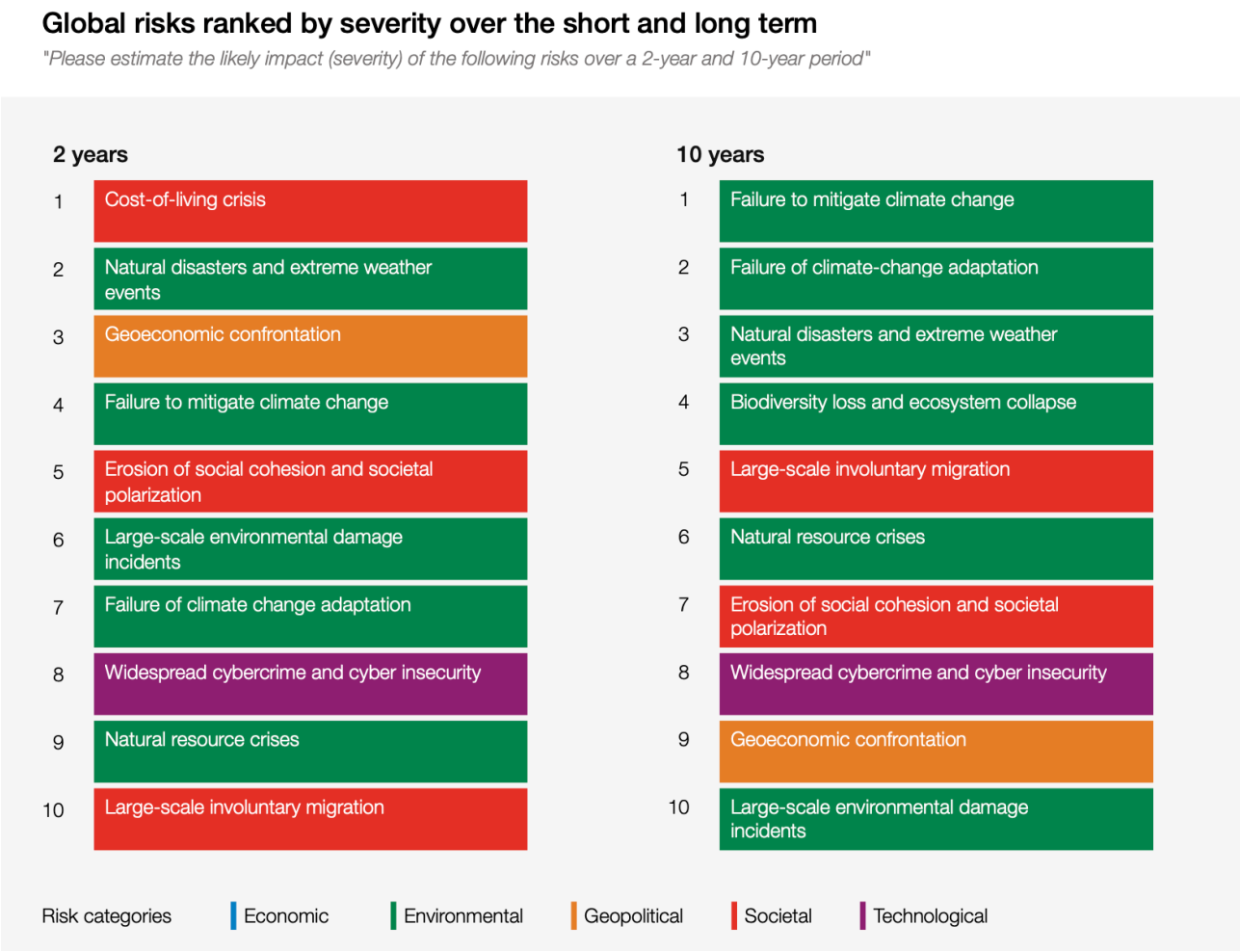
Kengetallen voor klimaat en natuur

Werner Murez , 11 december 2023



Bron[1]

[1] World Economic Forum, The Global Risks Report 2023 18th Edition INSIGHT REPORT - https://www3.weforum.org/docs/WEF_Global_Risks_Report_2023.pdf

OPWARMING

CO_2

- Hoeveel CO2 "mag" er in de atmosfeer zitten[2]? : ca **280 ppm** (parts pro million)[3]
- CO2 vandaag (11/2023) in de atmosfeer : **420 ppm**[4]
- Todays CO2 concentration has not been exceeded during the **past 420,000 years** and likely not during the past 20 million years.[5]
- jaarlijkse uitstoot CO2 wereldwijd (Gigaton): **ca. 37 Gt** [6]
- hoeveel CO2 mag men nog uitstoten om te vermijden dat de aarde meer dan 1,5°C opwarmt? [7] : nog **380 Gt** CO2 [8] [9] tot **250 Gt** CO2 [10]. (250:37=ca7)
- Hoeveel gigaton potentiële CO2 emissies vertegenwoordigen de huidige olie, gas en steenkool voorraden in de grond op aarde : **2.910 Gt** (equivalent CO2 uitstoot)[11] 2.910:37=78
- Hoeveel bedraagt de opwarming bij blijvende (ongewijzigde) CO2 uitstoot (business as usual): minimaal **6°C**. De ijskappen zijn dan volledig gesmolten. De situatie op aarde is dan zoals 250 miljoen jaar geleden[12] [13]

---

[2] Of het pre-industrieel niveau : Het niveau van CO2 bleef honderdduizenden jaren beneden 280 deeltjes per miljoen, maar : door verbranding van fossiele brandstoffen en het kappen van bossen steeg het naar boven 400 dpm (deeltjes per miljoen). We weten 100% zeker waar de opwarming vandaan komt : van recente menselijke activiteit. Waarom eigenlijk ook door het kappen van bomen ? Omdat bomen CO2 uit de lucht opnemen en gebruiken om te groeien en zuurstof teruggeven. Voor zover als nodig: fossiele brandstoffen zijn petroleum, kolen en gas. Bij het pre-industrieel niveau bleven de temperaturen stabiel.

