SOS Terra

Emergenze planetarie e negazionismo ambientale

Manuela Monti • Carlo Alberto Redi

Carocci editore Quality Paperbacks


AGISCI IN MODO CHE LE CONSEGUENZE DELLA TUA AZIONE SIANO COMPATIBILI CON LA SOPRAVVIVENZA DI UN'AUTENTICA VITA UMANA SULLA TERRA.
H. JONAS, IL PRINCIPIO RESPONSABILITÀ, P. 15.

The author of THE SEA AROUND US *and*
THE EDGE OF THE SEA
questions our attempt to control the natural world about us

SILENT SPRING

Rachel Carson

1950: 2,5 1970: 4 2022: 8

Universi Ecologia

Stanze
di Angela Urbano

Anni Sessanta, amici a New York

A Frank O'Hara Notebook, di imminente uscita negli Stati Uniti (No Place, pp. 278, $ 45), riproduce l'album di disegni, poesie, appunti e immagini che il poeta e critico d'arte Bill Berkson (1939-2016) dedicò al suo amico Frank O'Hara (1926-1966). Oltre a raccontare un'amicizia durata fino alla prematura scomparsa di O'Hara, il volume illustra la vitalissima scena artistica newyorchese degli anni Sessanta.

Chimica Oggi, lo sappiamo, l'ecosistema marino è quello più seriamente danneggiato dall'abuso della plastica. Ciò che ancora non sappiamo — osserva un documento del consorzio delle Accademie Scientifiche — sono i livelli di tossicità (certa) che derivano all'organismo umano dall'assunzione delle nanoplastiche. Perciò bisogna correre ai ripari

L'aggressione delle microplastiche

di MANUELA MONTI e CARLO ALBERTO REDI

Lo studio
S'intitola *A Scientific Perspective on Microplastics in Nature and Society* («Una prospettiva scientifica sulle microplastiche in natura e nella società») il documento elaborato da Sapea (Science Advice for Policy by European Academies), un consorzio di istituzioni scientifiche e culturali che fornisce consulenze su specifici temi di rilevanza politica alla Commissione europea (sapea.info). Il rapporto si divide in tre parti: la prima è dedicata alle evidenze che emergono in fatto microplastiche dalle ricerche nel campo delle scienze naturali; la seconda è incentrata sui comportamenti sociali; la terza riguarda invece gli aspetti legislativi e di regolamentazione

I quaderni

USCIRE DAL PLASTICENE

Parere del Comitato Etico a favore di un'economia circolare delle plastiche a difesa dell'ambiente e della salute

Fondazione Umberto Veronesi
– per il progresso delle scienze

The Economist

US-China relations in crisis

The dash to cash

Ethiopia's hidden war

How virus-testing works

MARCH 21ST–27TH 2020

Aristotele ***Politica***:

….. le piante sono fatte per gli animali e gli animali per l'uomo … … … … … …

30 0ttobre 1947

poneva come obiettivo il

completo sfruttamento delle risorse mondiali

L'economia della biodiversità

Ecologia Un rapporto commissionato dal governo di Londra mostra la necessità di cambiare subito i criteri di valutazione delle attività produttive e di investire nella rigenerazione dell'ambiente

di MANUELA MONTI *e* CARLO ALBERTO REDI

Il tempo cupo e solitario che abbiamo vissuto e ancora stiamo vivendo ha funzionato da cartina di tornasole svelando l'origine della pandemia Covid19: la distruzione degli ecosistemi e della biodiversità del pianeta. Tra pochi anni sulla Terra saremo dieci miliardi di esseri umani e, se vogliamo evitare altre pandemie, è necessario cambiare le nostre abitudini assai poco rispettose della natura e delle sue componenti ritenute finora, *tout court*, risorse economiche inesauribili.

È dunque imperativo responsabilizzare i cittadini sulla gravità della «questione ecologica» e rivoluzionare gli stili di vita: un prezioso esempio di metodologia da perseguire per questi fini ci è offerto dal governo britannico, che sta valutando il rapporto di sir Partha Dasgupta (Cambridge University) dal titolo *Economia della biodiversità*. Il professor Dasgupta è figura nota anche in Italia avendo creato nel 2001, presso una delle nostre istituzioni internazionali più meritorie (il Centro internazionale di fisica teorica Abdus Salam di Trieste), il programma di economia dell'ecologia (*ecological economics*). Con questa monumentale opera (606 pagine elaborate da biologi, chimici, medici, economisti, giurisperiti, sociologi, psicologi, letterati, filosofi) illustra come siamo giunti all'attuale livello di distruzione della biodiversità e quali azioni dobbiamo intraprendere per ricostruirla.

Se l'idea di leggere 606 pagine spaventa, invitiamo vivamente alla lettura della prefazione, dell'introduzione e dei titoli dei tanti capitoli del documento; già così risulta chiaro che il pianeta Terra è allo stremo. Siamo giunti al momento in cui i manufatti e i prodotti dell'uomo (edifici, plastiche e così via) che ammontano a circa 1,1 teratonnellate (un peso che equivale a 1.100 miliardi di tonnellate) hanno superato la biomassa dei viventi (inferiore a una teratonnellata; vegetali e animali). Le domande di risorse (materie prime, combustibili, legname, alimenti eccetera) e servizi (produzione di ossigeno, assorbimento della anidride carbonica atmosferica, riciclo di nutrienti, capacità di eliminare scorie e così via) che oggi poniamo alla Terra sono tali che dovremmo disporre di quasi due pianeti (1,6 per la precisione) per soddisfarle.

¶

Sulla base di dati numerici affidabili, si dimostra che il capitale «natura» (piante, animali, aria, suolo), il capitale umano (conoscenza, educazione, competenze, attitudini) e il capitale prodotto (macchine, strumenti, edifici, infrastrutture) sono in realtà legati da raffinate

capitale prodotto e capitale umano a spese del patrimonio naturale.

c) Questa attitudine compromette la nostra prosperità e quella delle generazioni future. Molti ecosistemi (foreste tropicali, barriere coralline) sono ormai persi, mentre altri sono sul punto di scomparire. Comunque intervenire ora per preservarli ha un costo ben minore rispetto alle perdite di quei patrimoni naturali. Degli 867 differenti ecosistemi categorizzati solo 42 sono attualmente ben protetti e gestiti.

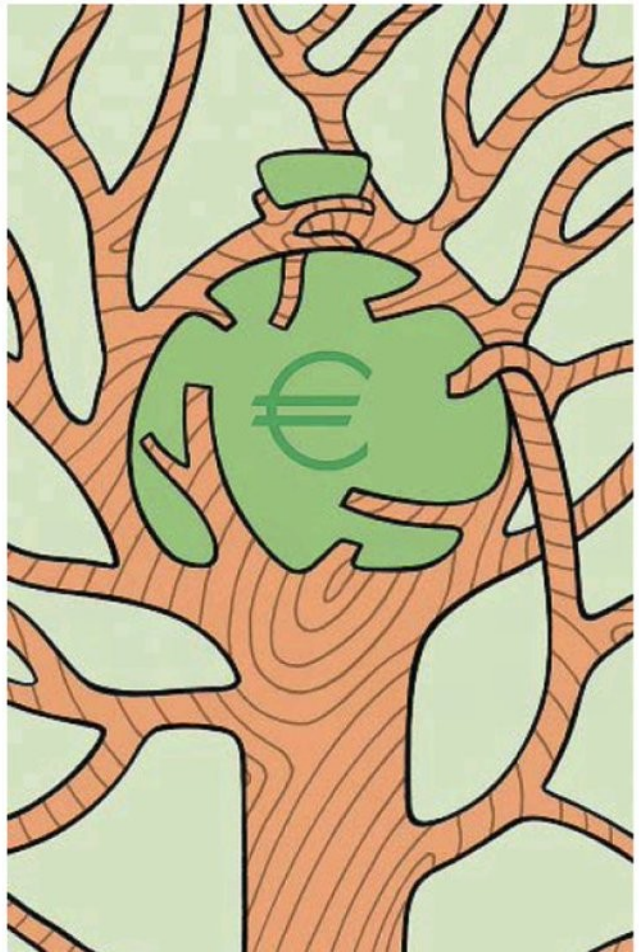
d) È necessario sviluppare e adottare differenti metriche di valutazione del successo economico, utilizzando misure del patrimonio (della ricchezza) che tengano conto dei benefici ottenibili dagli investimenti su risorse naturali, nella gestione di aree protette, attuando strategie (politiche) che scoraggino forme di consumo e produzione che risultino dannose per l'ambiente naturale. Ogni dollaro investito in ricostruzione di ecosistemi assicura un ritorno dai 3 ai 75 dollari (con una media di 10) di benefici economici in risorse e servizi prodotti dall'ecosistema (con esempi virtuosi nel campo della forestazione, gestione della pesca, ecoturismo).

e) La soluzione risiede nel capire e accettare una semplice verità: le nostre economie sono incastonate, integrate entro la natura e non esterne ad essa.

¶

Nell'insieme sono valutati i benefici che la biodiversità assicura all'economia e i costi derivanti dalla sua perdita a livello globale. Vengono inoltre identificate una serie di progettualità che possono simultaneamente assicurare prosperità economica e migliorare il livello di diversità biologica. Per realizzare questi cambiamenti e sostenerli a favore delle generazioni future, sono necessarie una «svolta verde» e una transizione ecologica nelle modalità e nei fini della produzione di beni, accompagnate da un radicale cambiamento degli attuali stili di vita; uno sforzo corale che va perseguito a livello europeo, con una Europa capace di tornare ad essere faro di civiltà.

Per il nostro Paese si presenta ora una occasione che non può andare persa; le sensibilità e competenze dei nuovi decisori politici responsabili dei dicasteri chiave per l'investimento in ricerca (l'Italia investe uno scarso 1,4 per cento del prodotto interno lordo e si trova in ventottesima posizione tra i Paesi avanzati dell'Ocse) fanno ben sperare di poter attrarre e giustificare i fondi europei del Next Generation Eu (detto anche Recovery



manufatti umani: 1.1 teratonnellate

biomassa viventi: < 1 Tt

(1Tt equivale a 10^{12} tonnellate)

attuali domande al pianeta Terra di:

risorse
(materie prime, combustibili, legname, alimenti, etc.)

e

servizi
(produzione di ossigeno, assorbimento della CO_2 atmosferica, riciclo di nutrienti, capacità di eliminare scorie, etc.)

dovremmo **disporre di 1.6 pianeti** !!!!

MIT Technology Review

The climate issue

Welcome to climate change

Mitigation

Why the battle to curb carbon emissions is losing ground

Adaptation

Technologies for living on a hotter, more dangerous planet

Suffering

A picture of life in the future for both the winners and the losers

HIV – 1980: da scimmie antropomorfe

Ebola - 1996/2013: da macachi

Marburg – 1998: da macachi

Nipah – 1998: da pipistrelli – maiale

film del 2011 *Contagion* con Matt Damon e Gwyneth Paltrow

SARS – 2002: da pipistrelli – zibetti

identificata da Carlo Urbani poi morto per l'infezione

H5N1 – 2003: da varie specie di volatili

H1N1 – 2009: da maiale

Mers – 2014: da pipistrelli – cammelli

Zika – 2016: da zanzare

bimbi invisibili del Brasile (microcefalia)

COVID-19: da pipistrelli (probabilmente)

Domenico De Masi

La felicità negata

Non c'è progresso senza felicità e non si può essere felici in un mondo segnato dalla distribuzione iniqua della ricchezza, del lavoro, del potere, del sapere, delle opportunità e delle tutele. Questo è l'esito raggiunto da una politica economica che ha come base l'egoismo, come metodo la concorrenza e come obiettivo l'infelicità.

Agenda 2024

SUBENDA 2024

4 crisi

ambientale

alimentare

sanitaria

energetica

DEFINE

NECESSITY

2010……388
2014 ……90

2022
48 supermiliardari

=

3.8 x 10^{9}

rapporto OXFAM
an economy for the 1%
http://www.oxfamitalia.org

I quaderni

L'IMPATTO DELLE DISEGUAGLIANZE SOCIO-ECONOMICHE SUL DIRITTO AD AVERE EGUALI OPPORTUNITÀ DI SALUTE IN ITALIA

Parere del Comitato Etico

Fondazione Umberto Veronesi
– per il progresso delle scienze

An elderly man holds out his begging cup in bustling Hong Kong.

School children in Madagascar eat lunch provided as part of a nutrition initiative run by the World Food Programme.

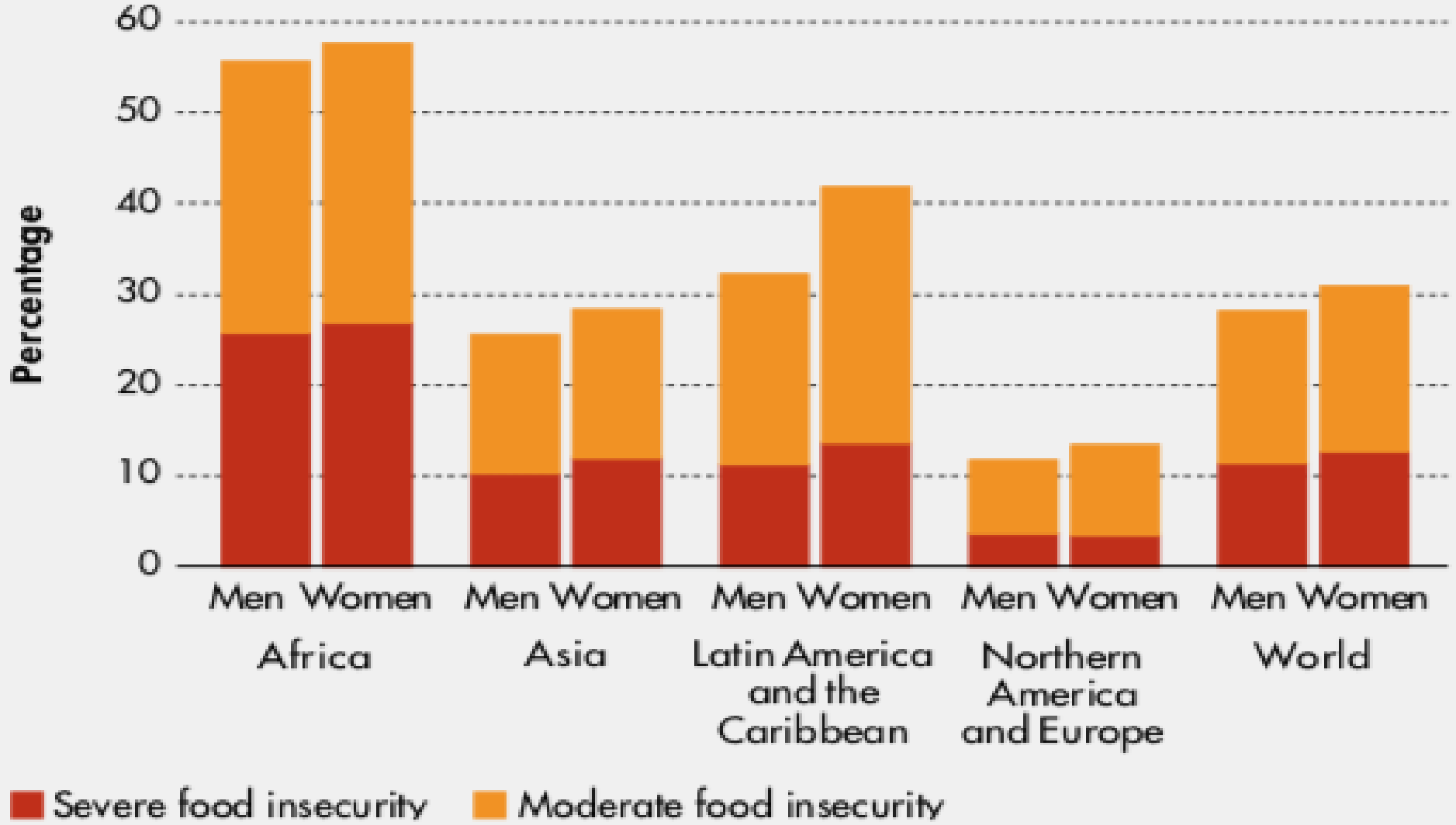
Food systems: seven priorities to end hunger and protect the planet

PREVALENCE OF FOOD INSECURITY

In every continent, the prevalence of moderate or severe food insecurity is slightly higher for women than for men, with the largest differences found in Latin America and the Caribbean.

