

The roles of science and education for sustainable development

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The World Academy of Sciences



United Nations
Educational, Scientific and
Cultural Organization



The World Academy of Sciences
for the advancement of science in developing countries

What is Sustainable Development?

"Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs."



From the World Commission on Environment and Development's (the Brundtland Commission) report 'Our Common Future', 1987.

GLOBAL CHALLENGES

- **Population growth**
- **Limited resources**
- **Energy demands**
- **CO₂ emissions and climate change**
- **Air and water pollution and environmental degradation**
- **Urban sprawl and mega-cities**
- **Infectious diseases, epidemics, antibiotic resistance**
- **Biodiversity loss**

Millennium Development Goals 2000-2015



1

**ERADICATE
EXTREME POVERTY
AND HUNGER**



2

**ACHIEVE UNIVERSAL
PRIMARY EDUCATION**



3

**PROMOTE GENDER
EQUALITY AND
EMPOWER WOMEN**



4

**REDUCE
CHILD MORTALITY**

MILLENNIUM DEVELOPMENT GOALS



5

**IMPROVE
MATERNAL HEALTH**



6

**COMBAT HIV/AIDS,
MALARIA AND OTHER
DISEASES**



7

**ENSURE
ENVIRONMENTAL
SUSTAINABILITY**

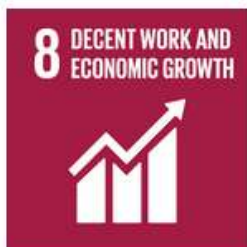


8

**A GLOBAL
PARTNERSHIP FOR
DEVELOPMENT**



SUSTAINABLE DEVELOPMENT GOALS



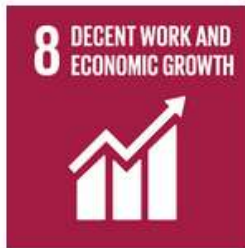
Go to www.menti.com and use the code 6487 3096

Which one of the SDGs is more related to your area of work?





SUSTAINABLE DEVELOPMENT GOALS



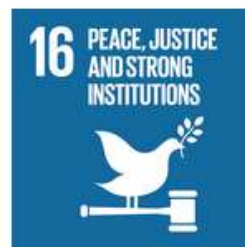
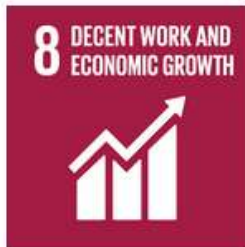
Go to www.menti.com and use the code 4098 2823

Which one of the SDGs is the most important one according to you?





SUSTAINABLE DEVELOPMENT GOALS





SUSTAINABLE DEVELOPMENT GOALS



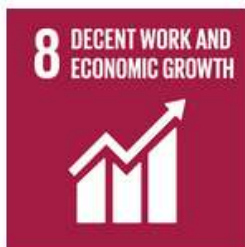
SCIENCE AND TECHNOLOGY ARE ESSENTIAL TO ACHIEVE THE SDGs