[3] IPCC, TAR Climate Change 2001: The Scientific Basis, 3 The Carbon Cycle and Atmospheric Carbon Dioxide, https://www.ipcc.ch/report/ar3/wg1/the-carbon-cycle-and-atmospheric-carbon-dioxide/

[4] NOAA National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Global Monitoring Laboratory, Trends in Atmospheric Carbon Dioxide, November 2023 , Earth System Research Laboratories , https://gml.noaa.gov/ccgg/trends/

[5] IPCC - https://archive.ipcc.ch/ipccreports/tar/wg1/016.htm#:~:text=The atmospheric concentration of CO,the past 20 million years.

[6] INTERNATIONAL ENERGY AGENCY (IEA)- CO2 Emissions in 2022

[7] "Resterende wereldwijde koolstofbudget " :Hoeveel CO2 de wereld kan uitstoten om een redelijke kans (50%) te hebben beneden een stijging van 1,5°C te blijven

[8] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. In Press. - pag 29 tabel (21-00-00 IPCC Climate Change 2021 The Physical Science Basis Summary for Policymakers)
23-03-20 Latest and possibly final IPCC warning- Effective climate policy is more urgent

[9] NIOZ Royal Netherlands Institute for Sea Research, Aimée Slangen , Latest and possibly final IPCC warning: Effective climate policy is more urgent than ever, 20/03/2023

[10] Lamboll, R.D., Nicholls, Z.R.J., Smith, C.J. *et al.* Assessing the size and uncertainty of remaining carbon budgets. *Nat. Clim. Chang.* (2023). https://doi.org/10.1038/s41558-023-01848-5

[11] FINANCIAL TIMES, Alan Livsey, London, "Lex in depth: the $900bn cost of 'stranded energy assets'" 04/02:2020. "We hebben een veelvoud olie, kolen en gas in de boeken staan dan klimaatwetenschappers veilig achten om te verbranden."

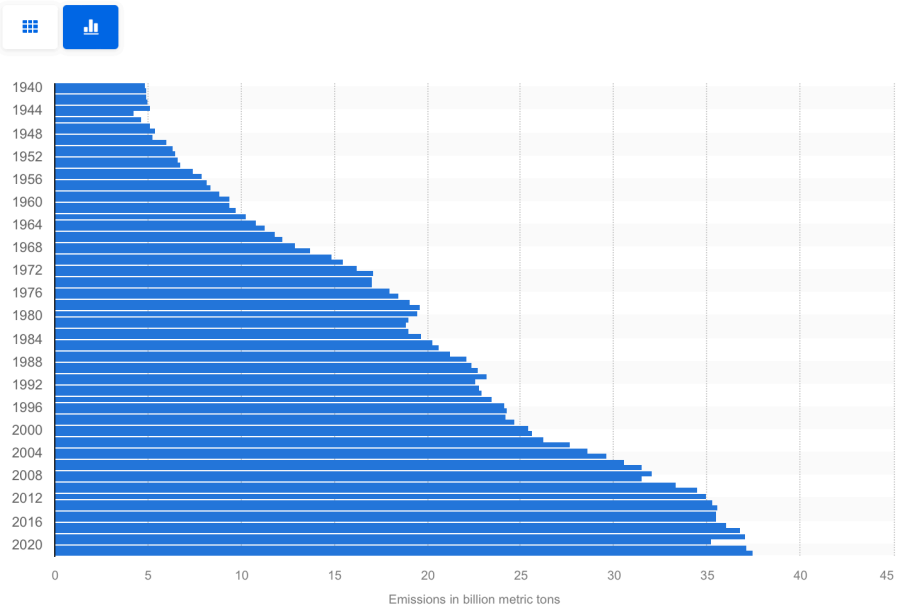
[12] Predictions of a world with 6°C of warming are universally dire, with the polar ice caps fully melted, mass migration and starvation. A period of warming of 6°C around 250 million years ago led to the extinction of 95% of the Earth's living species at that time according to research from Bristol University.

[13] Climate Home News, John Parnell, "World headed for 6°C of warming, says new study", 05/11/12

- Waarom precies **1,5°C:** That's the threshold beyond which scientists say increasingly severe wildfires, floods, heat and drought will outpace humanity's ability to adapt [14]
- Slechts **10% van de wereldbevolking** is verantwoordelijk voor 48% van de uitstoot [15]
- **Tipping points** : " critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly" wetenschappers zijn het er over eens dat bij 3 °C een op hol geslagen klimaat in beweging kan gezet worden: onstopbaar smelten van de ijskappen, vrijkomen van alle opgeslagen methaan uit de permafrost, op weg naar temperatuurstijgingen van 6-8 °C en meer zo.[16]

Annual carbon dioxide (CO_2) emissions worldwide from 1940 to 2022

(in billion metric tons)

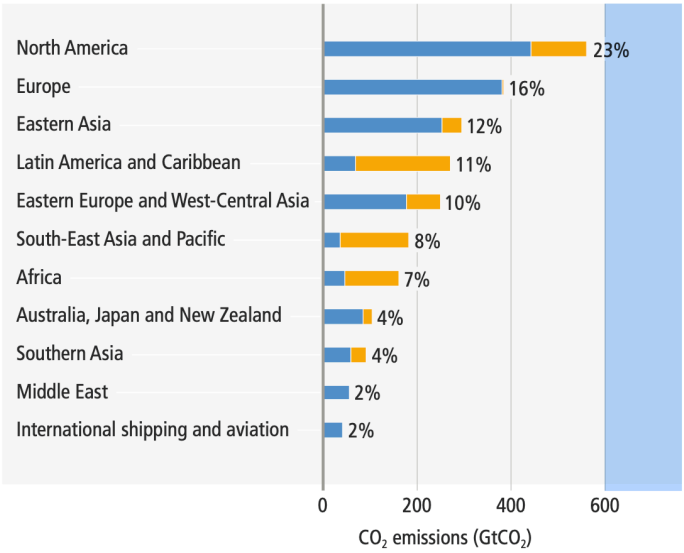


[14] IPCC Global Warming of 1.5°C, An IPCC Special Report , ISBN 978-92-9169-153-1， Frequently Asked Questions , 2019, https://www.ipcc.ch/site/assets/uploads/sites/2/2018/12/SR15_FAQ_Low_Res.pdf - https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Summary_Volume_LR.pdf

[15] 23-10-24 2023 state of the climate report- Entering uncharted territory l BioScience l Ox
Chancel L. 2022. Global carbon inequality over 1990–2019. Nature Sustainability 5: 931–938.