FIGURE B2.

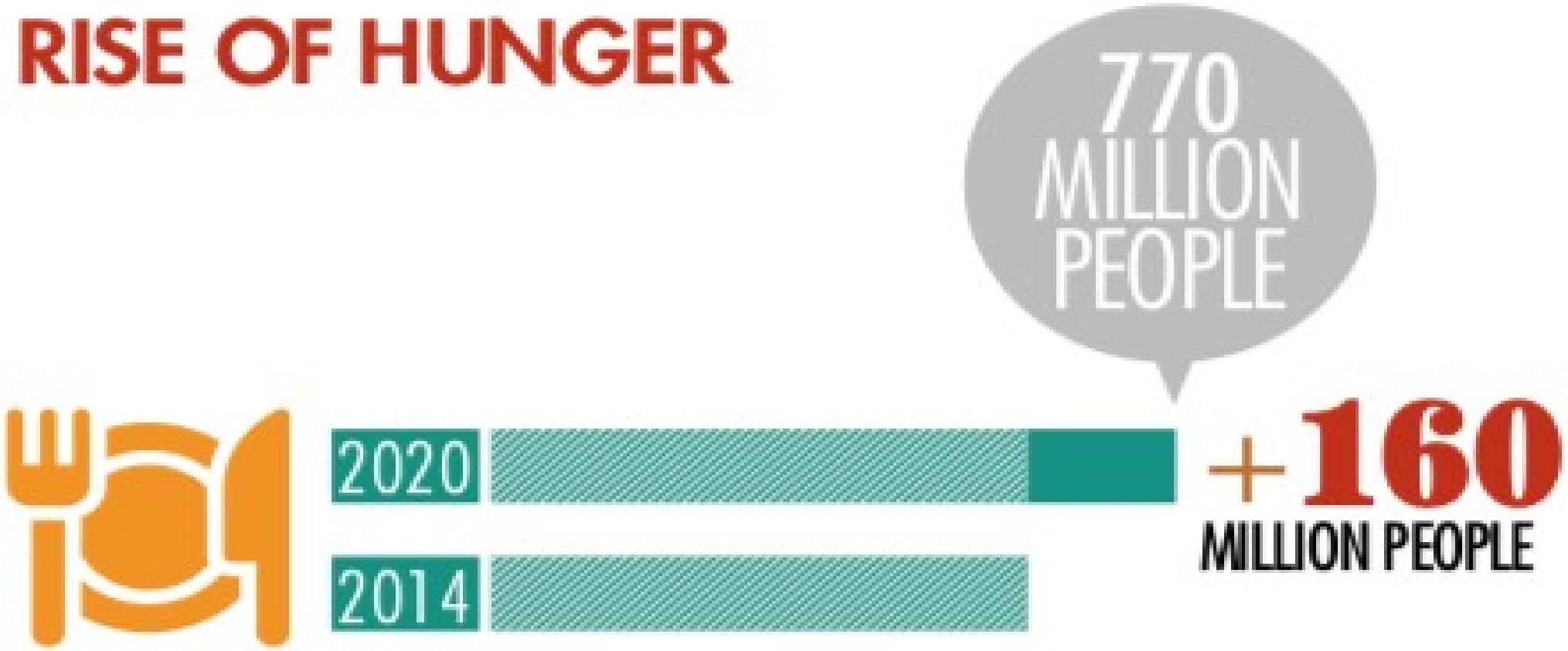
FOOD INSECURITY LEVELS BY REGION AND GENDER (2020)



Source: FAO, IFAD, UNICEF, WFP and WHO

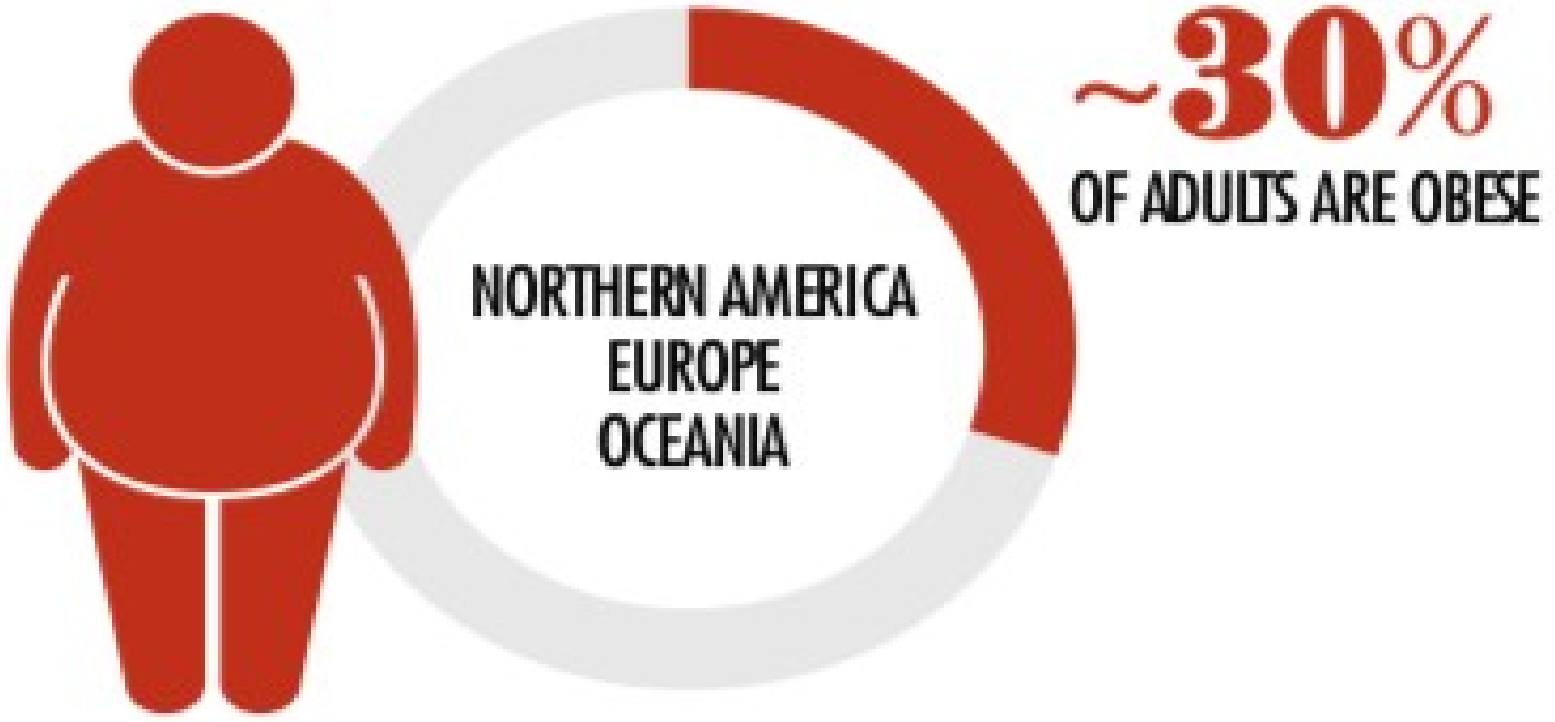
https://doi.org/10.4060/cb4477en-figB2

RISE OF HUNGER



Hunger is on the rise, with almost 770 million people undernourished in 2020, close to 160 million more than in 2014, and 118 million more than in 2019.

INCREASE OF OBESITY



Obesity has increased in all regions. Almost 30% of adults in Northern America, Europe and Oceania are obese.

MAP 28.
PREVALENCE OF OBESITY IN THE ADULT POPULATION (2016)

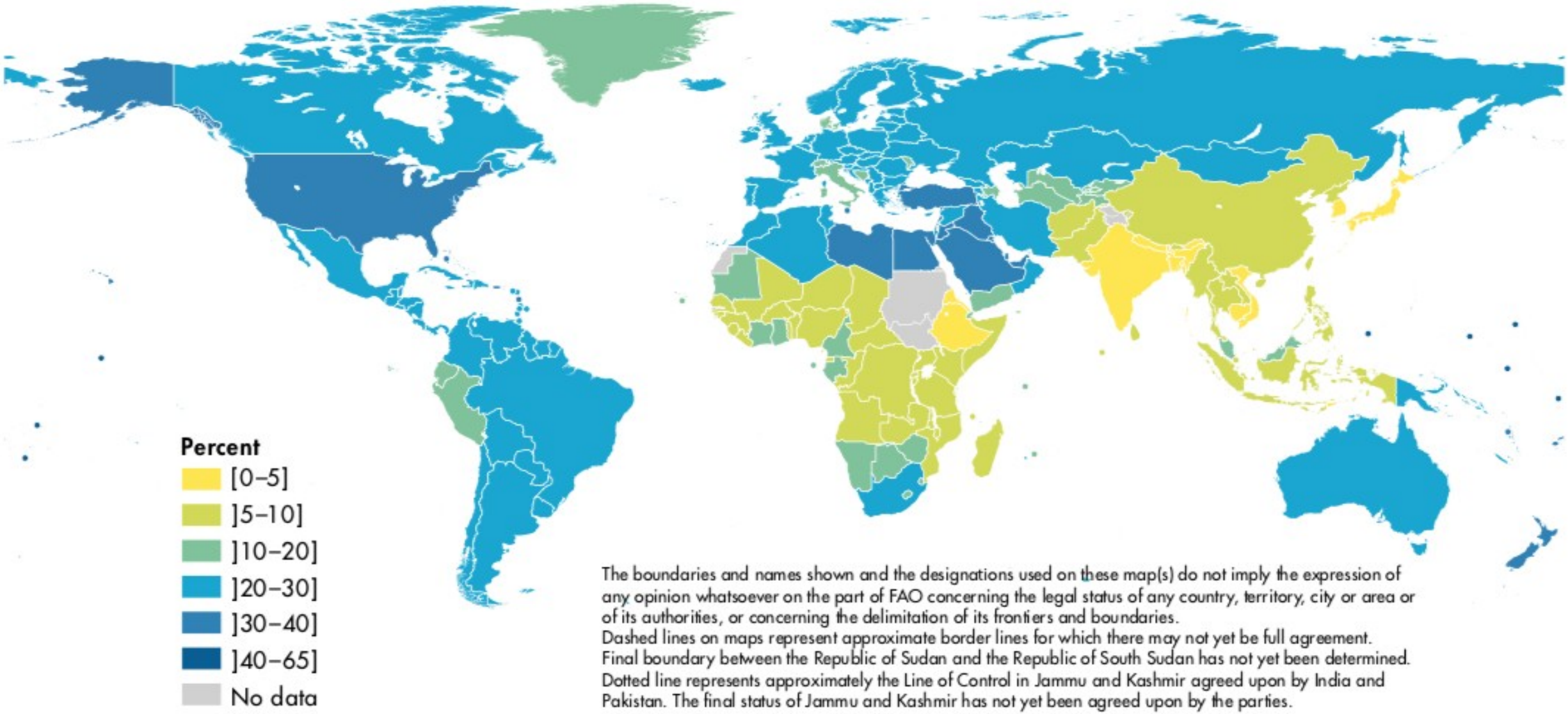


TABLE 46.
PREVALENCE OF OBESITY IN THE ADULT POPULATION (PERCENT) (CONTINUED)

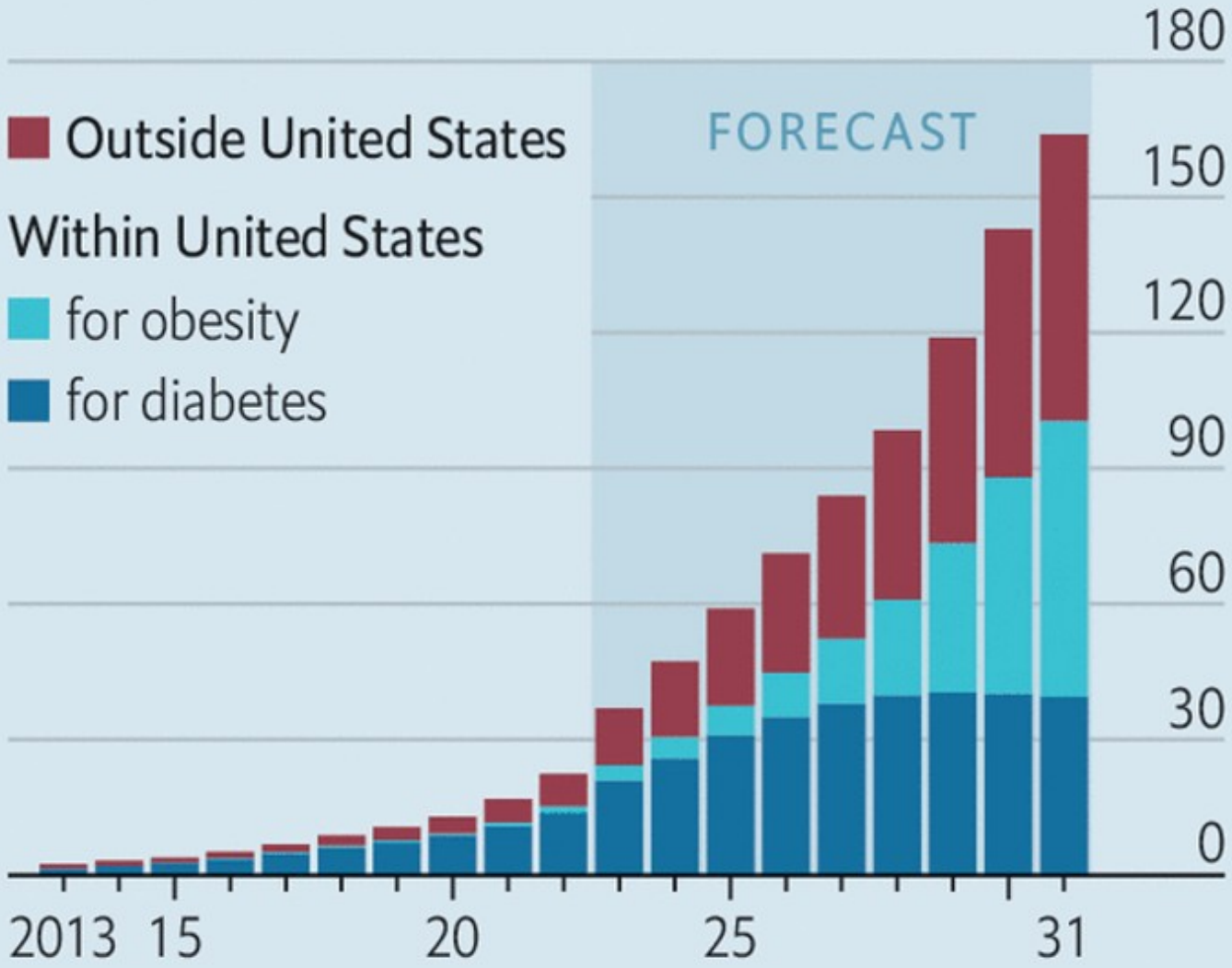
COUNTRY	2000	2005	2010	2011	2012	2013	2014	2015	2016
Israel	21.1	22.7	24.2	24.5	24.8	25.1	25.5	25.8	26.1
Italy	15.0	16.5	18.1	18.3	18.7	19.0	19.3	19.6	19.9
Jamaica	15.9	18.4	21.1	21.7	22.3	22.9	23.5	24.1	24.7
Japan	2.1	2.6	3.3	3.5	3.6	3.8	3.9	4.1	4.3
Jordan	26.4	29.2	31.9	32.5	33.1	33.7	34.3	34.9	35.5