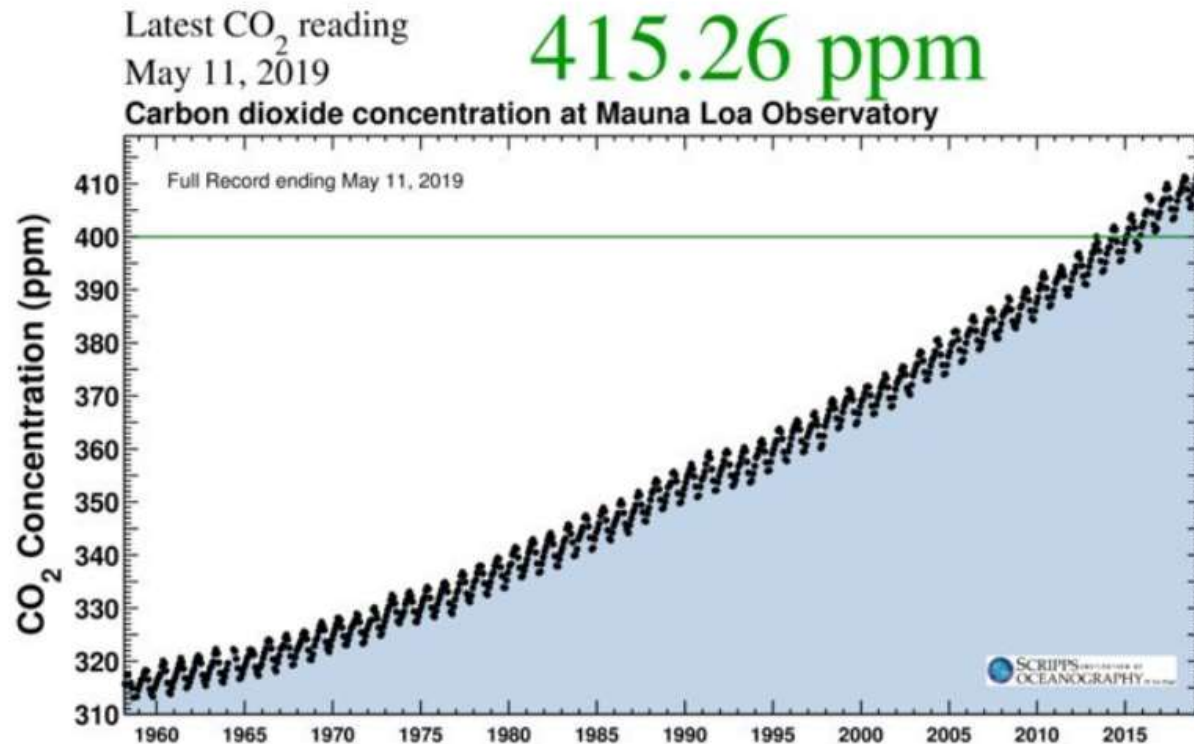
THE ROLE OF SCIENCE

- **Produce new knowledge**
- **Explain mechanisms, phenomena, changes**
- **Lead to solutions and novel technologies**
- **Educate, guide, sensitize**



SUSTAINABLE DEVELOPMENT GOALS





(The Keeling Curve)