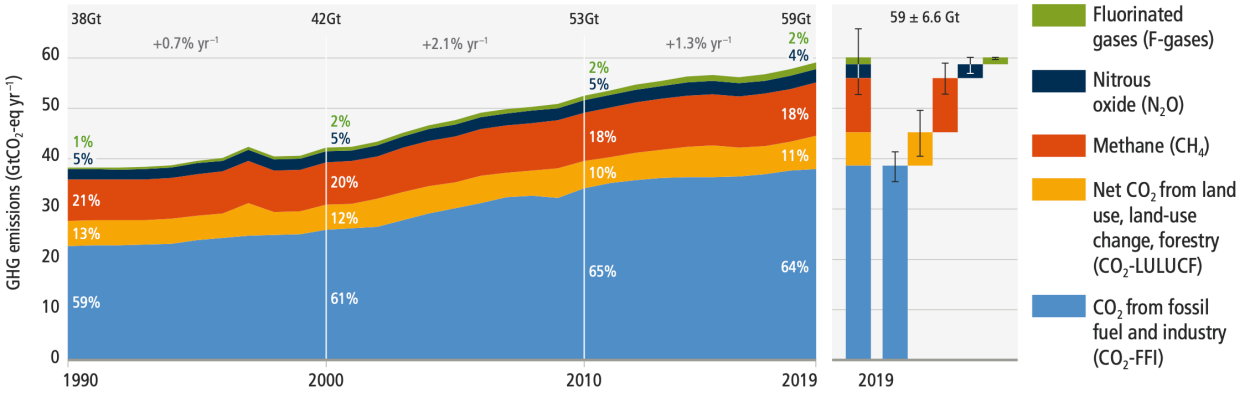
[16] IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001 - 23-00-00 IPCC CLIMATE CHANGE 2023 Synthesis Report Summary for Policymakers - https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

b. Historical cumulative net anthropogenic CO_2 emissions per region (1850–2019)



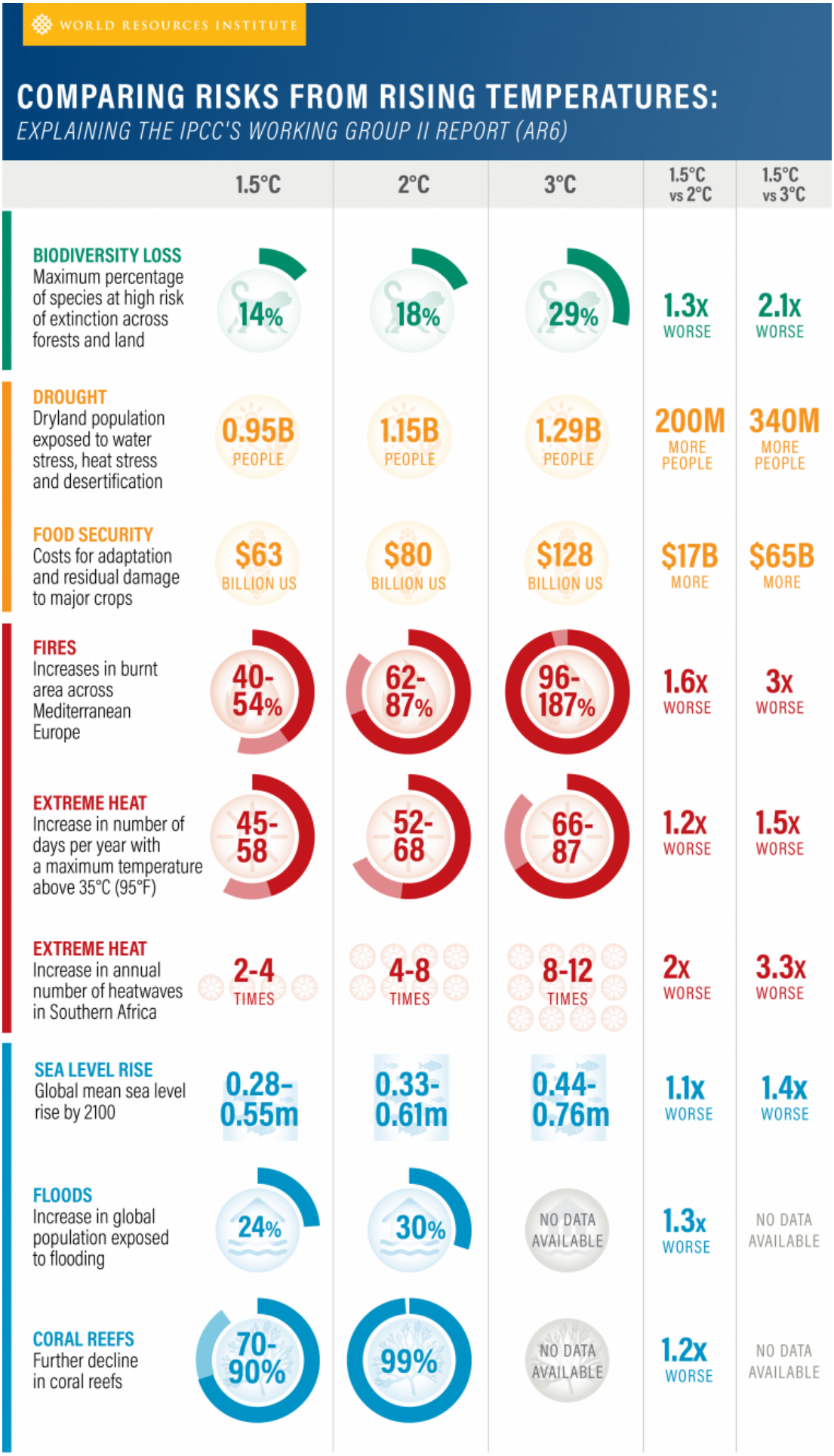
Global net anthropogenic emissions have continued to rise across all major groups of greenhouse gases.

a. Global net anthropogenic GHG emissions 1990–2019 [5]



Bron[17]

[17] IPCC Climate Change 2022 - Mitigation of Climate Change Summary for Policymakers



Note: For climate risks with projected ranges, we used the midpoint of the ranges to compare risks at different temperature thresholds. Sea level rise projections correspond to SSP1-1.9, SSP1-2.6, SSP2-4.5, which are roughly approximate to global warming of 1.5°C, 2°C, and 3°C, respectively.