Pablo Delcan

1

Insatiable appetite

GLP-1* sales, $bn



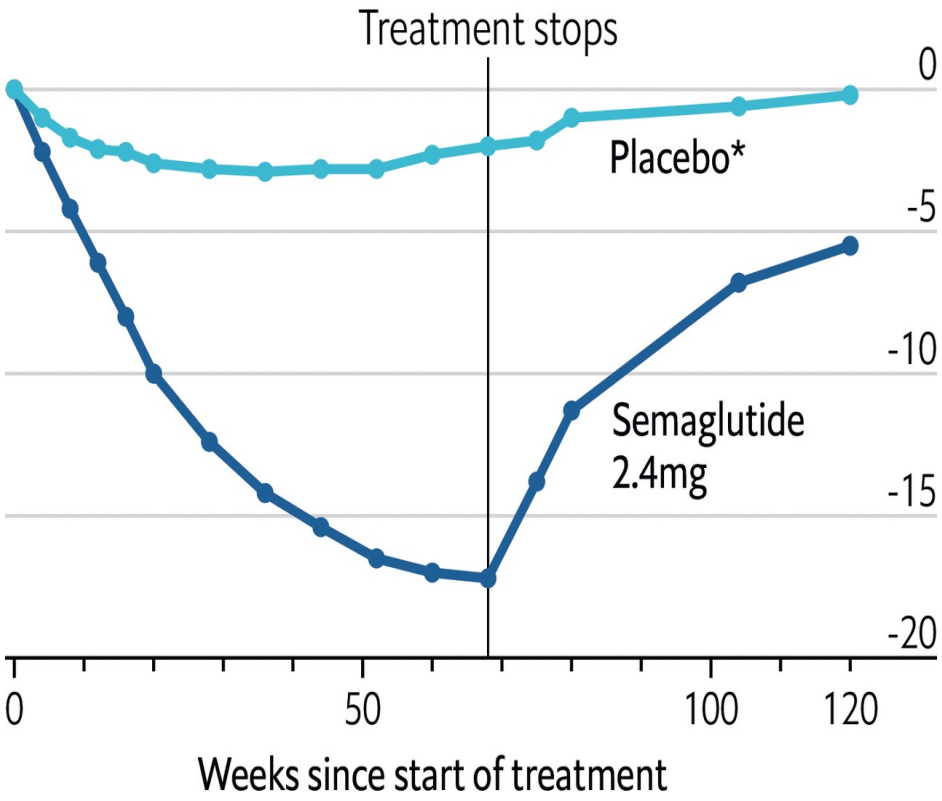
Source: Jefferies

*Glucagon-like peptide-1 receptor agonist

Don't stop

Semaglutide weight-loss drug trial

Change in body weight, %



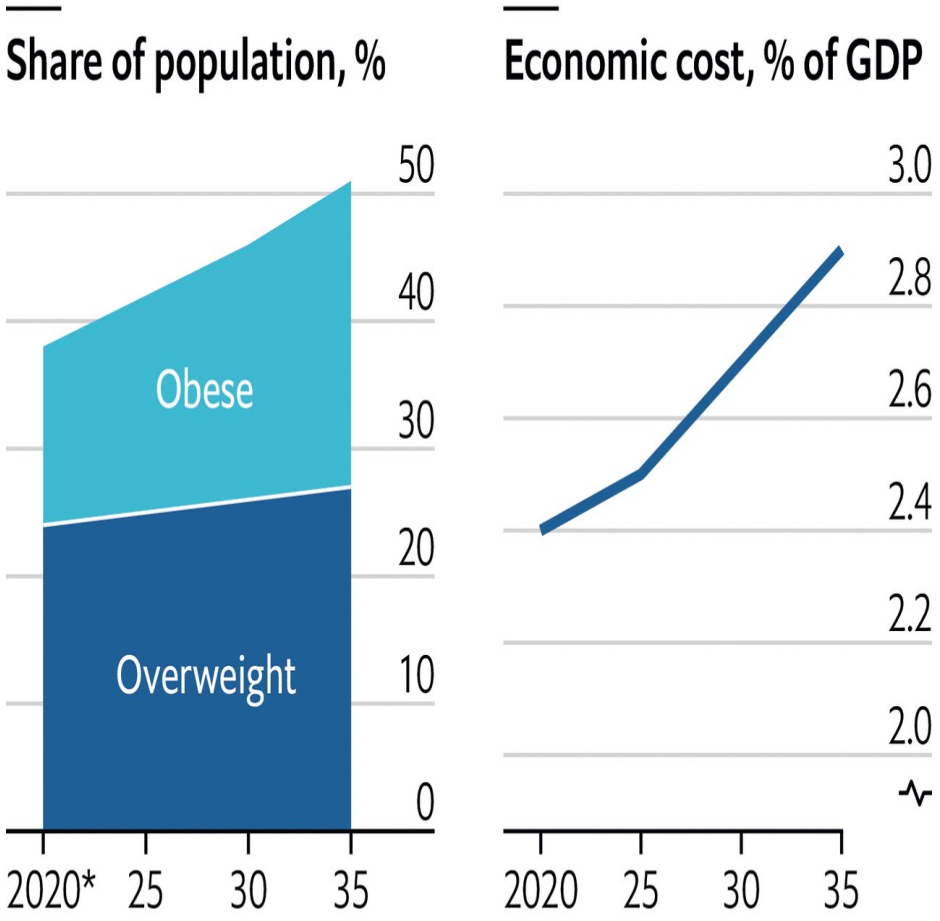
*Includes diet and exercise

Source: "Weight regain and cardiometabolic effects after withdrawal of semaglutide", by J. P. H. Wilding et al., *Diabetes, Obesity and Metabolism*, April 2022

The Economist

The bigger, the worse

World, overweight and obesity forecasts



Source: World Obesity Federation

*Estimate

The Economist

The Economist

The EU drifts eastward

Venture capital: back to basics

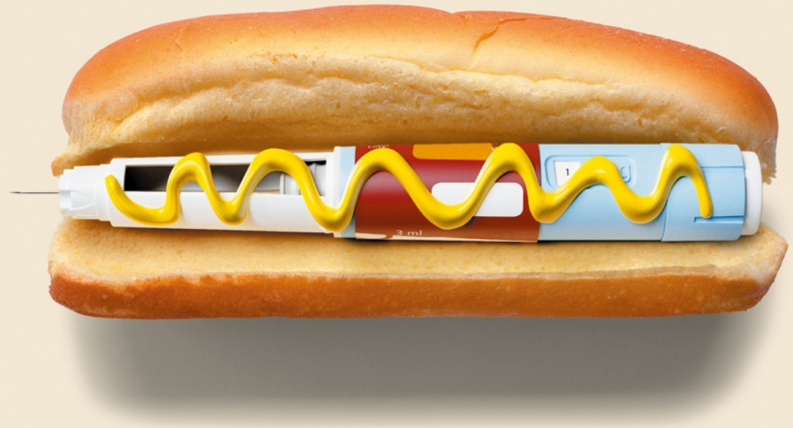
DeSantis's elusive foreign policy

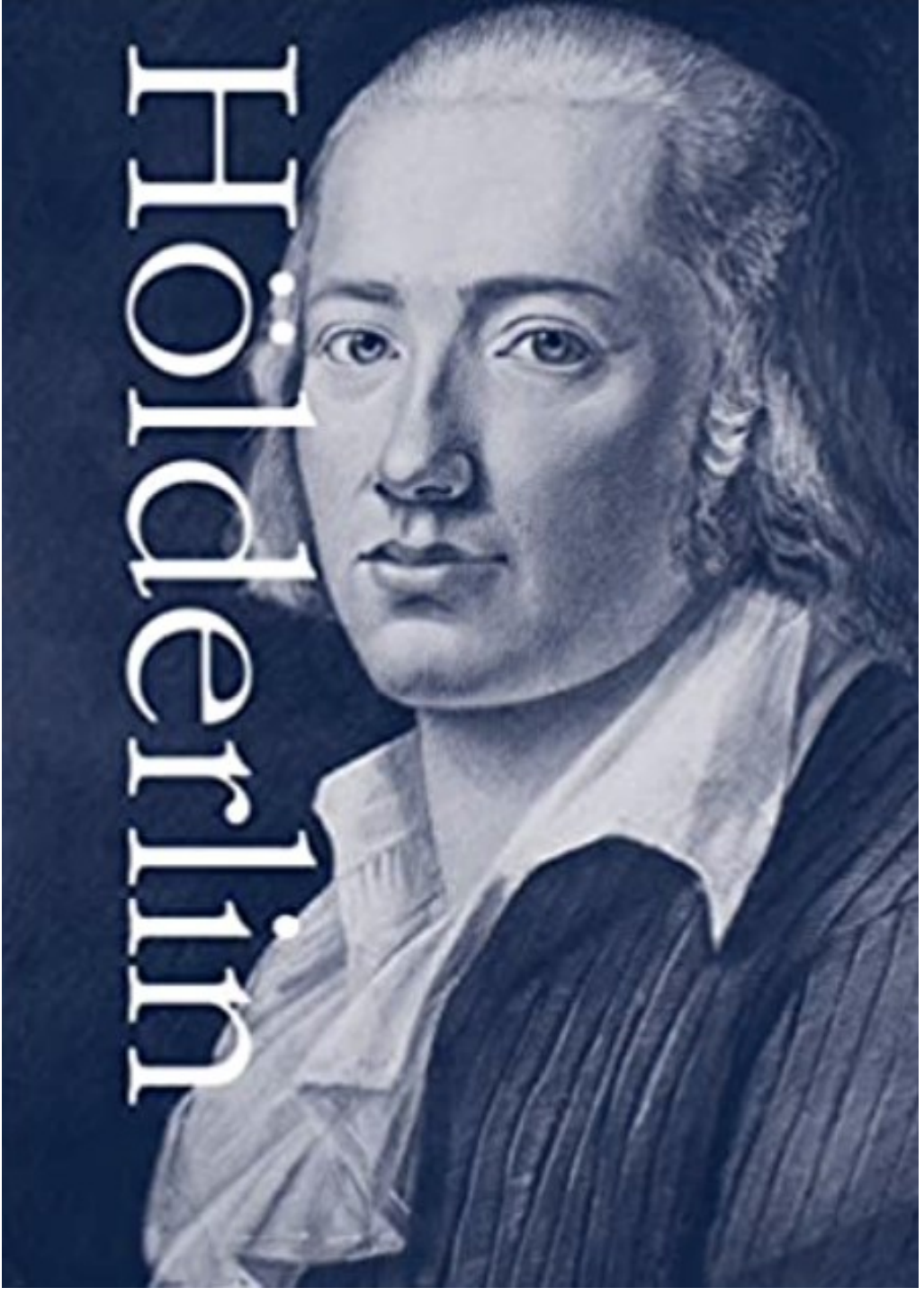
Rainforests need laws, not saws

MARCH 4TH–10TH 2023

EAT INJECT REPEAT

Curing obesity, worldwide





Wo aber Gefahr ist,
waechst das Rettende auch

PNAS RESEARCH ARTICLE | APPLIED PHYSICAL SCIENCES OPEN ACCESS

Paintings by Turner and Monet depict trends in 19th century air pollution

Anna Lea Albright[a,1] and Peter Huybers[b]

Edited by William Clark, Harvard University, Cambridge, MA; received November 8, 2022; accepted December 20, 2022

Individual paintings by artists including Vincent van Gogh and Edvard Munch have been shown to depict specific atmospheric phenomena, raising the question of whether longer-term environmental change influences stylistic trends in painting. Anthropogenic aerosol emissions increased to unprecedented levels during the 19th century as a consequence of the Industrial Revolution, particularly in Western European cities, leading to an optical environment having less contrast and more intensity. Here, we show that trends from more figurative to impressionistic representations in J.M.W. Turner and Claude Monet's paintings in London and Paris over the 19th century accurately render physical changes in their local optical environment. In particular, we demonstrate that changes in local sulfur dioxide emissions are a highly statistically significant explanatory variable for trends in the contrast and intensity of Turner, Monet, and others' works, including after controlling for time trends and subject matter. Industrialization altered the environmental context in which Turner and Monet painted, and our results indicate that their paintings capture changes in the optical environment associated with increasingly polluted atmospheres during the Industrial Revolution.

air pollution | artwork | environmental reconstruction | atmospheric science

Significance

Individual paintings are known to depict snapshots of particular atmospheric phenomena, raising the possibility that paintings could also document longer-term environmental change.
During the Industrial Revolution, air pollution increased to unprecedented levels, but these values remain uncertain given the lack of widespread, direct measurements. Here, we show that stylistic changes from more figurative to impressionistic paintings by Turner and Monet over the 19th century strongly covary with increasing levels of air pollution. In particular, stylistic changes in their work toward hazier contours and a whiter color palette are consistent with the optical changes expected from higher atmospheric aerosol concentrations. These results indicate that Turner and Monet's paintings capture elements of the

Some works of art, even those that do not appear "realistic," appear to faithfully record particular natural phenomena. Edvard Munch's *The Scream* (1893), for example, is argued to depict nacreous clouds (1). Vincent van Gogh's *Moonrise* (1889) is dated to precisely 9:08 p.m. local time on July 13, 1889, using topographic observations, lunar tables, and letters (2). Nine of Claude Monet's paintings in his London series are also dated using solar geometry, with results confirmed by cross-referencing against Monet's letters (3). A survey of over 12,000 paintings, moreover, indicates that different schools reflect local meteorological conditions, such as paler blue skies in the British school than other contemporaneous European schools (4). Another important example of paintings depicting the natural environment comes from a set of studies of sunset coloration over time relative to volcanic eruptions that injected aerosols into the stratosphere (5, 6). Sunsets seen through an aerosol-laden stratosphere appear redder because of greater