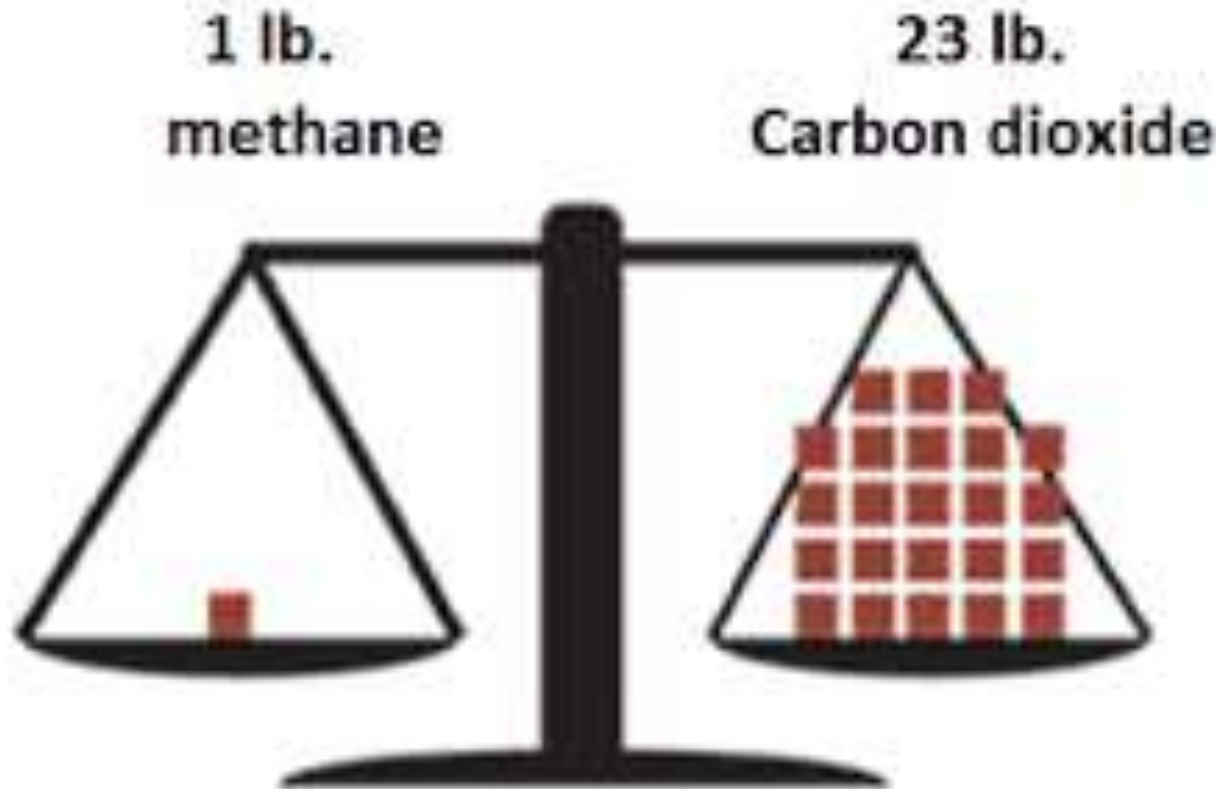
ENVIRONMENT

It's Official: Atmospheric CO₂ Just Exceeded 415 ppm For The First Time in Human History

PETER DOCKRILL 13 MAY 2019

Yet another alarming milestone of humanity's damaging effect on the environment has now officially been reached – crossing a barrier into a hot,

CH_4 *versus* CO_2 as a GHG



Heat Trapping Ability

[News](#)[Opinion](#)[Sport](#)[Culture](#)[Lifestyle](#)[More ▾](#)[Environment](#) ▶ [Climate change](#) [Wildlife](#) [Energy](#) [Pollution](#)

Greenhouse gas emissions

Methane emissions from cattle are 11% higher than estimated

Bigger livestock in larger numbers in more regions has led to methane in the air climbing faster than predicted due to 'out-of-date data'

Agence France-Presse

Fri 29 Sep 2017 11.23 BST



4,694 1



▲ A sharp rise in methane pollution could jeopardise the goal of capping global warming below 2C. Photograph: Graham Turner for the Guardian

Environment ► Climate change Wildlife Energy Pollution

Farming

Avoiding meat and dairy is 'single biggest way' to reduce your impact on Earth

Biggest analysis to date reveals huge footprint of livestock - it provides just 18% of calories but takes up 83% of farmland

Damian Carrington
Environment editor

@dpcarrington

Thu 31 May 2018 19.00 BST



709,250 3,749

This article is over 4 months old



▲ Cattle at an illegal settlement in the Jamanxim National Forest, state of Para, northern Brazil, November 29, 2009. With 1.3 million hectares, the Jamanxim National Forest is today a microcosm that replicates what happens in the Amazon, where thousands of hectares of land are prey of illegal woodcutters, stock breeders and gold miners. Photograph: Antonio Scorza/AFP/Getty Images

NEWS • 08 AUGUST 2019 • CORRECTION 08 AUGUST 2019, UPDATE 08 AUGUST 2019

Eat less meat: UN climate change report calls for change to human diet

The report on global land use and agriculture from the Intergovernmental Panel on Climate Change comes amid accelerating deforestation in the Amazon.

“It’s really exciting that the IPCC is getting such a strong message across,” says Ruth Richardson, the Toronto, Canada-based executive director at the Global Alliance for the Future of Food, a strategic coalitions of philanthropic foundations. “We need a radical transformation, not incremental shifts, towards a global land use and food system that serves our climate needs.”

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theguardian

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Climate change scepticism

Climate Consensus - the 97%

Scientists understood the climate 150 years ago better than the EPA head today

Scott Pruitt denies basic science that we've understood for over a century



< 10,095 440

[John Abraham](#)

Friday 31 March 2017 11:00 BST



President Donald Trump and his EPA administrator Scott Pruitt shake hands at the signing of an executive order