Kostprijs

- hoeveel kost de globale opwarming economisch ? de kost zal groeien tot **30 biljoen** (10^{12}) **USD per jaar**[18]

Publieke opinie

- Steun van de bevolking voor het klimaatbeleid : EUROPA : **93 %** van de EU-burgers vindt klimaatverandering een groot probleem[19]
- **87 %** vindt dat de EU ambitieuze doelstellingen moet vaststellen om hernieuwbare energie te stimuleren en de energie-efficiëntie te verbeteren.[20]
- USA : people view climate change as a critical threat : overall **56 %** - slechts 22% van de republikeinen)[21]

[18] JACOBSON Mark Z. , No miracles needed, 2023 Cambridge, University Printing House, (Stanford University USA) p. 13

[19] Europese Commissie, Enquête 2021 , Steun van de bevolking voor het klimaatbeleid, https://climate.ec.europa.eu/citizens/citizen-support-climate-action_nl#:~:text=Enquête 2021,-Belangrijkste resultaten&text=90 % van de mensen — en,tegen 2050 klimaatneutraal te maken.

[20] Europese Commissie, Enquête 2021 , Steun van de bevolking voor het klimaatbeleid, https://climate.ec.europa.eu/citizens/citizen-support-climate-action_nl#:~:text=Enquête 2021,-Belangrijkste resultaten&text=90 % van de mensen — en,tegen 2050 klimaatneutraal te maken.

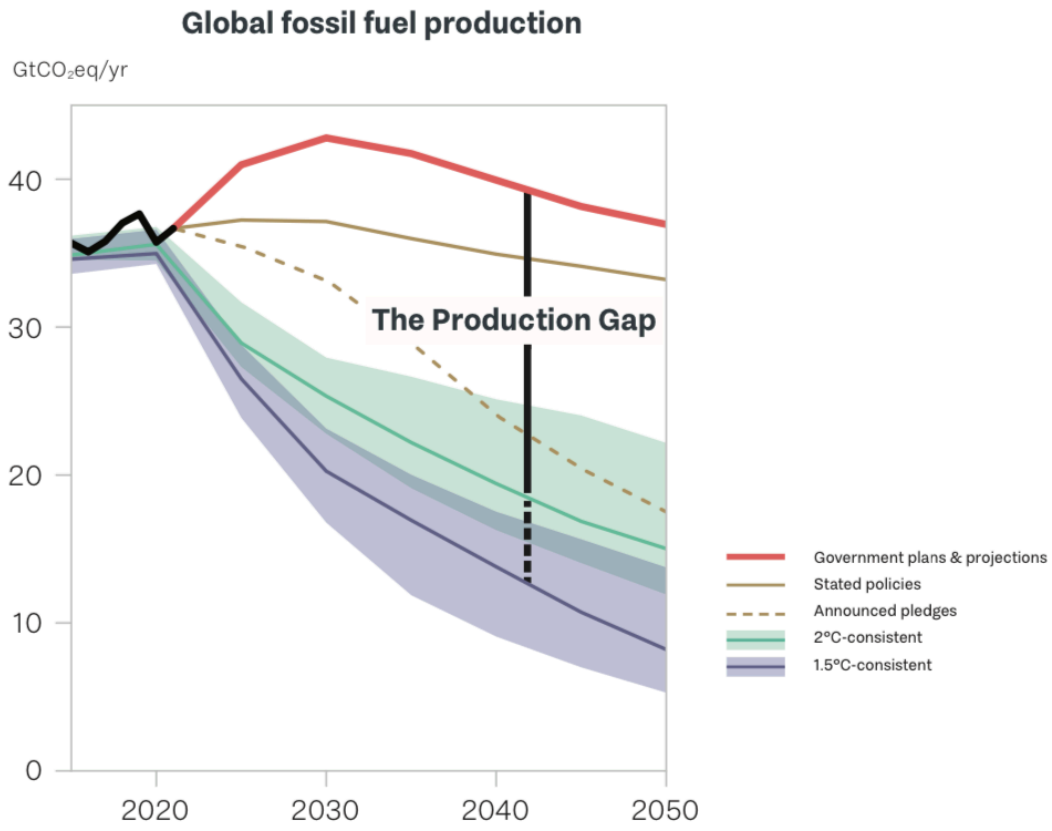
[21] The Chicago Council on Global Affairs, Race, Ethnicity, and American Views of Climate Change, May 25, 2023, RESEARCH PUBLIC OPINION SURVEY BY DINA SMELTZ , CRAIG KAFURA , CANDACE RONDEAUX , HEELA RASOOL-AYUB , AND DEBORAH AVANT, https://globalaffairs.org/research/public-opinion-survey/race-ethnicity-and-american-views-climate-change

GAP [22]

- Governments, in aggregate, still plan to produce more than **double the amount of fossil fuels** in 2030 than would be consistent with limiting warming to 1.5°C. [23]
- It found that if all national-level goals are met, the world will likely warm **between 2.5°C and 2.9°C** by 2100 [24] [25]

Figure ES.1

The fossil fuel production gap — the difference between governments' plans and projections and levels consistent with limiting warming to 1.5°C and 2°C, as expressed in units of greenhouse gas emissions from fossil fuel extraction and burning — remains large and expands over time. (See details in Chapter 2 and Figure 2.1.)