Pioggia, vapore e velocità
JWM Turner (1844)


Gare di Saint Lazare
C Monet
(1877)


The houses of parlament and the sunset
C Monet(1903)

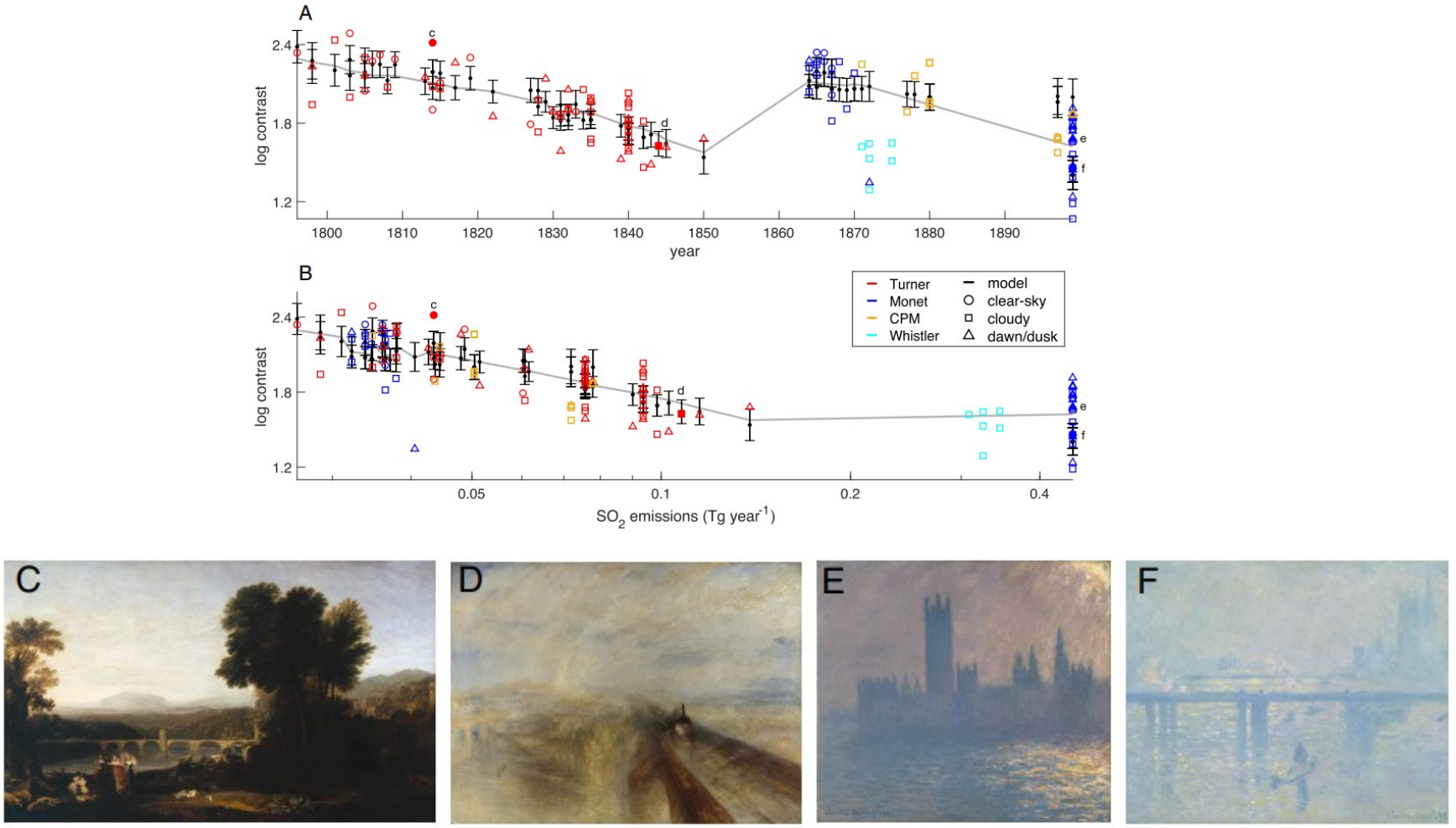


Fig. 3. Trends in the contrast index for different subject matter in the 60 Turner paintings (red) and 38 Monet paintings (blue) versus (*A*) year or (*B*) SO_2 emissions local to London or Paris. Also shown are six Whistler *Nocturnes* paintings (cyan), seven paintings by Caillebotte, four by Pissarro, and one by Morisot (gold). Paintings are categorized according to depicting conditions that are predominantly clear-sky (circle), cloudy (square), and dawn or dusk (triangle). Model predictions (black horizontal lines) are shown along with their 5 to 95% uncertainty (black vertical bars). Trends (gray lines) are illustrated by allowing year and SO_2 to vary but withholding categorical fixed effect. Monet's London paintings are plotted using 1899 London emissions because paintings were begun in the winter of 1899 to 1900, although exhibited in the following years, up until 1904. SO_2 is plotted on a logarithmic scale. Also shown are four representative paintings: (*C*) Turner's *Apullia in Search of Appullus* (1814), (*D*) Turner's *Rain, Steam, and Speed* (1844), (*E*) Monet's *Houses of Parliament, Sunlight Effect* (1899, in the Brooklyn Museum), and (*F*) Monet's *Charing Cross Bridge* (1899, in Madrid's Thyssen-Bornemisza Museum), with their values also highlighted in (*A*) and (*B*), as solid markers labeled with their panel letter.

SO_2: biossido di zolfo

Eruzione del vesuvio
CF Lacroix (1761)

Vulcano Tambora (1815)

Atmos. Chem. Phys., 7, 4027–4042, 2007
www.atmos-chem-phys.net/7/4027/2007/

Atmospheric Chemistry and Physics

Atmospheric effects of volcanic eruptions as seen by famous artists and depicted in their paintings

C. S. Zerefos[1,2], V. T. Gerogiannis[3], D. Balis[4], S. C. Zerefos[5], and A. Kazantzidis[4]

[1]National Observatory of Athens, Athen, Greece
[2]Academy of Athens, Athen, Greece
[3]National Meteorological Service, Athen, Greece
[4]Laboratory of Atmospheric Physics, Aristotle University of Thessaloniki, Thessaloniki, Greece
[5]School of Architecture, National Technical University of Athens, Athen, Greece

Received: 26 February 2007 – Published in Atmos. Chem. Phys. Discuss.: 16 April 2007
Revised: 12 July 2007 – Accepted: 26 July 2007 – Published: 2 August 2007

Abstract. Paintings created by famous artists, representing sunsets throughout the period 1500–1900, provide proxy information on the aerosol optical depth following major volcanic eruptions. This is supported by a statistically significant correlation coefficient (0.8) between the measured red-to-green ratios of a few hundred paintings and the dust veil index. A radiative transfer model was used to compile an independent time series of aerosol optical depth at 550 nm corresponding to Northern Hemisphere middle latitudes during the period 1500–1900. The estimated aerosol optical depths range from 0.05 for background aerosol conditions, to about 0.6 following the Tambora and Krakatau eruptions and cover a period practically outside of the instrumentation era.

1 Introduction

Man-made forcing of climate change is complicated by the scattering caused by the volcanic aerosols in the stratosphere (Deirmendijian, 1973).

The effects of volcanic eruptions on climate along with volcanic indices of importance to climate have been recently discussed in the literature (Robock, 2000; Zielinski, 2000; Robertson et al., 2001). Volcanic aerosol indices include the Dust Veil Index (DVI), the Volcanic Explosivity Index (VEI) as well as ice core sulphate Index which can go back to 1500 (Lamb, 1970; Zielinski, 2000; Newhall and Self, 1982).

The earliest compilation is the DVI, introduced by Lamb (1970, 1977, 1983). It extends from 1500 to 1983 and is based primarily on historical accounts of optical phenomena while surface radiation measurements were used when available. In a few cases, reports of cooling associated with volcanic aerosols were incorporated into the index. Robock (1981) introduced a latitudinally dependent estimation of the DVI. Sato et al. (1993) produced a zonally averaged compilation of optical depth for volcanic eruptions from 1850.

Officine a Porta Romana
U Boccioni
(1909-1910)

Plasticene
M Monti
(2023)

Pavia,
Novembre 2023

Circolo Polare Artico
Agosto 2023


BIRMINGHAM CIVIC SOCIETY 2004
ALEXANDER
PARKES
1813 - 1890
INVENTOR OF THE FIRST PLASTIC,
WORKED ON THIS SITE FOR
ELKINGTON, MASON & COMPANY,
ELECTROPLATERS,
CIRCA 1840-1850

- 1869: John Hyatt brevetta la celluloide
- 1907: Leo Hendrick Baekeland inventa la bakelite

- 1913: Jacques Edwin Brandenberger inventa il cellophane
- 1941: Rex Whinfield e James Tennant Dickson brevettano il PET
- 1953: Wallace Carothers sintetizza il nylon
- 1954: Giulio Natta fa «il propilene» Nobel per la chimica (con Karl Ziegler) nel 1963

“for their discoveries in the field of the chemistry and technology of high polymers”

The Nobel Prize in Chemistry 1963

Karl Ziegler
Giulio Natta

Share this

The Nobel Prize in Chemistry 1963

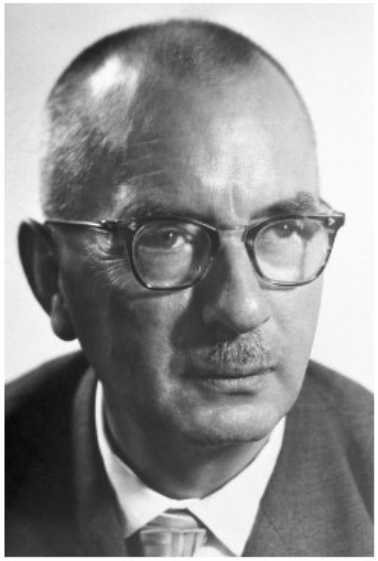


Photo from the Nobel Foundation archive.

Karl Ziegler

Prize share: 1/2

Photo from the Nobel Foundation archive.

Giulio Natta (Imperia 26 Febbraio, 1903- Bergamo 2 Maggio, 1979)

Prize share: 1/2

The Nobel Prize in Chemistry 1963 was awarded jointly to Karl Ziegler and Giulio Natta "for their discoveries in the field of the chemistry and technology of high polymers."

MOPLEN – Polipropilene Isotattico

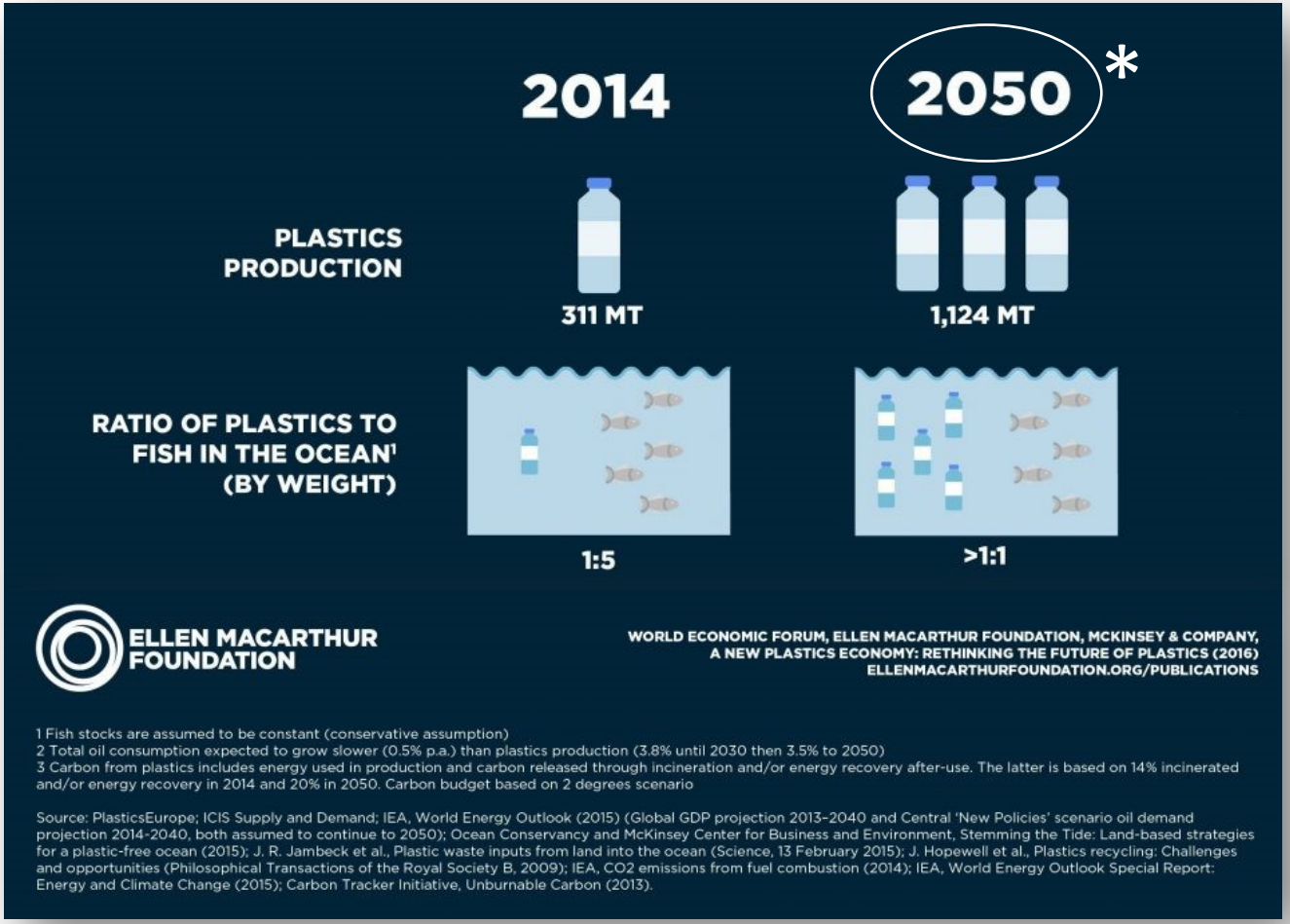
https://www.ellenmacarthurfoundation.org/

The New Plastics Economy: Rethinking the future of plastics

Applying circular economy principles to global plastic packaging flows could transform the plastics economy and drastically reduce negative externalities such as leakage into oceans, according to this new report.