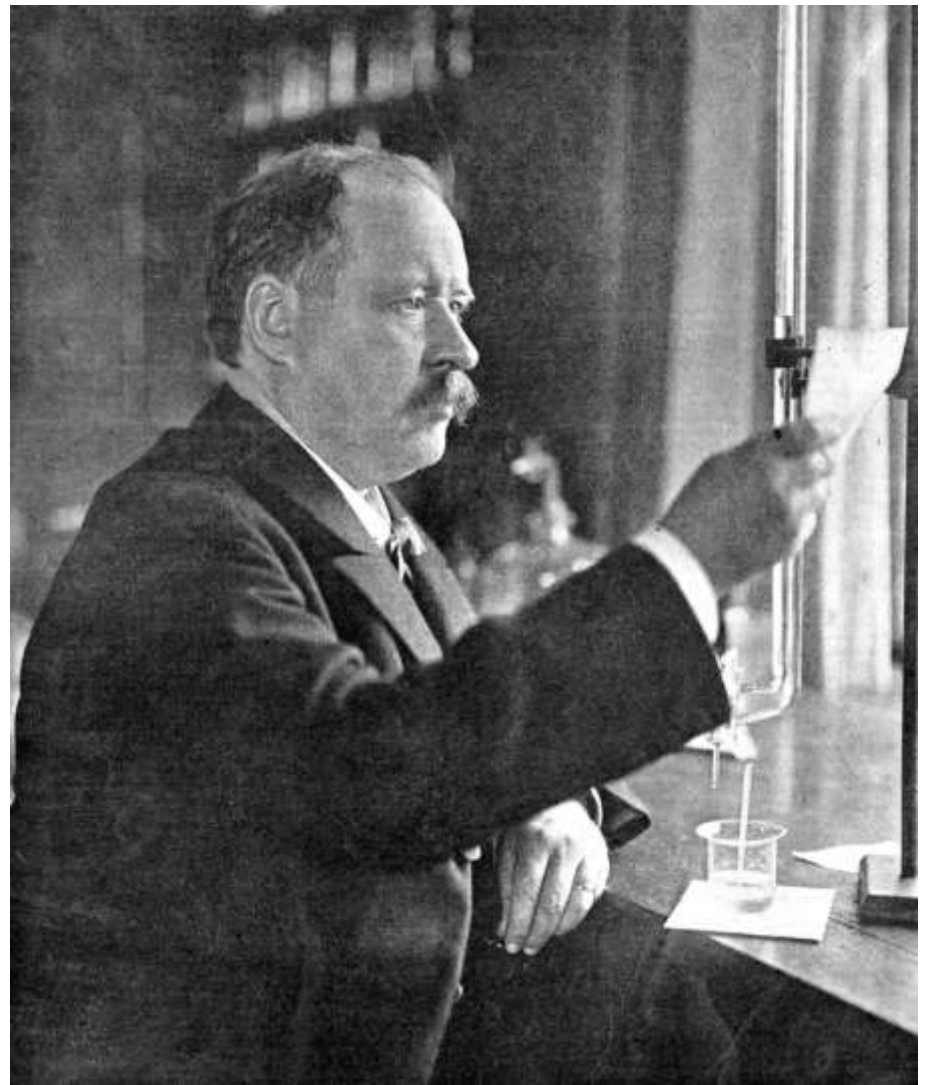


COP24 KATOWICE
UNITED NATIONS CLIMATE CHANGE CONFERENCE
POLAND 2018



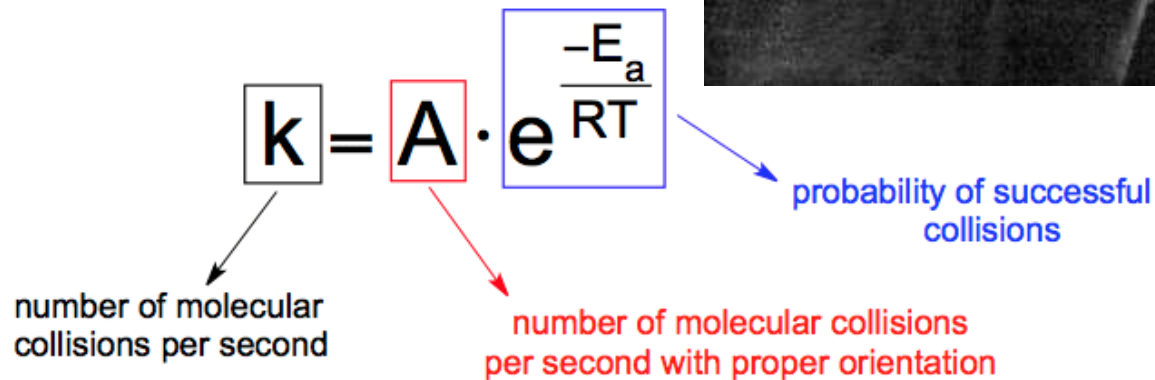
Svante Arrhenius

Nobel Prize Winner 1903



Svante Arrhenius

Nobel Prize Winner 1903



LONDON, EDINBURGH, AND DUBLIN
PHILOSOPHICAL MAGAZINE
AND
JOURNAL OF SCIENCE.