[22] "The production gap". Dit is het verschil tussen de in het verdrag van Parijs gestelde doelen en de werkelijkheid

[23] 1.5 is the most misunderstood number - BLOOMBERG 1/12/2023

[24] United Nations Environment Programme (2023). Emissions Gap Report 2023: Broken Record – Temperatures hit new highs, yet world fails to cut emissions (again). Nairobi. https://doi.org/10.59117/20.500.11822/43922.

[25] SEI, Climate Analytics, E3G, IISD, and UNEP. (2023). The Production Gap: Phasing down or phasing up? Top fossil fuel producers plan even more extraction despite climate promises. Stockholm Environment Institute, Climate Analytics, E3G, International Institute for Sustainable Development and United Nations Environment Programme. https://doi.org/10.51414/sei2023.050

POLLUTIE

- Doden luchtvervuiling: Globally, all cause excess deaths due to fine particulate and ozone air pollution are estimated at **8.34 million** [26]
- De VVM berekende dat de luchtverontreiniging – ongeacht de bron – **in België in 2020** voor zo'n **8 miljard euro** aan externe gezondheidskosten zorgde.[27] [28] De kost van maatregelen voor de verbetering van milieukwaliteit is kleiner dan de gezondheidskost.
- "Because WWS (Energy from Wind,Water,Sun) also eliminates health and climate costs for energie, which together are **4 times energy costs**, on average, a WWS system will reduce social (economic) cost that customers pay by about 92 percent. [29]

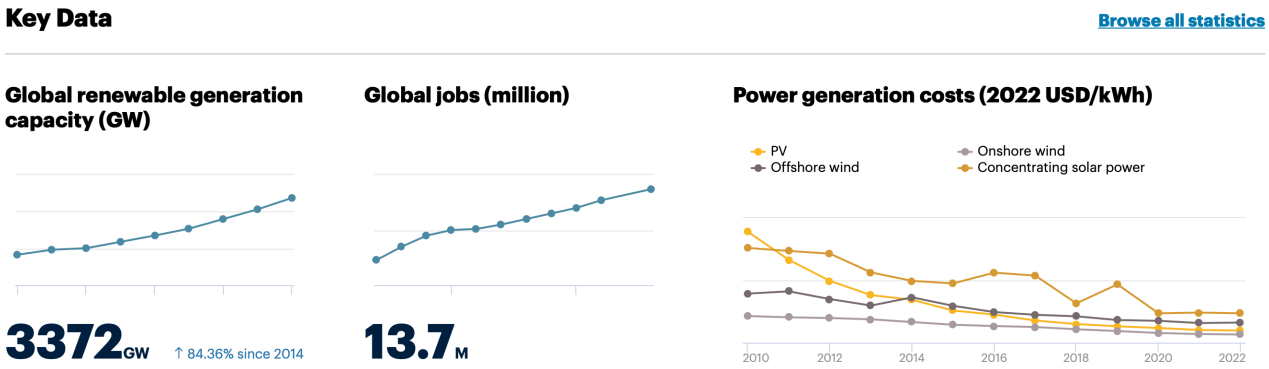
[26] Jos Lelieveld, Andy Haines, Richard Burnett, Cathryn Tonne, Klaus Klingmüller, Thomas Münzel, Andrea Pozzer , "Air pollution deaths attributable to fossil fuels: observational and modelling study" , BMJ 2023;383:e077784 I doi: 10.1136/bmj-2023-077784 , 29/11/2023

[27] 23-06-23 De ziekmakende havens van Antwerpen en Rotterdam

[28] 75 tot 80% van alle kankergevallen is te wijten aan externe oorzaken, zoals roken en luchtverontreiniging

[29] JACOBSON Mark Z. , No miracles needed, 2023 Cambridge, University Printing House, p. 382

HERNIEUWBARE ENERGIE



bron[30]

- Er is voldoende WWZ (energie van WIND, Water en Zon) in de wereld om te voorzien in de mondiale energiebehoefte, en er zijn voldoende opslagmogelijkheden om black-outs te voorkomen[31]
- Kostprijs : The global weighted average cost of electricity from solar PV fell by 89 per cent to USD **0.049/kWh**, almost **one-third less than the cheapest fossil fuel globally**. For onshore wind the fall was 69 per cent to USD 0.033/kWh in 2022, slightly less than half that of the cheapest fossil fuel-fired option in 2022.[32] [33] [34] [35]
- A renewable future would see **30 percent less area mined** [36] [37]

[30] 23-12-10 website IRENA – International Renewable Energy Agency https://www.irena.org/

[31] JACOBSON Mark Z. , No miracles needed, 2023 Cambridge, University Printing House (Stanford University USA)

[32] IRENA 29/08/2023 https://www.irena.org/News/pressreleases/2023/Aug/Renewables-Competitiveness-Accelerates-Despite-Cost-Inflation#:~:text=The global weighted average cost,fuel-fired option in 2022.

[33] IRENA (2023), World Energy Transitions Outlook 2023: 1.5°C Pathway, Volume 1, International Renewable Energy Agency, Abu Dhabi.

[34] COP28, IRENA and GRA (2023), Tripling renewable power and doubling energy efficiency by 2030: Crucial steps towards 1.5°C, International Renewable Energy Agency, Abu Dhabi.