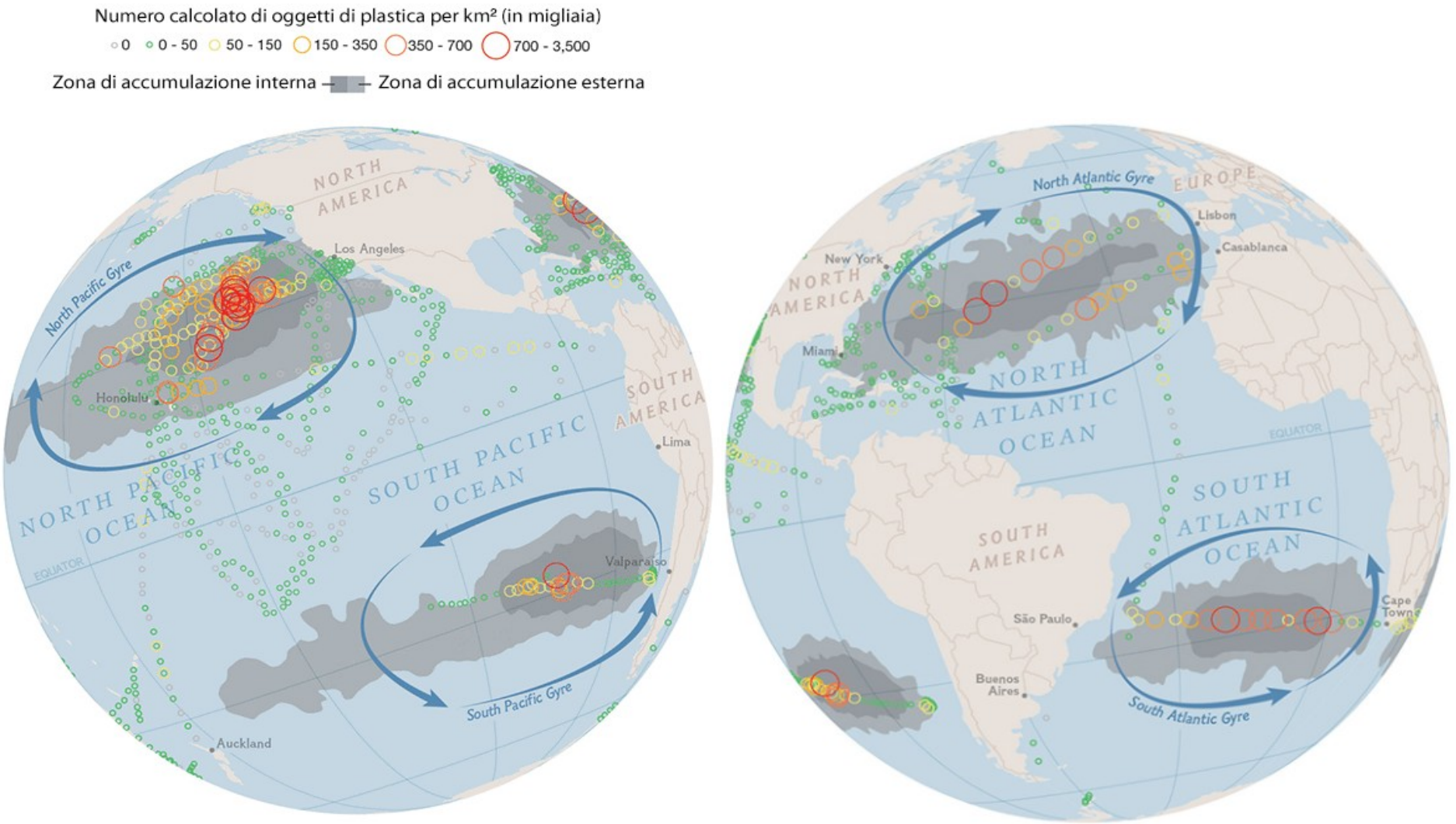
The New Plastics Economy: Rethinking the future of plastics provides, for the first time, a vision of a global economy in which plastics never become waste, and outlines concrete steps towards achieving the systemic shift needed.

The report was produced by the World Economic Forum and the Ellen MacArthur Foundation, with analytical support from McKinsey & Company, as part of Project MainStream, a global, multi-industry initiative that aims to accelerate business-driven innovations to help scale the circular economy. It was financially supported by the MAVA Foundation.



*33 miliardi di tonnellate di plastica in più

(Ellen MacArthur Foundation, 2016; Galloway T.S., 2015)



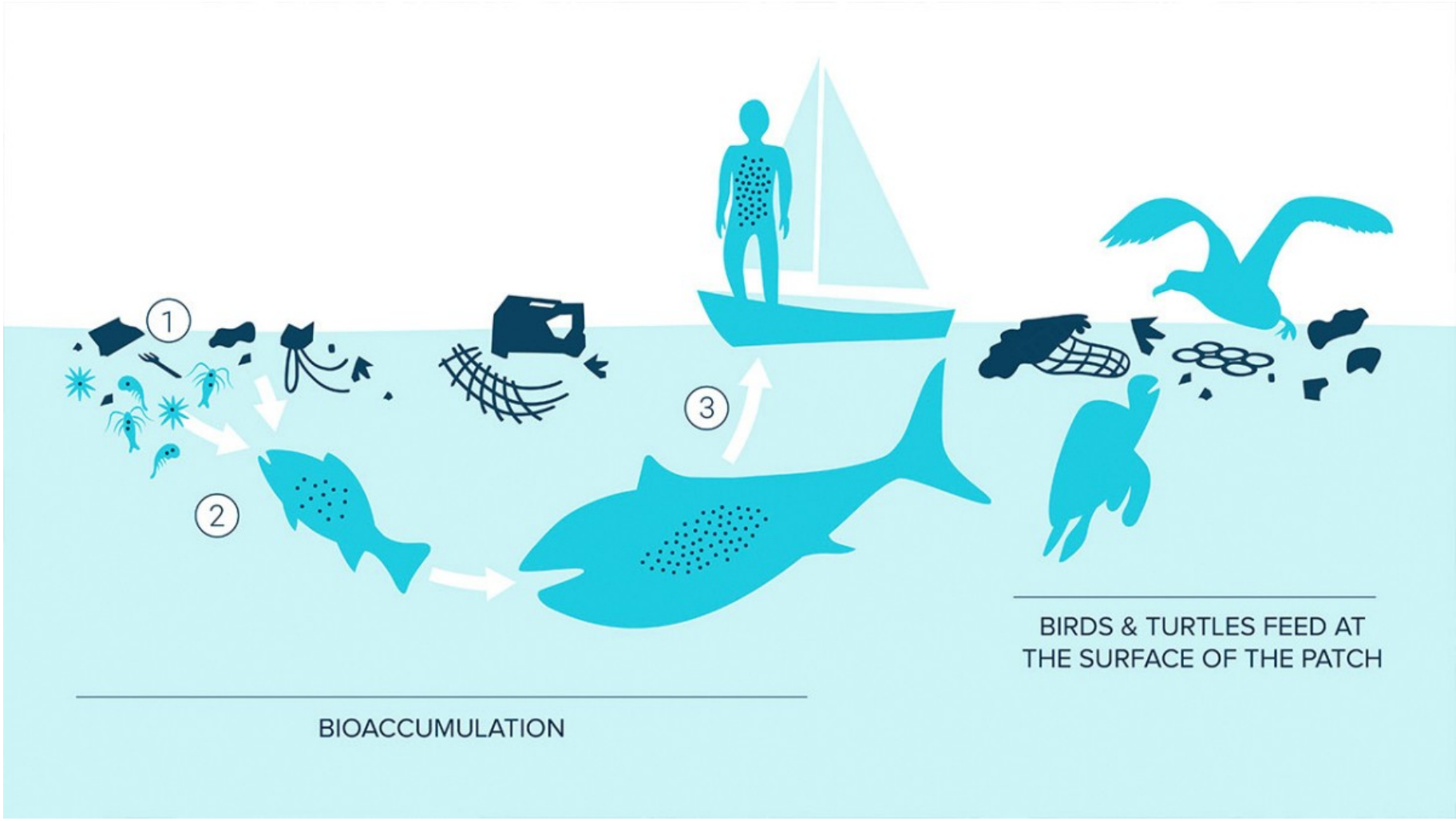
(Cozar et al. PNAS, 2014)

HOW LONG UNTIL IT'S GONE?

Estimated decomposition rates of common marine debris items

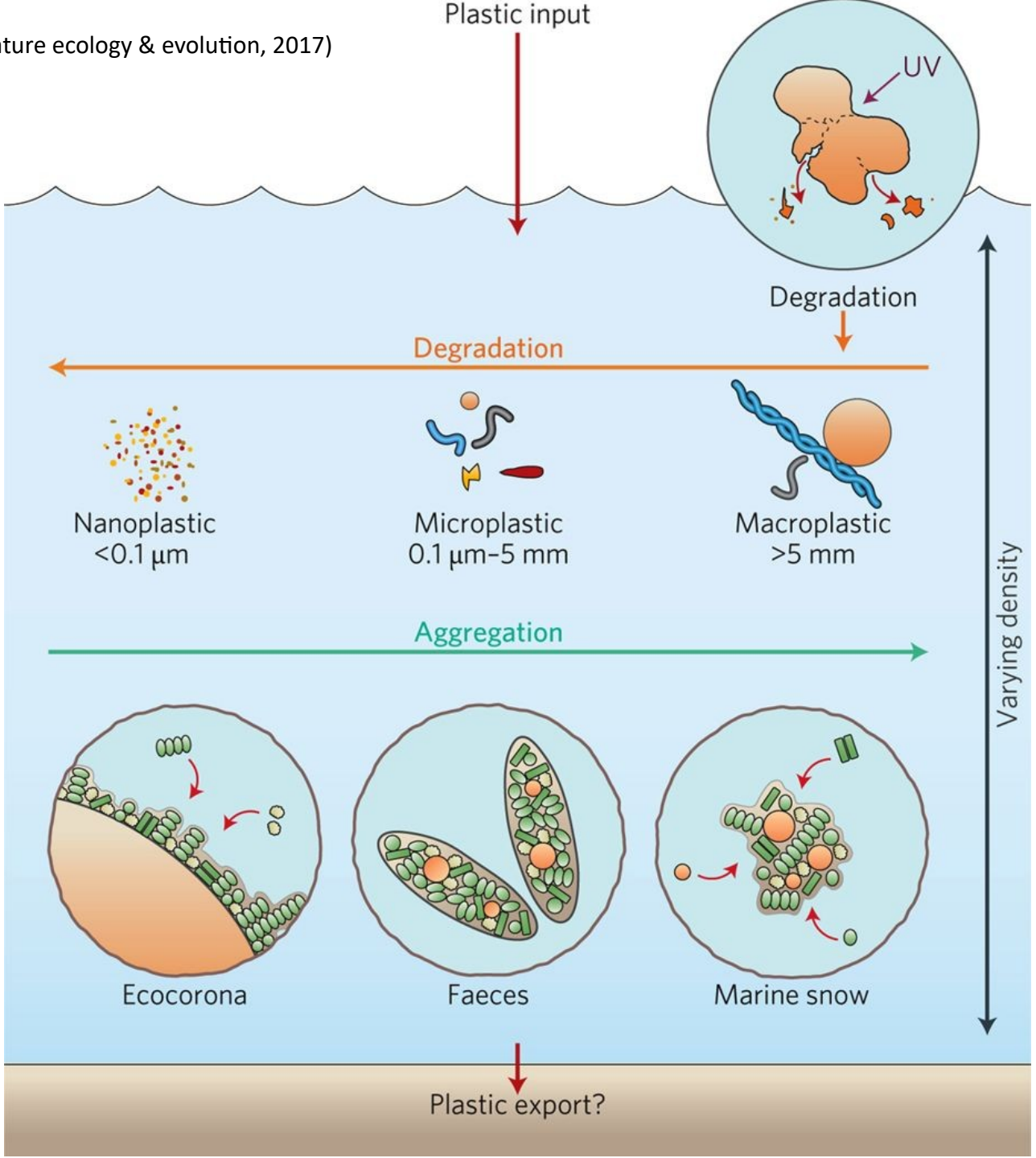
Estimated individual item timelines depend on product composition and environmental conditions.

Source: NOAA (National Oceanic and Atmospheric Administration), US / Woods Hole Sea Grant, US
Graphics: Oliver Lüde / Museum für Gestaltung Zürich, ZHdK


1
2
3
BIOACCUMULATION
BIRDS & TURTLES FEED AT
THE SURFACE OF THE PATCH

OUT OF THE PLASTIC TRAP: SAVING THE MEDITERRANEAN FROM PLASTIC POLLUTION

(Galloway T.S. et al., Nature ecology & evolution, 2017)



L’esposizione alla plastica per un adulto di circa 60kg che consuma 3kg di cibo-liquido/giorno è di circa

250ug/Kg di peso/giorno

(Muncke, 2011)

- Giocattoli
- Cosmetici
- Pellicola per alimenti
- Dispositivi medici

23 milioni di additivi delle plastiche negli oceani

(Galloway T.S. et al., Nature ecology & evolution, 2017)

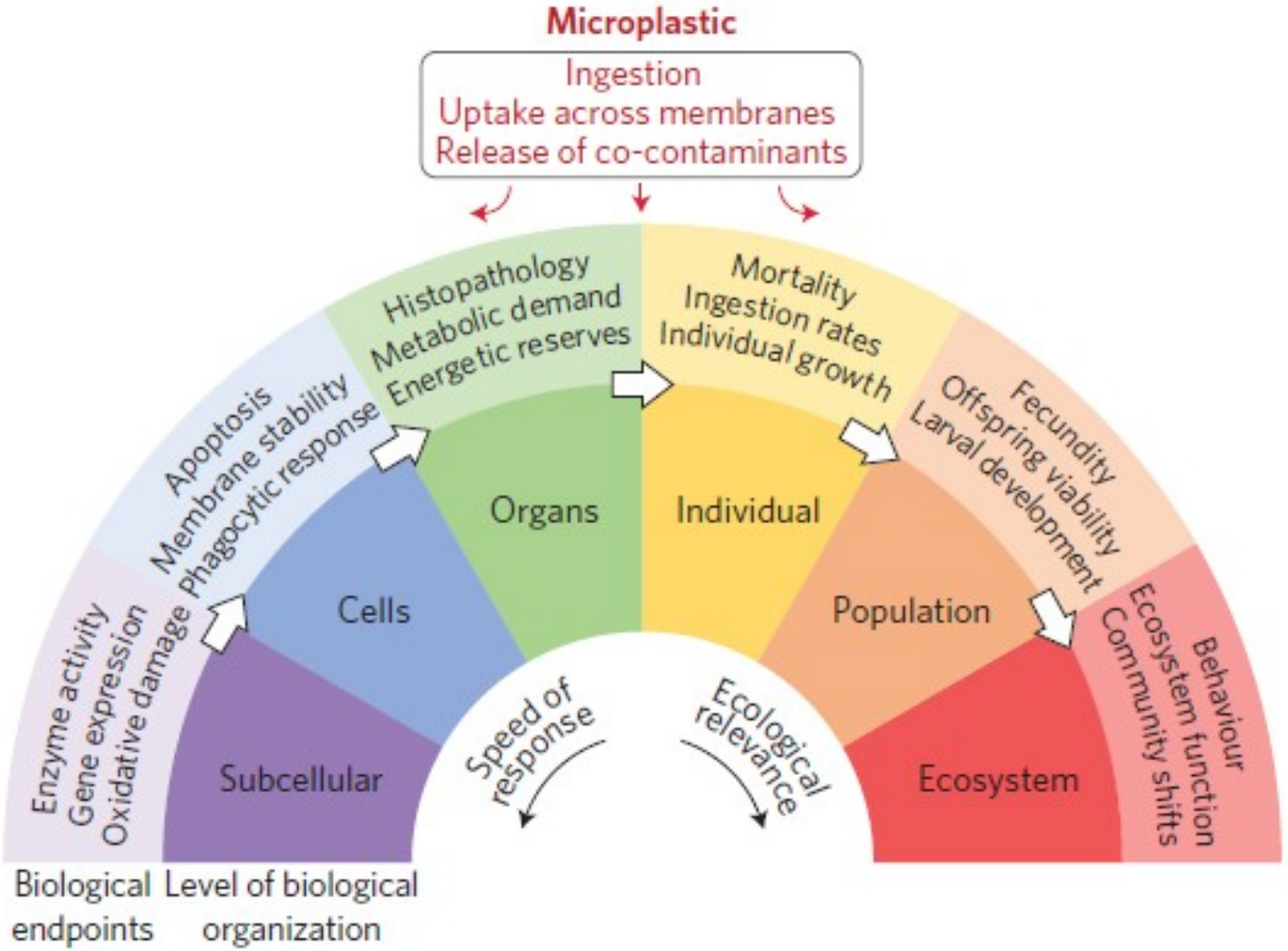


Figure 3 | Simplified scheme illustrating potential impacts of exposure to microplastic across successive levels of biological organization.