[FIFTH SERIES.]

APRIL 1896.

XXXI. *On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground.* By Prof. SVANTE ARRHENIUS *.

I. *Introduction : Observations of Langley on Atmospheric Absorption.*

A GREAT deal has been written on the influence of the absorption of the atmosphere upon the climate. Tyndall † in particular has pointed out the enormous im-

Letter | Published: 23 May 2016

The climate response to five trillion tonnes of carbon

Katarzyna B. Tokarska , Nathan P. Gillett, Andrew J. Weaver, Vivek K. Arora & Michael Eby

Nature Climate Change **6**, 851–855 (2016) | [Download Citation](#) 

Abstract

Concrete actions to curtail greenhouse gas emissions have so far been limited on a global scale¹, and therefore the ultimate magnitude of climate change in the absence of further mitigation is an important consideration for climate policy². Estimates of fossil fuel reserves and



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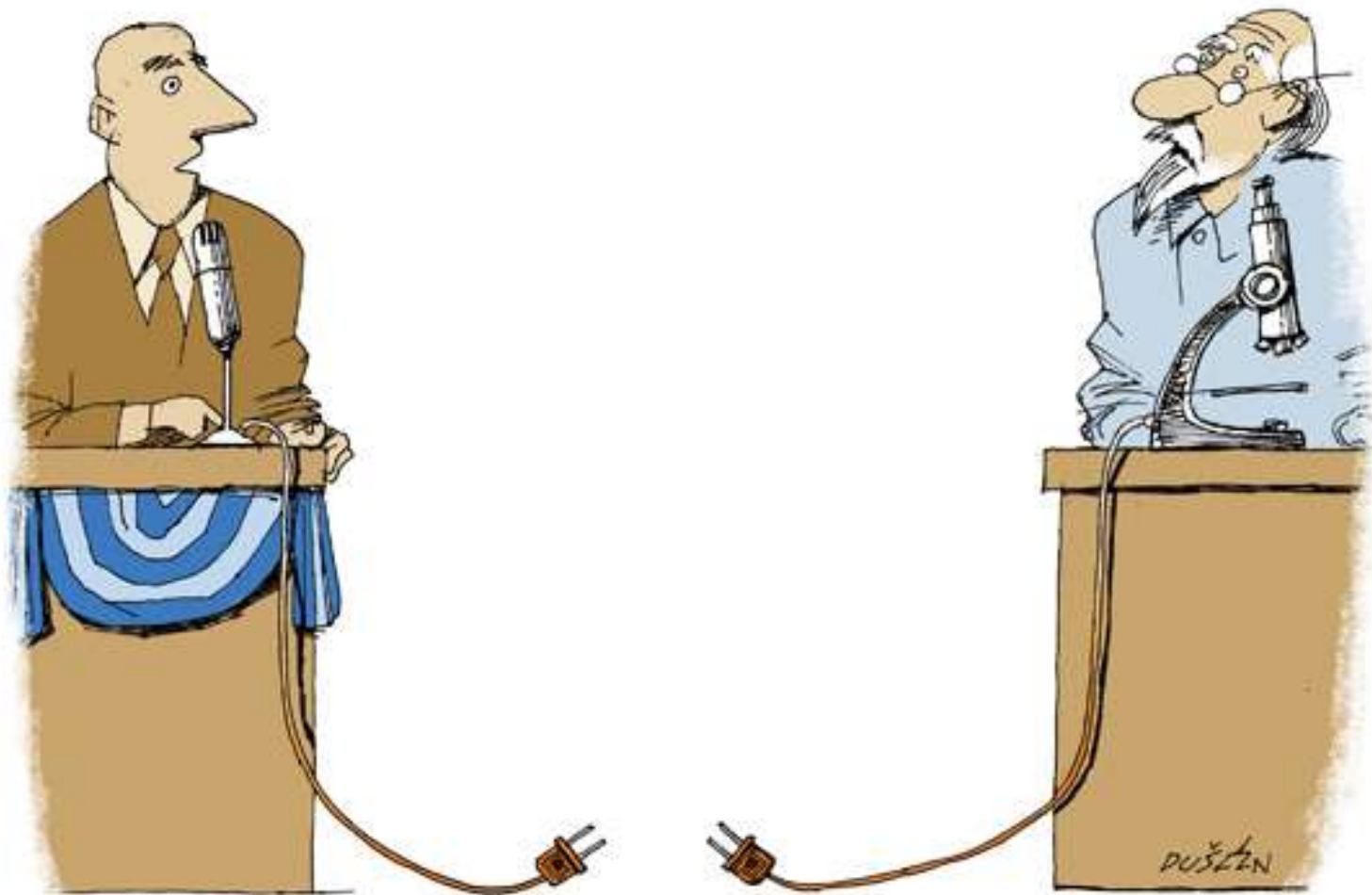


