



Science and the SDGs

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Stratospheric sink for chlorofluoromethanes : chlorine atom-catalysed destruction of ozone

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Chlorofluoromethanes are being added to the environment in steadily increasing amounts. These compounds are chemically inert and may remain in the atmosphere for 40–150 years, and concentrations can be expected to reach 10 to 30 times present levels. Photodissociation of the chlorofluoromethanes in the stratosphere produces significant amounts of chlorine atoms, and leads to the destruction of atmospheric ozone.

HALOGENATED aliphatic hydrocarbons have been added to the natural environment in steadily increasing amounts over several decades as a consequence of their growing use, chiefly as aerosol propellants and as refrigerants^{1,2}. Two chlorofluoromethanes, CF₂Cl₂ and CFCI₃, have been detected through-

photolytic dissociation to CFCI₂ + Cl and to CF₂Cl + Cl, respectively, at altitudes of 20–40 km. Each of the reactions creates two odd-electron species—one Cl atom and one free radical. The dissociated chlorofluoromethanes can be traced to their ultimate sinks. An extensive catalytic chain reaction leading to the net destruction of O₃ and O occurs in the stratosphere:



This has important chemical consequences. Under most conditions in the Earth's atmospheric ozone layer, (2) is the slower of the reactions because there is a much lower concentration of O than of O₃. The odd chlorine chain (Cl, ClO) can be compared with the odd nitrogen chain (NO, NO₂) which is believed to be intimately involved in the regulation of the present level of O₃ in the atmosphere^{7–10}. At stratospheric temperatures, ClO reacts with O six times faster than NO₂ reacts with O (refs 11, 12). Consequently, the Cl–ClO chain

Numerical simulation of climate and climatic change

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Detailed three-dimensional numerical models of the atmosphere, coupled as necessary to models of other parts of the climatic system, provide the most promising approach to understanding the physical basis of climate. Models of this kind can be used to investigate the impact of anthropogenic pollution on climate. At the present time, the main concern is with increasing concentrations of CO₂ which might lead to overall warming of the troposphere, but chemical and thermal pollution may also pose a threat. The possible climatic changes would take place slowly and would involve the response of the slowly reacting parts of the climatic system, particularly the oceans. The problem of how to simulate such changes of climate presents many difficulties, which are currently being studied.

THE most powerful tool available for studying the physical basis of climate and climatic change is the general circulation model, which simulates the evolution of the atmosphere numerically and is capable in principle of taking into account all the factors that determine climate. Such models are complex and require a range of expertise and prolonged experimentation to bring them to the point where they can be put to good use in climate

For a sea point a purely atmospheric model lacking a dynamical interaction with the ocean requires either the sea-surface temperatures to be specified or to be determinable from the local heat balance. The former, with the values set to the long-term climatological average, is appropriate when the object is to provide a realistic simulation of climate, and the latter has been used in attempts to understand particular features

Diverse values of nature for sustainability

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Twenty-five years since foundational publications on valuing ecosystem services for human well-being^{1,2}, addressing the global biodiversity crisis³ still implies confronting barriers to incorporating nature's diverse values into decision-making. These barriers include powerful interests supported by current norms and legal rules such as property rights, which determine whose values and which values of nature are acted on. A better understanding of how and why nature is (under)valued is more urgent than ever⁴. Notwithstanding agreements to incorporate nature's values into actions, including the Kunming-Montreal Global Biodiversity Framework (GBF)⁵ and the UN Sustainable Development Goals⁶, predominant environmental and development policies still prioritize a subset of values, particularly those linked to markets, and ignore other ways people relate to and benefit from nature⁷. Arguably, a 'values crisis' underpins the intertwined crises of biodiversity loss and climate change⁸, pandemic emergence⁹ and socio-environmental injustices¹⁰. On the basis of more than 50,000 scientific publications, policy documents and Indigenous and local knowledge sources, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) assessed knowledge on nature's diverse values and valuation methods to gain insights into their role in policymaking and fuller integration into decisions^{7,11}. Applying this evidence, combinations of values-centred approaches are proposed to improve valuation and address barriers to uptake, ultimately leveraging transformative changes towards more just (that is, fair treatment of people and nature, including inter- and intragenerational equity) and sustainable futures.

Article

Measuring and forecasting progress towards the education-related SDG targets

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Education is a key dimension of well-being and a crucial indicator of development^{1–4}. The Sustainable Development Goals (SDGs) prioritize progress in education, with a new focus on inequality^{5–7}. Here we model the within-country distribution of years of schooling, and use this model to explore educational inequality since 1970 and to forecast progress towards the education-related 2030 SDG targets. We show that although the world is largely on track to achieve near-universal primary education by 2030, substantial challenges remain in the completion rates for secondary and tertiary education. Globally, the gender gap in schooling had nearly closed by 2018 but gender disparities remained acute in parts of sub-Saharan Africa, and North Africa and the

[nature](#) > collection

Collection

Progress towards the Sustainable Development Goals

Submission status

Open

The year 2023 marks the mid-point of the 15-year period envisaged to achieve the Sustainable Development Goals, targets for global development adopted in September 2015 by all United Nations Member States. To help track where we are on this journey, and to amplify success stories, in this Collection we present studies that assess progress or that showcase interventions that have made a difference. We include articles that focus on at least one of the Sustainable Development Goals, at the local, regional or global scale, and we are pleased to invite submissions of studies framed in a similar way. With a growing overview of where we stand and which measures make a difference, we can generate momentum on a sustainable pathway towards improved human lives and a healthier planet.



Editorial

12 Sep 2023

[Nature](#)

The world's goals to save humanity are hugely ambitious — but they are still the best option

Not one of the United Nations Sustainable Development Goals looks set to be achieved by 2030. But deadlines can help focus the mind, and scientists should double down on their work to support the goals.



Book Review

11 Sep 2023

[Nature](#)

Bucking the system: the extraordinary story of how the SDGs came to be

Behind the UN Sustainable Development Goals is a stirring tale of people overcoming huge odds against hostile institutions.

Ehsan Masood



Comment

11 Sep 2023

[Nature Sustainability](#)

Returning to core principles to advance the 2030 Agenda

Principles underpinning the 2030 Agenda — indivisibility, integration and universality — can safeguard against inaction or unsustainable practices but have not yet come into effect. We propose measures to strengthen alignment with them as the world gears up to accelerate implementation at the 2023 SDG Summit.

Nina Weitz, Henrik Carlsen ... Åsa Persson



Editorial

6 Sep 2023

[Nature](#)

Gender equality: the route to a better world

Health outcomes, ending poverty and greening the environment are boosted when power is shared between the genders.



**Do you really know the way
the world is heading? Take
this quiz on plans to save
humanity.**

The United Nations has ambitious aims to end poverty and clean up the planet by 2030. See whether you know how the world is faring on the Sustainable Development Goals.

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