nanomaterials

MDPI

Review

Impact of Microplastics and Nanoplastics on Human Health

Maxine Swee-Li Yee [1,*], Ling-Wei Hii [2,3,4], Chin King Looi [2,3], Wei-Meng Lim [2,4], Shew-Fung Wong [5,6], Yih-Yih Kok [5,7], Boon-Keat Tan [5,6], Chiew-Yen Wong [5,7] and Chee-Onn Leong [2,4,*]

1 Centre of Nanotechnology and Advanced Materials, Faculty of Engineering, University of Nottingham Malaysia Campus, Jalan Broga, Semenyih 43500, Malaysia
2 Center for Cancer and Stem Cell Research, Institute for Research, Development and Innovation (IRDI), International Medical University, Kuala Lumpur 57000, Malaysia; lingweihii@imu.edu.my (L.-W.H.); 00000028295@student.imu.edu.my (C.K.L.); weimeng_lim@imu.edu.my (W.-M.L.)
3 School of Postgraduate Studies, International Medical University, Kuala Lumpur 57000, Malaysia
4 School of Pharmacy, International Medical University, Kuala Lumpur 57000, Malaysia
5 Center for Environmental and Population Health, Institute for Research, Development and Innovation (IRDI), International Medical University, Kuala Lumpur 57000, Malaysia; shewfung_wong@imu.edu.my (S.-F.W.); yihyih_kok@imu.edu.my (Y.-Y.K.); boonkeat_tan@imu.edu.my (B.-K.T.); wongchiewyen@imu.edu.my (C.-Y.W.)
6 School of Medicine, International Medical University, Kuala Lumpur 57000, Malaysia
7 School of Health Sciences, International Medical University, 126, Jalan Jalil Perkasa 19, Bukit Jalil, Kuala Lumpur 57000, Malaysia
* Correspondence: Maxine.Yee@nottingham.edu.my (M.S.-L.Y.); cheeonn_leong@imu.edu.my (C.-O.L.)

Abstract: Plastics have enormous impacts to every aspect of daily life including technology, medicine and treatments, and domestic appliances. Most of the used plastics are thrown away by consumers after a single use, which has become a huge environmental problem as they will end up in landfill, oceans and other waterways. These plastics are discarded in vast numbers each day, and the breaking down of the plastics from micro- to nano-sizes has led to worries about how toxic these plastics are to the environment and humans. While, there are several earlier studies reported the effects of micro- and nano-plastics have on the environment, there is scant research into their impact on the human body at subcellular or molecular levels. In particular, the potential of how nano-plastics move through the gut, lungs and skin epithelia in causing systemic exposure has not been examined thoroughly. This review explores thoroughly on how nanoplastics are created, how they behave/breakdown within the environment, levels of toxicity and pollution of these nanoplastics, and the possible health impacts on humans, as well as suggestions for additional research. This paper aims to inspire future studies into core elements of micro- and nano-plastics, the biological reactions caused by their specific and unusual qualities.

Keywords: nanoplastics; nanotoxicity; nanomaterials; toxicology; plastics; health impacts; environmental impacts; pollution

Citation: Yee, M.S.-L.; Hii, L.-W.; Looi, C.K.; Lim, W.-M.; Wong, S.-F.; Kok, Y.-Y.; Tan, B.-K.; Wong, C.-Y.; Leong, C.-O. Impact of Microplastics and Nanoplastics on Human Health. *Nanomaterials* **2021**, *11*, 496. https://doi.org/10.3390/nano11020496

Academic Editor: Vivian Hsiu-Chuan Liao

Received: 24 January 2021
Accepted: 13 February 2021
Published: 16 February 2021

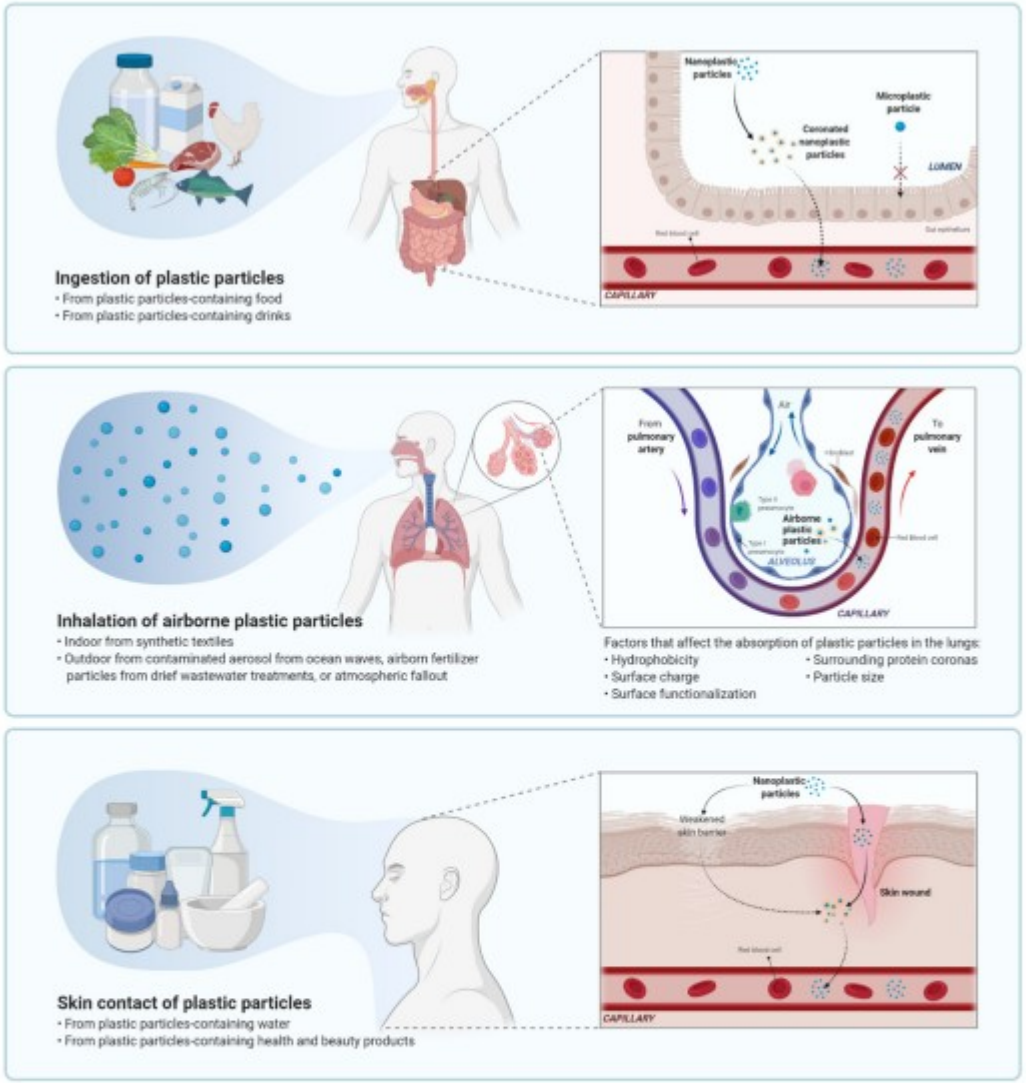
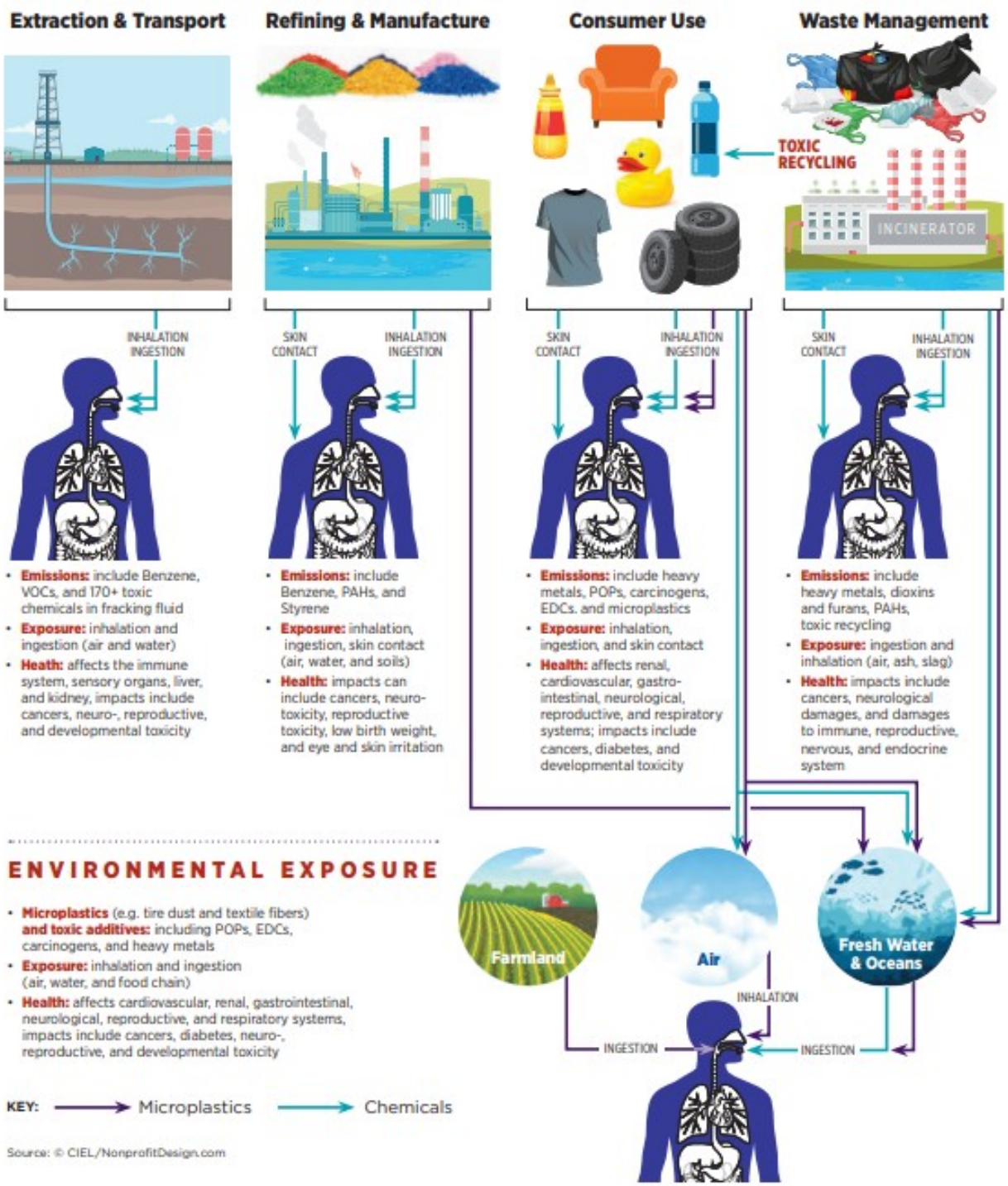
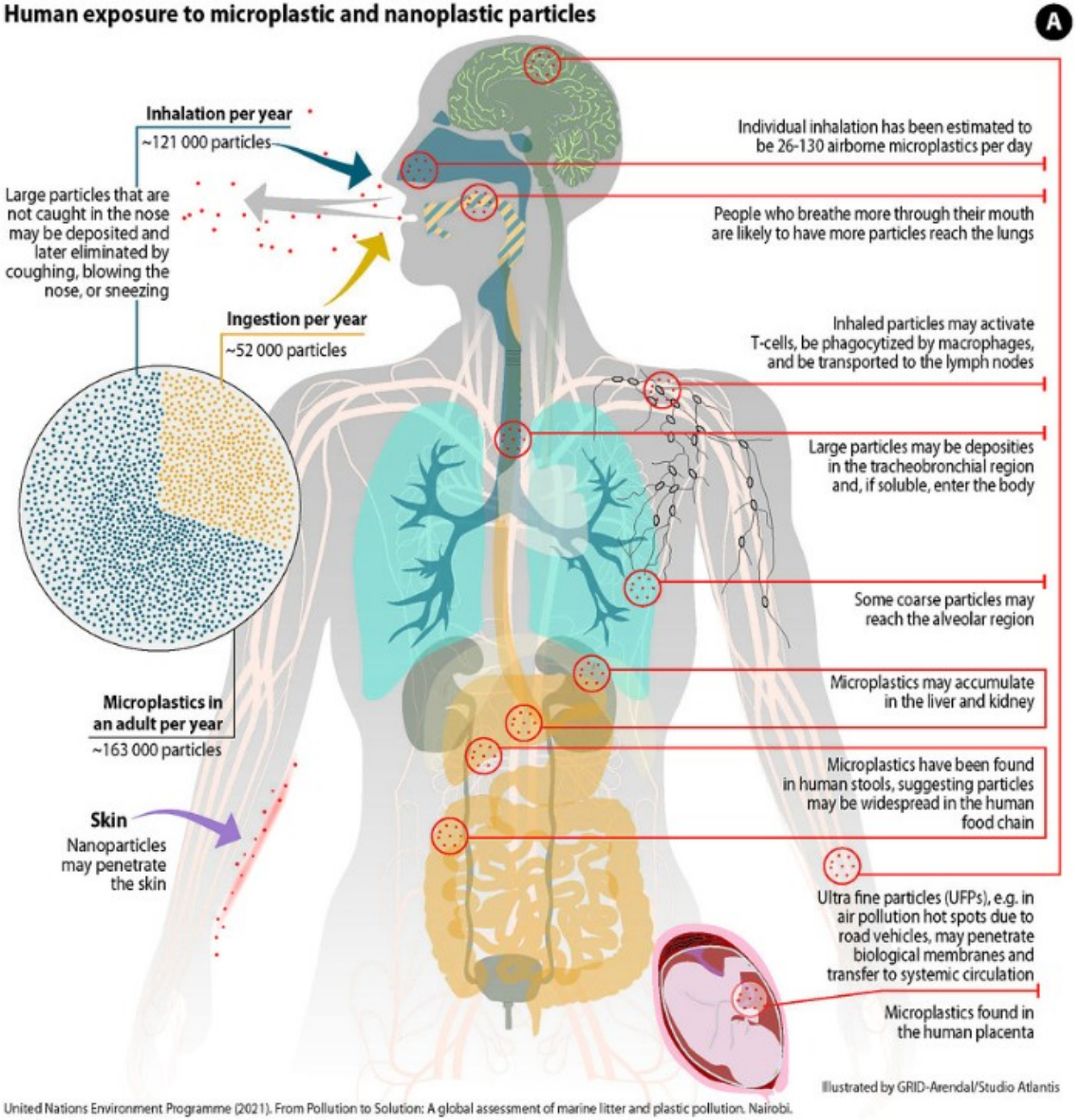


Figure 2. Routes of plastic particles entry into human body. There are three key routes for micro- and nanoplastics entry into the human body: Inhalation, ingestion and skin contact. Nanoplastics may interact with proteins, lipids, carbohydrates, nucleic acids, ions, and water in human body, leading to the formation of coronated nanoplastic particles for absorption. The plastic particles can enter human body through ingestion of contaminated food and water supplies, or inhalation of the airborne plastic particles that originate from synthetic textiles and polluted outdoor air. While, the skin membrane is too fine for these plastic particles to pass through, nanoplastics may penetrate through wound and weakened skin barrier, directly or indirectly.