[35] IEA INTERNATIONAL ENERGY AGENCY (2023) Net Zero Roadmap A Global Pathway to Keep the 1.5 °C Goal in Reach 2023 Update

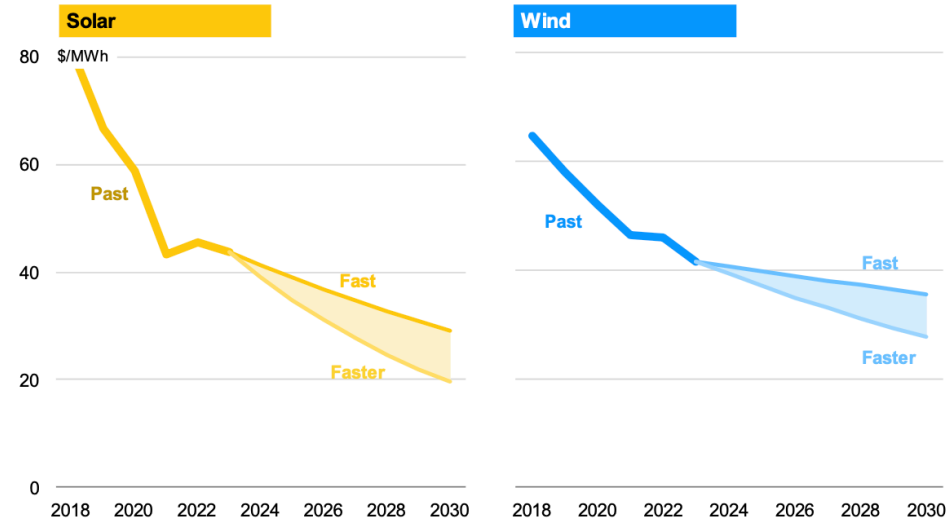
[36] Jeff Opperman, 23/11/2023, “Renewable Energy or Fossil Fuels- Which Requires More Mining?” in Foreign Policy (FP)

[37] WWF and BCG. (2023). Building a Nature-Positive Energy Transformation: Why a low-carbon economy is better for people and nature. WWF, Washington, DC.

KERNENERGIE

- Indien men alle kosten, inclusief externe, in rekening brengt, kost één kilowattuur windenergie in 2014 alles tezamen 9,2 Eurocent, elektriciteit uit steenkool en **kernenergie telkens meer dan 14 Eurocent**.[38]
- Het radioactief afval moet **honderden duizenden jaren** gestockeerd worden[39]
- Nuclear Fusion: But even the strongest proponents of fusion admit that a commercial reactor could not be available at least the **mid-2030s**, and even that date is uncertain. Given that we need to eliminate 80 % of world emissions by 2030, that date is to far away.[40]

Figure 9: Expected solar and wind costs at different learning rates, $/MWh



Source: BNEF,[44] RMI analysis

Bron [41]

[38] Kemfert, C. (2017). Das fossile Imperium schlägt zurück. Warum wir die Energiewende jetzt verteidigen müssen. Hamburg: Murmann Publishers. p.76.

[39] JACOBSON Mark Z. , No miracles needed, 2023 Cambridge, University Printing House (Stanford University USA) p. 156

[40] Ibidem

[41] BloombergNEF (2022) New Energy Outlook 2022 - Kingsmill Bond, Sam Butler-Sloss, Amory Lovins, Laurens Speelman, Nigel Topping, RMI X-Change: Electricity report , july 2023

BIODIVERSITEIT

- Sinds 1970 is de populatiegrootte van vissen, vogels, zoogdieren, amfibieën en reptielen wereldwijd met gemiddeld **69%** afgenomen. Dat blijkt uit het Living Planet Report 2022. [42] [43]
- agriculture and food systems being responsible for a third of greenhouse gas emissions and **70%** of land-based biodiversity loss[44]

[42] WWF (2022) Living Planet Report 2022 – Building a nature- positive society. Almond, R.E.A., Grooten, M., Juffe Bignoli, D. & Petersen, T. (Eds). WWF, Gland, Switzerland.
https://www.wwf.nl/globalassets/pdf/lpr/living-planet-report-2022-wwf-in-het-kort.pdf
https://www.wwf.nl/globalassets/pdf/lpr/living-planet-report-2022-wwf.pdf

[43] Het verslag over de biodiversiteit is niet voor de teerhartigen. In minder dan twee generaties hebben we meer 69% van de in het wild levende dieren op deze planeet uitgeroeid. '69%': weten we dit wel zeker toch? Het zijn absoluut juiste gegevens. Hiertoe worden over de ganse wereld 31.821 populaties van 5.230 gewervelde soorten doorlopend bestudeerd door biologen. Het is een gemiddelde. Er zijn populaties die achteruitgaan maar ook populaties die vooruit gaan.

[44] Nature's critical role in the climate fight must be recognized BY DR KIRSTEN SCHUIJT, DIRECTOR GENERAL, WWF INTERNATIONAL I DECEMBER 8, 2023

DEFORESTATIE

- Ontbossing **4.7 million hectares of forests are lost every year**. [45] [46]
- Het verlies aan tropische wouden bedraagt **15 voetbalvelden per minuut** [47]
- The world has lost **178 million ha of forest since 1990**. The area of primary forest has decreased by 81 million ha since 1990, but the rate of loss more than halved in 2010–2020 compared with the previous decade.[48]
- Forests suck up **one third** of the world's greenhouse gas emissions, are home to **80%** of the Earth's terrestrial biodiversity, and provide livelihoods for **1.6 billion** people. [49]

[45] The rate of net forest loss declined from 7.8 million ha per year in the decade 1990–2000 to 5.2 million ha per year in 2000–2010 and 4.7 million ha per year in 2010–2020. FAO. 2020. Global Forest Resources Assessment 2020 – Key findings. Rome. https://doi.org/10.4060/ca8753en

[46] https://ourworldindata.org/deforestation

[47] Het verlies is hallucinant : 15 voetbalvelden per minuut. Onnodig erbij te vermelden dat primaire wouden lange tijd nodig hebben om terug te groeien