From the World Commission on Environment and Development's (the Brundtland Commission) report 'Our Common Future', 1987.

The Great Divide

A two-way bridge between science and policy is desperately needed.

By Didier Schmitt | December 1, 2013



THE ROLE OF SCIENTISTS

- **Keep an open mind and a wide perspective**
- **Educate and communicate**
- **Role model**
- **Moral and social responsibility**

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Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines

Gerardo Ceballos^{a,1}, Paul R. Ehrlich^{b,1}, and Rodolfo Dirzo^b

^aInstituto de Ecología, Universidad Nacional Autónoma de México, Mexico City 04510, Mexico; and ^bDepartment of Biology, Stanford University, Stanford, CA 94305

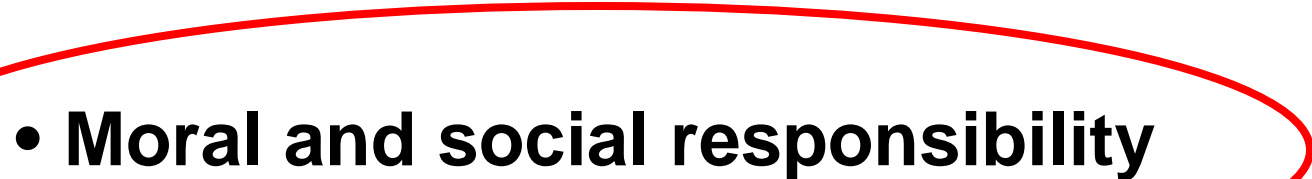
Contributed by Paul R. Ehrlich, May 23, 2017 (sent for review March 28, 2017; reviewed by Thomas E. Lovejoy and Peter H. Raven)

The population extinction pulse we describe here shows, from a quantitative viewpoint, that Earth's sixth mass extinction is more severe than perceived when looking exclusively at species extinctions. Therefore, humanity needs to address anthropogenic population extirpation and decimation immediately. That conclusion is based on analyses of the numbers and degrees of range contraction (indicative of population shrinkage and/or population extinctions according to the International Union for Conservation of Nature) using a sample of 27,600 vertebrate species, and on a more detailed analysis documenting the population extinctions between 1900 and 2015 in 177 mammal species. We find that the rate of population loss in terrestrial vertebrates is extremely high—even in “species of low concern.” In our sample, comprising nearly half of known vertebrate species, 32% (8,851/27,600) are decreasing; that is, they have de-

especially because many of those species were obscure and had limited ranges, such as the Catarina pupfish (*Megupsilon aporus*, extinct in 2014), a tiny fish from Mexico, or the Christmas Island pipistrelle (*Pipistrellus murrayi*, extinct in 2009), a bat that vanished from its namesake volcanic remnant.

Species extinctions are obviously very important in the long run, because such losses are irreversible and may have profound effects ranging from the depletion of Earth's inspirational and esthetic resources to deterioration of ecosystem function and services (e.g., refs. 17–20). The strong focus among scientists on species extinctions, however, conveys a common impression that Earth's biota is not dramatically threatened, or is just slowly entering an episode of major biodiversity loss that need not generate deep concern now (e.g., ref. 21, but see also refs. 9, 11, 22). Thus, there might be

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 - Moral and social responsibility
- 

"We live in an age in which it is scientific researchers who are able to see specific dangers quite clearly. Therefore they have a duty to speak out."