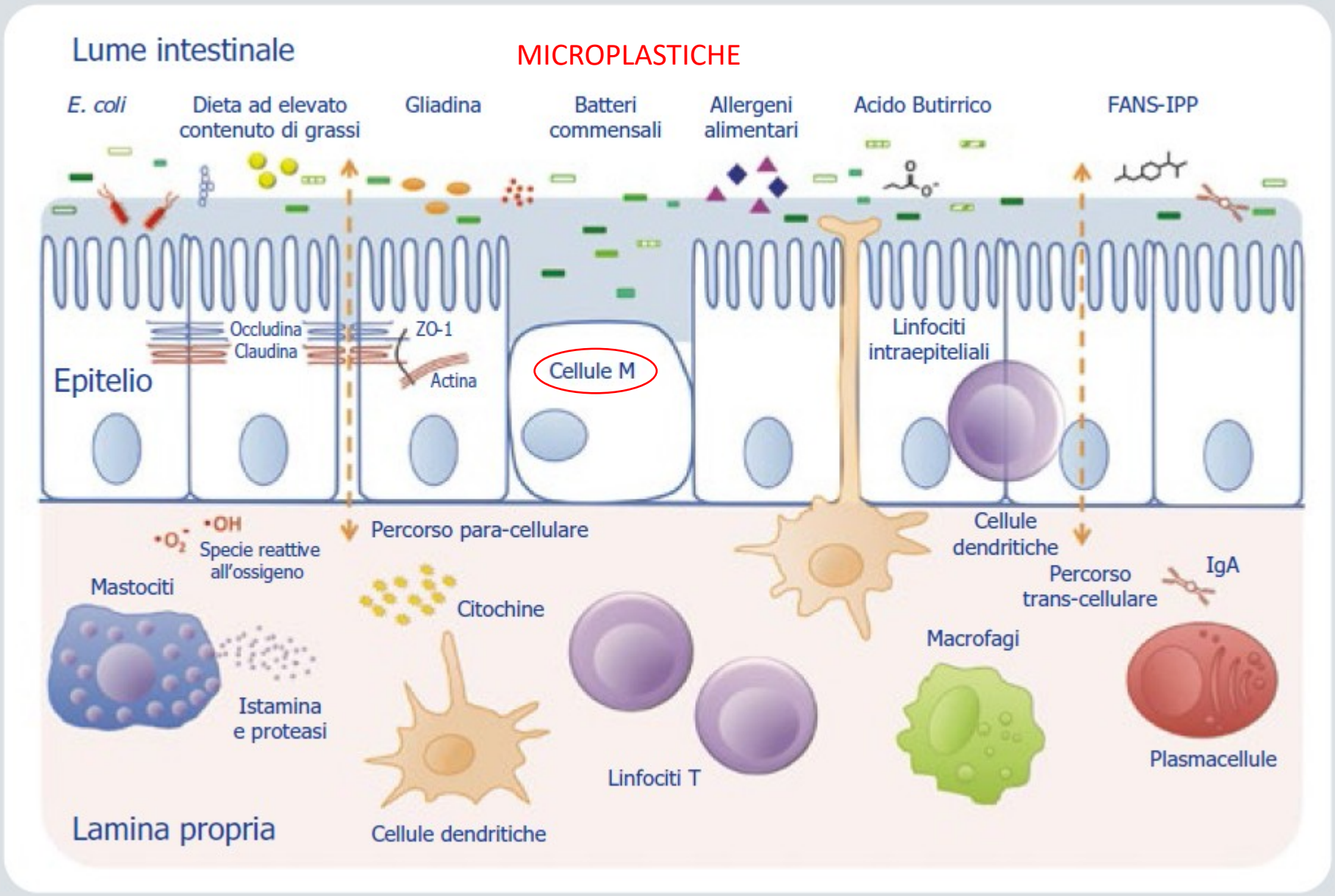
Table 1. Summary of potential toxic effects of micro- and nanoplastics on human health.

Toxic Effects	Characteristics of Plastic Particles	Particle Size	Details
Inflammation	Polystyrene particles	202 nm and 535 nm	• Upregulation of IL-8 expression. • Induced inflammation in human A549 lung cells.
	Unaltered/Carboxylated polystyrene nanoparticles	20 nm, 44 nm, 500 nm, and 1000 nm	• Upregulation of IL-6 and IL-8 expression. • Enhanced inflammation in multiple human malignancies.
	Carboxylated and amino-modified polystyrene particles	120 nm	• Altered expression of scavenger receptors. • M2 cells increased IL-10 production. • Increased TGFβ1 (M1) and energy metabolism (M2).
	Unaltered polyethylene particles	0.3 μm, 10 μm	• Increased the secretion of IL-6, IL-1β, and TNFα in murine macrophages.
	Polyethylene particles from plastic prosthetic implants	0.2 μm and 10 μm	• Induced the expression of TNFα, IL-1, and RANKL. • Resulted in periprosthetic bone resorption. • Induced inflammatory response at the implant area.
	Polystyrene microplastics particles	5 μm and 20 μm	• Induced inflammation in the liver. • Induced adverse effects on neurotransmission.
Oxidative stress and apoptosis	Amine-modified polystyrene nanoparticles	60 nm	• Strong interaction and aggregation with mucin. • Induced apoptosis in all intestinal epithelial cells.
	Cationic polystyrene nanoparticles	60 nm	• Induced ROS generation and ER stress • Induced autophagic cell death of mouse macrophages and lung epithelial cells.
	Unaltered or functionalized polystyrene polyvinyl chloride (PVC) and poly (methyl methacrylate) (PMMA)	20 nm, 40 nm, 50 nm, and 100 nm 120 nm, 140 nm	• Induced apoptosis of several human cell types. • Reduced cell viability with a reduction of ATP and increase of ROS concentrations.
Metabolic homeostasis	Pristine and fluorescent polystyrene microplastics	5 μm	• Changes in amino acid and bile acid metabolism. • Induced gut microbiota dysbiosis and intestinal barrier dysfunction.
	Anionic carboxylated polystyrene nanoparticles	20 nm	• Altered ion channel function and ionic homeostasis • Activated basolateral K^+ channels. • Induced Cl^- and HCO^{3-} ion efflux.
	Polystyrene nanoparticles	30 nm	• Blocked vesicle transport and the distribution of cytokinesis-associated proteins.
	Cationic polystyrene nanoparticles	50 nm and 200 nm	• Disrupted intestinal iron transport and cellular uptake.
	Pristine polystyrene microparticles	5 μm and 20 μm	• Reduction in hepatic ATP levels. • Impairment of energy metabolism.
	Microplastics	0.5 μm and 5 μm	• Metabolic disorder associated with gut microbiota dysbiosis and gut barrier dysfunction. • Increased the risks of metabolic disorder in the offspring.

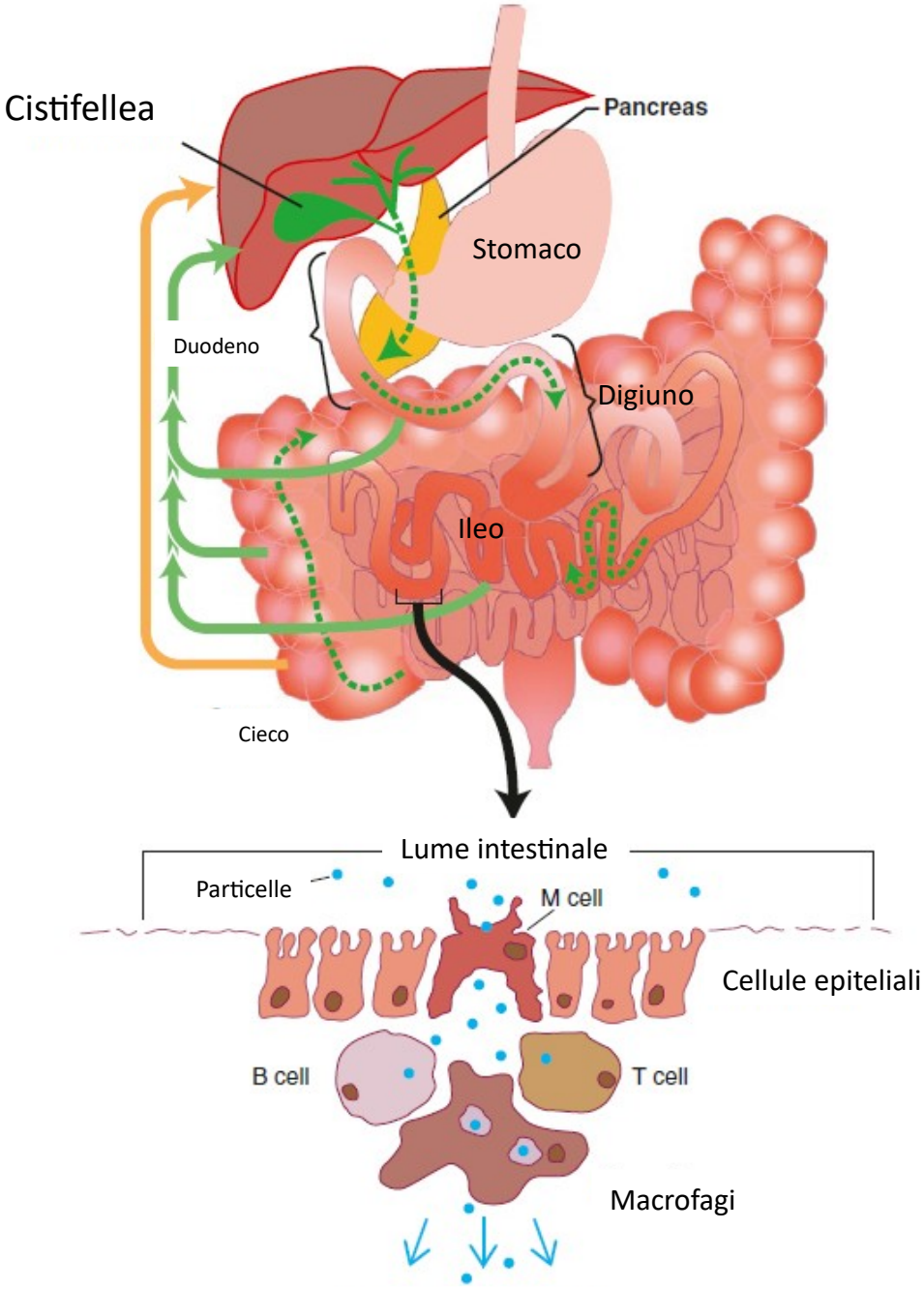

Extraction & Transport
Refining & Manufacture
Consumer Use
Waste Management
TOXIC RECYCLING
INCINERATOR
INHALATION
INGESTION
SKIN CONTACT
INHALATION
INGESTION
SKIN CONTACT
INHALATION
INGESTION
SKIN CONTACT
INHALATION
INGESTION
• Emissions: include Benzene, VOCs, and 170+ toxic chemicals in fracking fluid
• Exposure: inhalation and ingestion (air and water)
• Health: affects the immune system, sensory organs, liver, and kidney, impacts include cancers, neuro-, reproductive, and developmental toxicity
• Emissions: include Benzene, PAHs, and Styrene
• Exposure: inhalation, ingestion, skin contact (air, water, and soils)
• Health: impacts can include cancers, neuro-toxicity, reproductive toxicity, low birth weight, and eye and skin irritation
• Emissions: include heavy metals, POPs, carcinogens, EDCs. and microplastics
• Exposure: inhalation, ingestion, and skin contact
• Health: affects renal, cardiovascular, gastro-intestinal, neurological, reproductive, and respiratory systems; impacts include cancers, diabetes, and developmental toxicity
• Emissions: include heavy metals, dioxins and furans, PAHs, toxic recycling
• Exposure: ingestion and inhalation (air, ash, slag)
• Health: impacts include cancers, neurological damages, and damages to immune, reproductive, nervous, and endocrine system
ENVIRONMENTAL EXPOSURE
• Microplastics (e.g. tire dust and textile fibers) and toxic additives: including POPs, EDCs, carcinogens, and heavy metals
• Exposure: inhalation and ingestion (air, water, and food chain)
• Health: affects cardiovascular, renal, gastrointestinal, neurological, reproductive, and respiratory systems, impacts include cancers, diabetes, neuro-, reproductive, and developmental toxicity
Farmland
Air
Fresh Water & Oceans
INHALATION
INGESTION
INGESTION
KEY:
Microplastics
Chemicals
Source: © CIEL/NonprofitDesign.com



United Nations Environment Programme (2021). From Pollution to Solution: A global assessment of marine litter and plastic pollution. Nairobi.