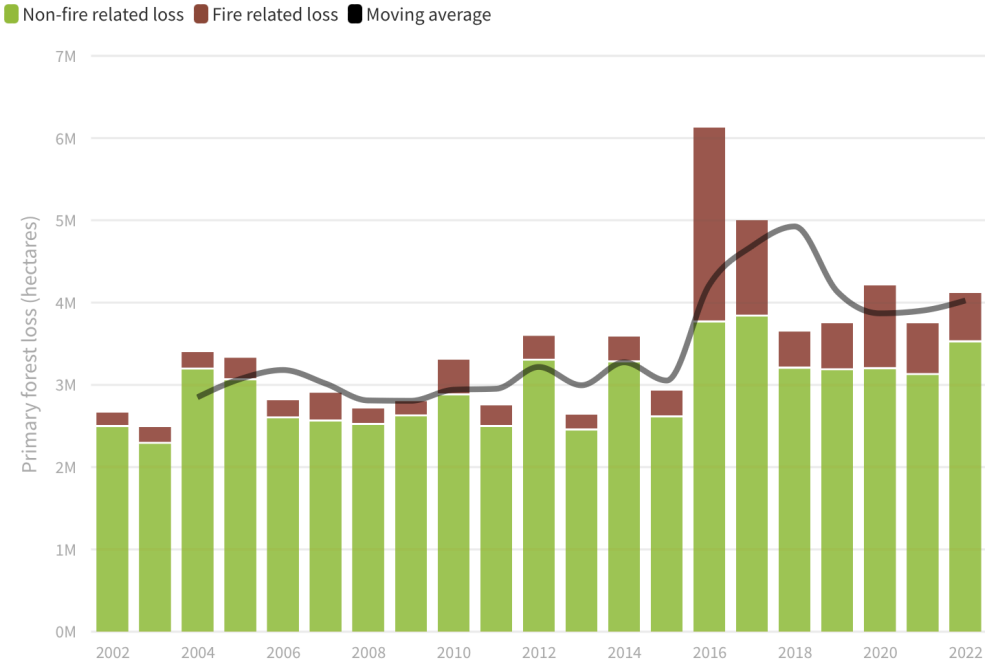
Verlies aan Tropische wouden in 2022 (bron: WRI)

verlies aan tropische wouden (Ha/m2)	4 miljoen hectare per jaar	40.000.000.000
aantal dagen		365
verlies tr. wouden per dag (m2)		109.589.041
aantal uren		24
verlies tr. wouden per uur (m2)		4.566.210
aantal minuten per uur		60
verlies tr. wouden per minuut (m2)		76.104
Oppervlakte 1 voetbalveld (ca) (m2)		5.000
VERLIES AAN TR WOUDEN IN AANTAL VOETBALVELDEN PER MINUUT		**15**

[48] FAO. 2020. Global Forest Resources Assessment 2020 – Key findings. Rome. https://doi.org/10.4060/ca8753en

[49] WWF (2023) The Forest Pathways Report. Gagen, M.H., Dudley, N., Jennings, S., Timmins, H.L. Baldwin- Cantello, W., D'Arcy, L., Dodsworth, J.E., Fleming, D., Kleymann, H., Pacheco, P., Price, F., (Lead Authors). WWF, Gland, Switzerland.

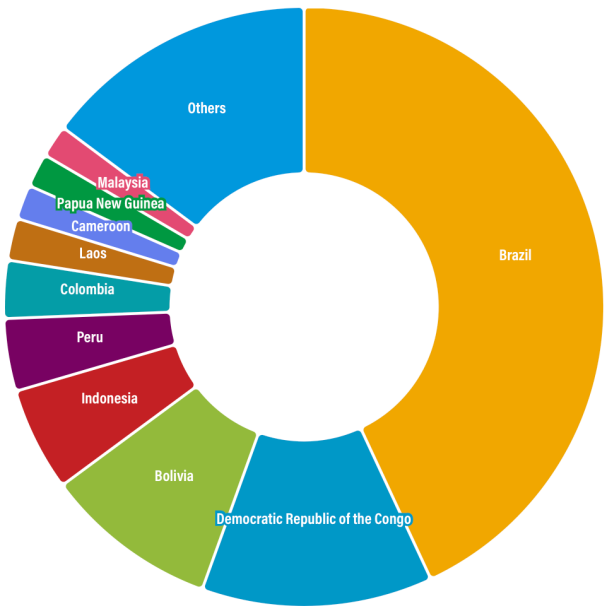
Tropical primary forest loss, 2002-2022



Non-fire related loss can occur from mechanical clearing for agriculture and logging, as well as natural causes such as wind damage and river meandering. The three-year moving average may represent a more accurate picture of the data trends due to uncertainty in year-to-year comparisons. All figures calculated with a 30 percent minimum tree cover canopy density.

GLOBAL FOREST WATCH WORLD RESOURCES INSTITUTE

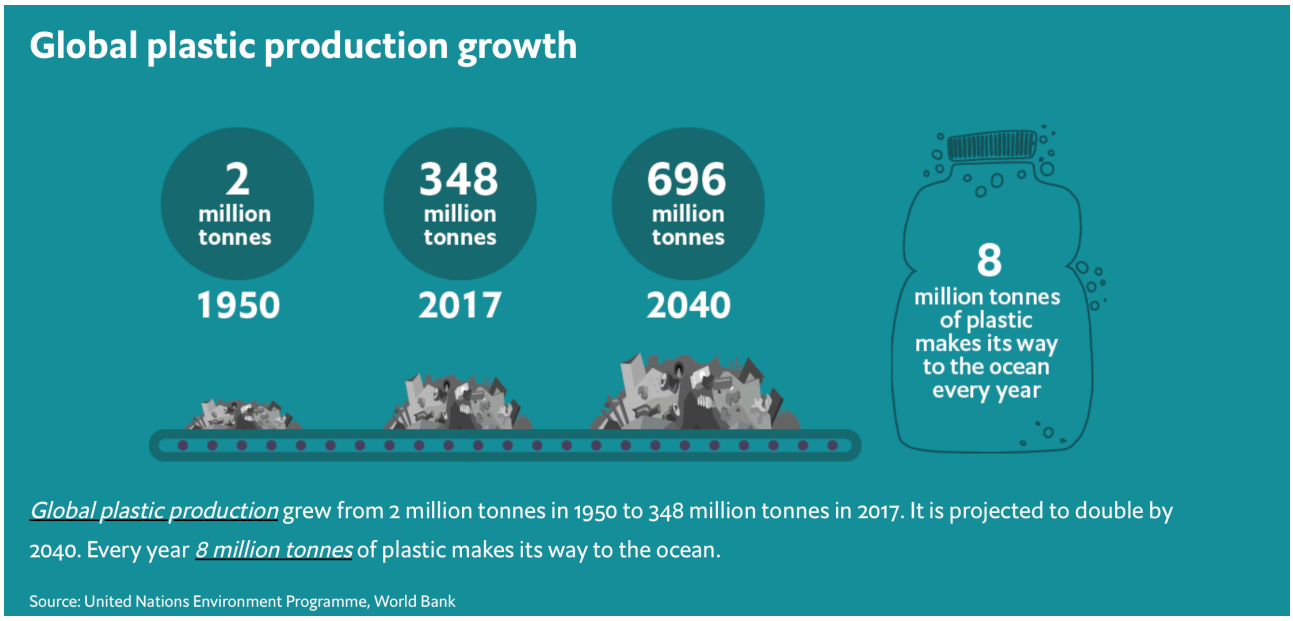
Top countries for primary forest loss by area in 2022