*by Konrad Lorenz,
Nobel prize
winner 1973*



THE ROLE OF SCIENTISTS

- Keep an open mind and a wide perspective
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2005-2014:

DECADE for the

*Education for
Sustainable
Development*

initiative led by

UNESCO



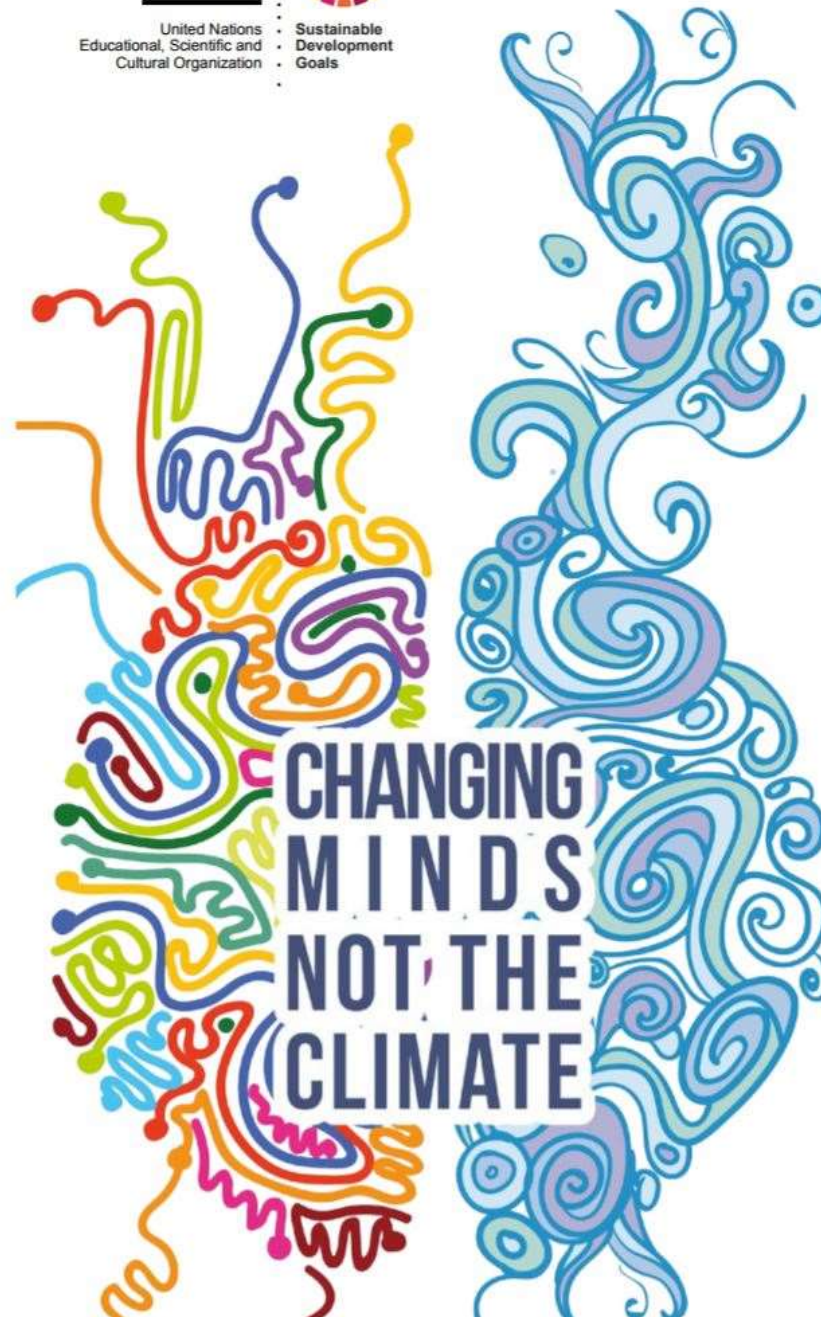
unesco.org

EDUCATION FOR THE FUTURE

WORLD CONFERENCE ON
EDUCATION FOR
SUSTAINABLE
DEVELOPMENT

United Nations' Competencies for Sustainable Development:
Education for Sustainable Development (ESD)

In order to halt the current model of
unsustainable development,
societies must work on a change of
mind/behavior.



**“Progress is impossible without change,
and those who cannot change their mind
cannot change anything”**

George Bernard Shaw

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Can you make a contribution towards SDGs implementation/helping address one or more of the Global Challenges, at least at your local level?



We have two paths that we can take:

1

Business
as Usual
Path

vs.

2

Sustainable
Development
Path

Thank you for your attention

**I wish that you behold a vision of sustainability
both in your mind and in your heart**



Max Paoli

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