Circolo sanguigno e linfatico → Traslocazione in altri tessuti e organi



Galloway T.S., 2015

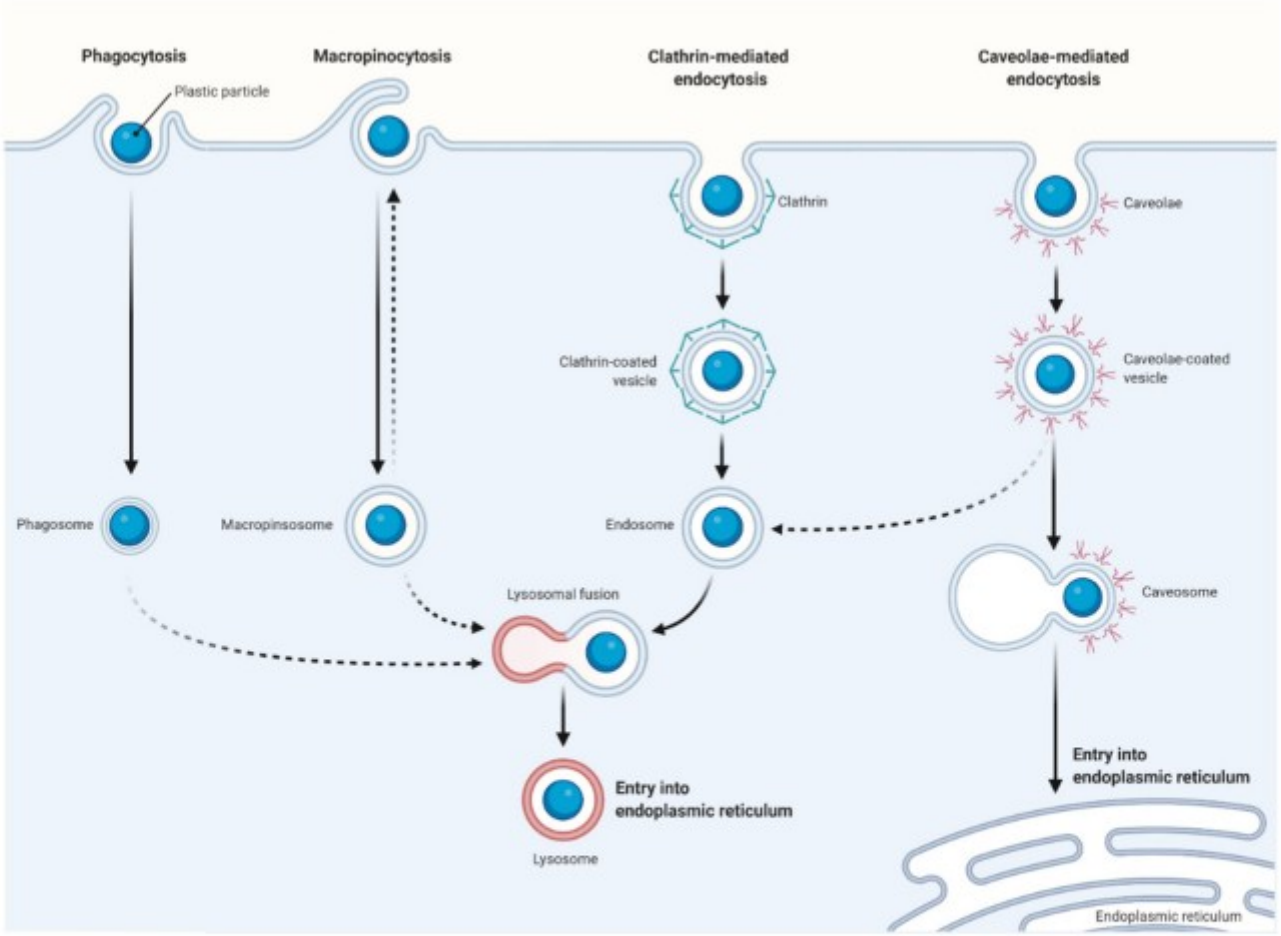
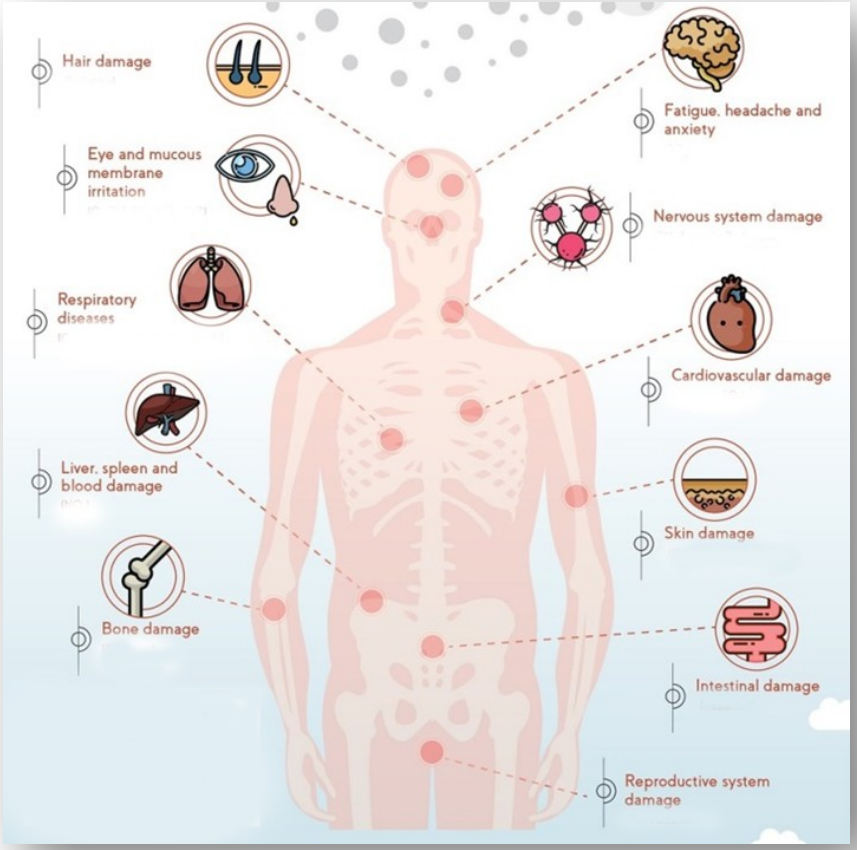


Figure 3. Routes of cellular uptake of plastic particles. Phagocytosis, macropinocytosis, clathrin- and caveolae-mediated endocytosis are the common endocytotic pathways that have been identified for cellular uptake of plastic particles. Micro- and nanoplastics can be absorbed by cells through different routes, of which endocytotic nanoparticle uptake is the primary route where adhesive interaction of nanoparticles (or inactive permeation of the cell membrane) with channel- or transport-protein occurs.



«genomica sociale»
Come la vita quotidiana influenza il tuo DNA


100%廢污水
製冰所
100%廢污水
製冰所
100%廢污水
製冰所

INTRODUCTION

Introduction to the New Plastics Economy Global Commitment

The New Plastics Economy Global Commitment unites businesses, governments, and other organisations behind a common vision and targets to address plastic waste and pollution at its source. It is led by the Ellen MacArthur Foundation in collaboration with UN Environment.

Launched in October 2018, the Global Commitment already unites more than **350** organisations on its common vision of a circular economy for plastics, keeping plastics in the economy and out of the ocean. Signatories include:

- More than **150** businesses that are part of the plastic packaging value chain, jointly representing over **20%** of all plastic packaging used globally, including many of the world's leading consumer packaged goods companies, retailers, and plastic packaging producers
- **16** governments across five continents and across national, regional, and city level
- **26** financial institutions with a combined **USD 4.2 trillion** worth of assets under management and **6** investors in total committing to invest about **USD 275 million**
- Leading institutions such as WWF, the World Economic Forum, the Consumer Goods Forum, and IUCN
- More than **50** academics, universities, and other educational or research organisations including MIT Environmental Solutions Initiative, Michigan State University, and University College London

All **350+** organisations have endorsed one common vision of a circular economy for plastics, in which plastics never become waste (see next page).

To help make this vision a reality, all business and government signatories to the Global Commitment are committing to a set of ambitious **2025** targets. They will work to **eliminate** the plastic items we don't need; **innovate** so all plastics we do need are designed to be safely reused, recycled, or composted; and **circulate** everything we use to keep it in the economy and out of the environment.

Credibility and transparency are ensured by setting a clear minimum level of ambition for signatories, common definitions underpinning all commitments, publication of commitments online and annual reporting on progress, with the first progress report to be published later in 2019. The minimum ambition level will be reviewed every **18 to 24 months**, and become increasingly ambitious over the coming years to ensure the Global Commitment continues to represent true leadership.

The Ellen MacArthur Foundation and UN Environment call on all businesses that make or use plastics, and all governments across the world, to sign up to the Global Commitment and join the more than **350** co-signatories in a 'race to the top' to create a circular economy for plastic.

2019 Spring report - UN Environment and Ellen MacArthur Foundation

2019


Plastic &
Health
THE HIDDEN COSTS
OF A PLASTIC PLANET
CIEL
Healthy Babies Bright Futures
IPEN
a toxics-free future
t.e.j.a.s
UPSTREAM
gaia
#break
free
from
plastic

Plastic & Health

THE HIDDEN COSTS OF A PLASTIC PLANET

Center for International Environmental Law (CIEL) uses the power of law to protect the environment, promote human rights, and ensure a just and sustainable society. CIEL seeks a world where the law reflects the interconnection between humans and the environment, respects the limits of the planet, protects the dignity and equality of each person, and encourages all of earth's inhabitants to live in balance with each other.

Earthworks is a nonprofit organization dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions.

Global Alliance for Incinerator Alternatives (GAIA) is a worldwide alliance of more than 800 grassroots groups, non-governmental organizations, and individuals in over 90 countries whose ultimate vision is a just, toxic-free world without incineration.

Healthy Babies Bright Futures (HBBF) is an alliance of nonprofit organizations, scientists and donors that designs and implements outcomes-based programs to measurably reduce babies' exposures to toxic chemicals in the first 1,000 days of development. HBBF brings together the strongest and latest science, data analysis, critical thinking, performance measurement, campaign talent, communications skills and commitment to collaboration.

IPEN brings together leading public interest groups working on environmental and public health issues in over 100 countries to take action internationally to minimize and, whenever possible, eliminate hazardous, toxic chemicals.

Texas Environmental Justice Advocacy Services (t.e.j.a.s.) is dedicated to providing community members with the tools necessary to create sustainable, environmentally healthy communities by educating individuals on health concerns and implications arising from environmental pollution, empowering individuals with an understanding of applicable environmental laws and regulations and promoting their enforcement, and offering community building skills and resources for effective community action and greater public participation.

UPSTREAM seeks to transform our throw-away society to a culture of stewardship. We envision a world in which plastics and other materials are not designed to be used for a matter of minutes and then thrown away, and we empower business, communities, and people to co-create a brighter future with us.

#breakfreefromplastic is a global movement envisioning a future free from plastic pollution made up of 1,400 organizations from across the world demanding massive reductions in single-use plastics and pushing for lasting solutions to the plastic pollution crisis.

https://scientificadvice.eu/

Scientific Advice Mechanism
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January 2019

A scientific perspective on microplastics in nature and society

Key downloads

Evidence review report

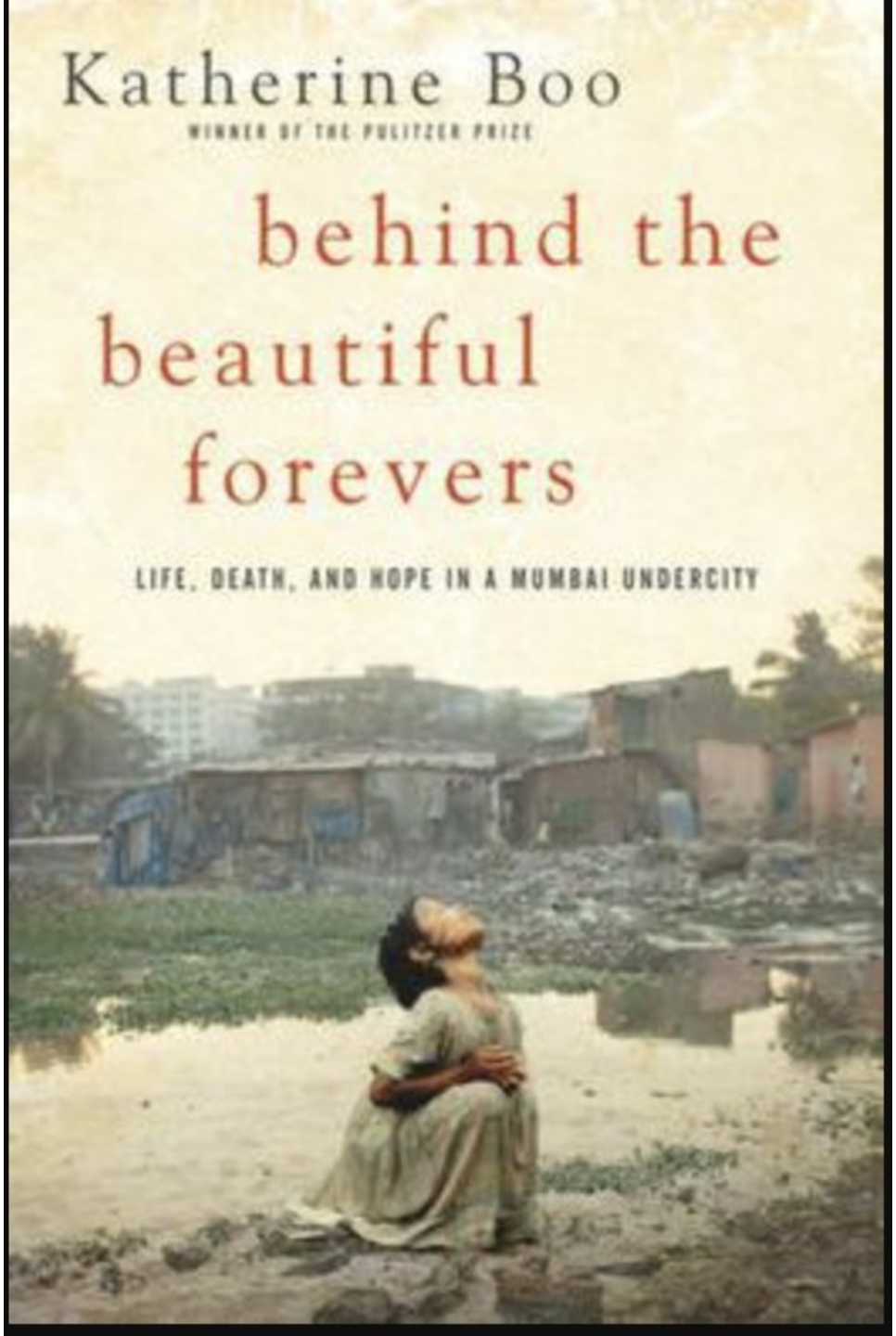
Scientific opinion

The best available evidence suggests that microplastics and nanoplastics do not pose a widespread risk to humans or the environment, except in small pockets. But that evidence is limited, and the situation could change if

Scientific advice

Delivery date
15 January 2019


Katherine Boo
VINCITRICE DEL PREMIO PULITZER
Belle per sempre
«Così stellare da far vergognare
la maggior parte dei romanzi»
THE NEW YORK TIMES
PIEMME Voci


Katherine Boo
WINNER OF THE PULITZER PRIZE
behind the beautiful forevers
LIFE, DEATH, AND HOPE IN A MUMBAI UNDERCITY

I giusti (Jorge Luis Borges)

Un uomo che coltiva il suo giardino, come voleva Voltaire.
Chi è contento che sulla terra esista la musica.
Chi scopre con piacere una etimologia.
Due impiegati che in un caffè del Sud giocano in silenzio agli scacchi.
Il ceramista che intuisce un colore e una forma.
Il tipografo che compone bene questa pagina che forse non gli piace.
Una donna e un uomo che leggono le terzine finali di un certo canto.
Chi accarezza un animale addormentato.
Chi giustifica o vuole giustificare un male che gli hanno fatto.
Chi è contento che sulla terra ci sia Stevenson.
Chi preferisce che abbiano ragione gli altri.
Tali persone, che si ignorano, stanno salvando il mondo.