GLOBAL FOREST WATCH WORLD RESOURCES INSTITUTE

PLASTICS

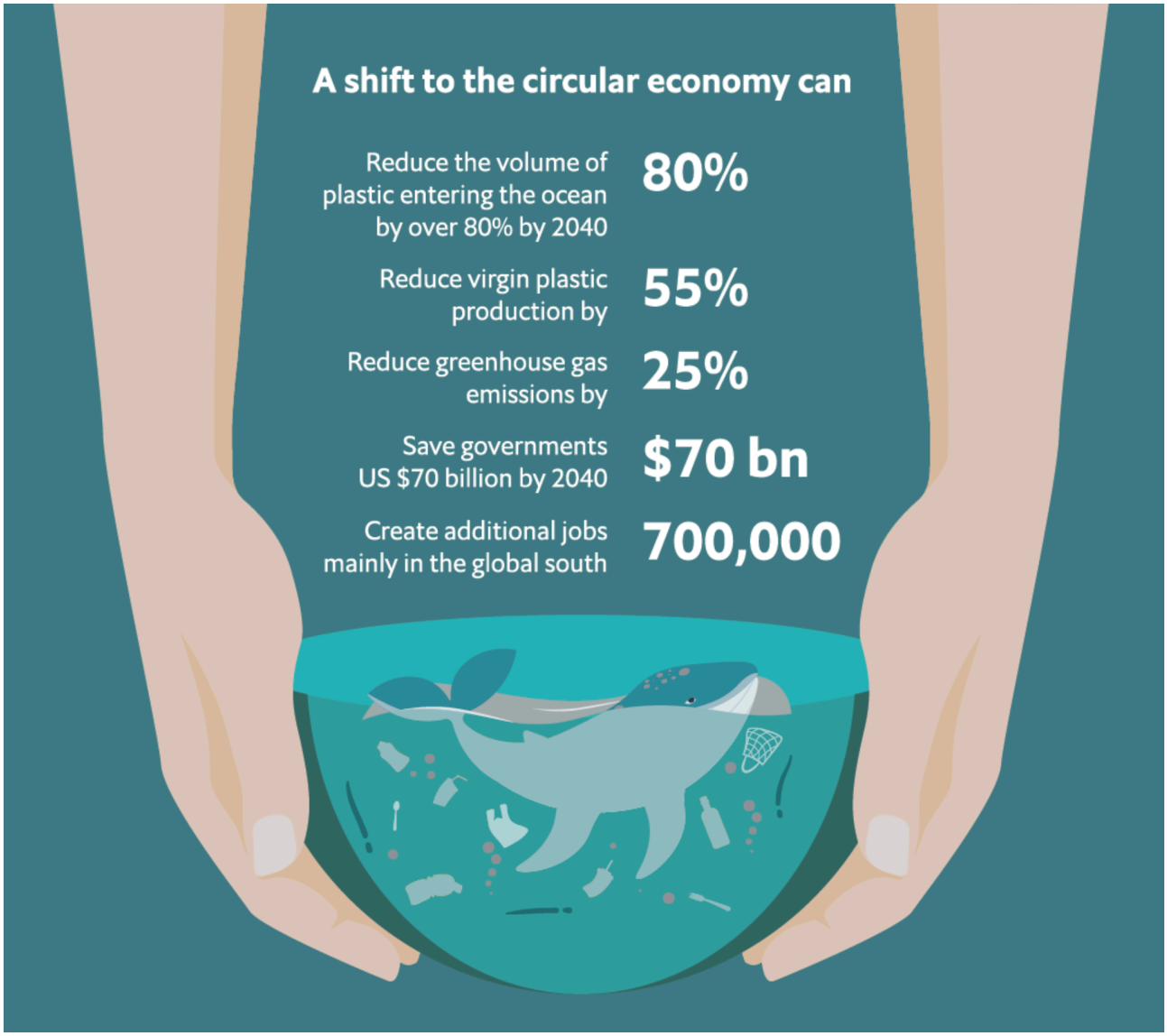
- The world is currently producing about 400 million metric tons of plastic waste every year, with less than **10%** of it being recycled[50]
- Plastic pollution is one of today's most critical environmental issues. Its particles have already spread to **every environment imaginable** across the world, from the peak of Mount Everest to the depths of the Mariana Trench. [51]
- One source is synthetic textiles. Items such as carpets and curtains and the elastane found in T-shirts, socks and clothing release more than **700,000 plastic fibres** each time a washing machine is run.[52]



[50] United Nations Environment Programme (2023). Turning off the Tap. How the world can end plastic pollution and create a circular economy. Nairobi.

[51] Back to Blue : The future of the ocean: The tech to tackle plastics - https://backtoblueinitiative.com/the-future-of-the-ocean-the-tech-to-tackle-plastics/#theGreatPlasticsCleanup

[52] ibidem


A shift to the circular economy can
Reduce the volume of plastic entering the ocean by over 80% by 2040
80%
Reduce virgin plastic production by
55%
Reduce greenhouse gas emissions by
25%
Save governments US $70 billion by 2040
$70 bn
Create additional jobs mainly in the global south
700,000