientific and Technical Affairs group has evaluated the scientific data available and concluded that the use of plastic microbeads does not raise any human safety concern.
- The ASEAN Cosmetic Association is taking a proactive stance in order to protect our environment and especially the water ways.

ASEAN Cosmetics Association

Increasing Global Regulation

- US introduced the **Microbead-Free Waters Act** in 2015
  - Bans manufacture of rinse-off products starting July 1, 2017
- UK government to introduce a ban of microplastics from all cosmetics by the end of 2017
  - Banned from sale in the UK from the end of 2017
- Nine US states have banned microbeads:
  - California, Colorado, Connecticut, Illinois, Indiana, Maine, Maryland, New Jersey, Wisconsin, and Erie County, New York
    - All but California's law allow biodegradable microbeads
- The Netherlands, Austria, Luxembourg, Belgium and Sweden have issued a joint call to ban the microplastics used in personal care products.

Questions to Ask

- Is it necessary for product performance?
- What are safer alternatives?
  - Natural substances that can meet the desired performance
  - (Bio-based, biodegradable plastics)
- What about a natural solution that could
  - Support a local industry by using an agricultural product or waste
  - Sequester carbon and restore agricultural soil?

Safer Alternatives

- …beeswax, rice bran wax, jojoba waxes, starches derived from corn, tapioca and carnauba, seaweed, silica, clay and other natural compounds. – *US Personal Care Products Council*

"These natural exfoliants are both gentle on the skin and completely bio-degradable." Wendy Stirling, Botanicals

Resources and References

- UNEP Plastics In Cosmetics Report and Factsheet, 2015
- Review of Microplastics in Cosmetics, commissioned by the Dutch Ministry of Infrastructure and Environment, July 2014
- Beat the MicroBead, Plastic Soup Foundation
  - country-based lists of products with plastic microbeads
- The Story Of Stuff: Ban the Bead video & references

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