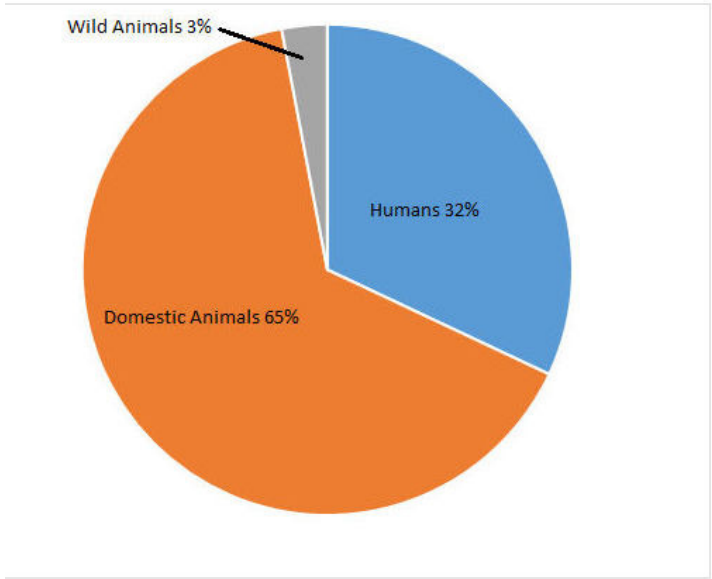
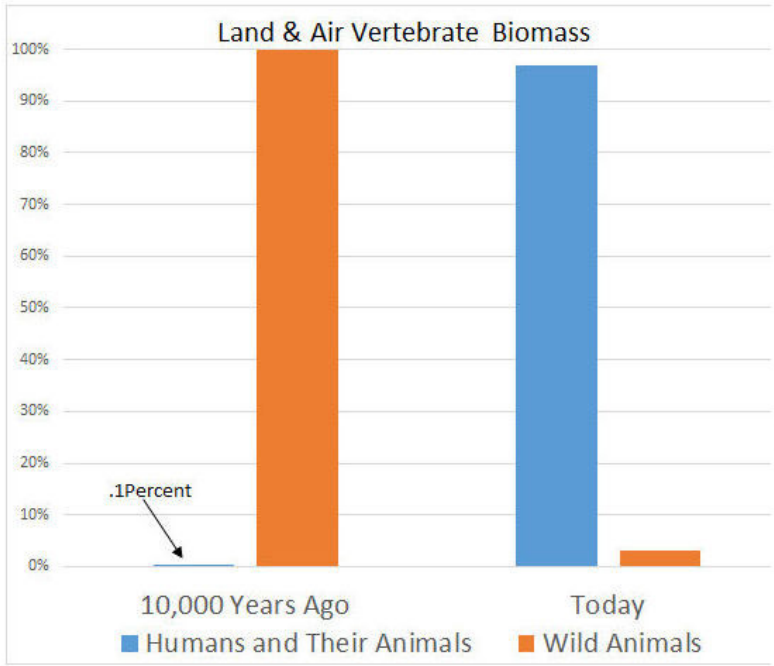
Earth as a System

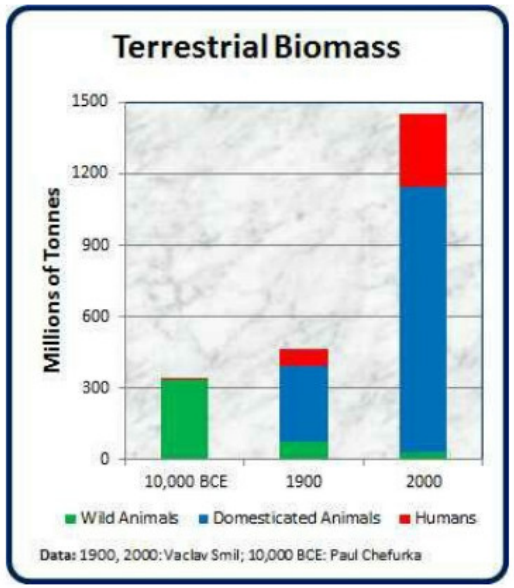
A SYSTEM WITH 4 PRIMARY PARTS

WATER (hydrosphere)
LAND (geosphere)
AIR (atmosphere)

LIFE (biosphere)


Wild Animals 3%
Humans 32%
Domestic Animals 65%


Land & Air Vertebrate Biomass
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
.1Percent
10,000 Years Ago
Today
Humans and Their Animals
Wild Animals


Terrestrial Biomass
Millions of Tonnes
1500
1200
900
600
300
0
10,000 BCE
1900
2000
Wild Animals
Domesticated Animals
Humans
Data: 1900, 2000: Vaclav Smil; 10,000 BCE: Paul Chefurka

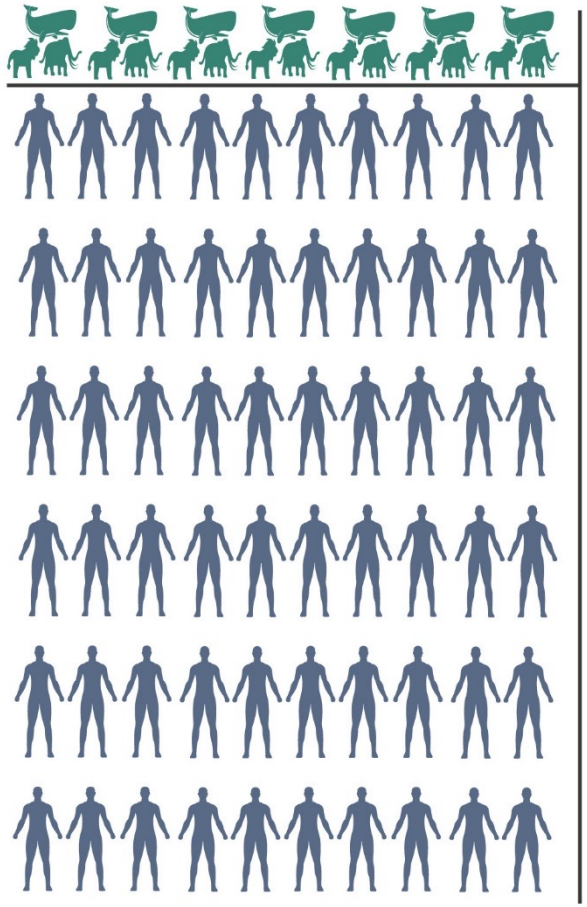
Distribution of mammals on Earth

Our World in Data

Mammal biomass is shown for the year 2015. = 1 million tonnes carbon (C)

Wild mammals

4% global mammal biomass



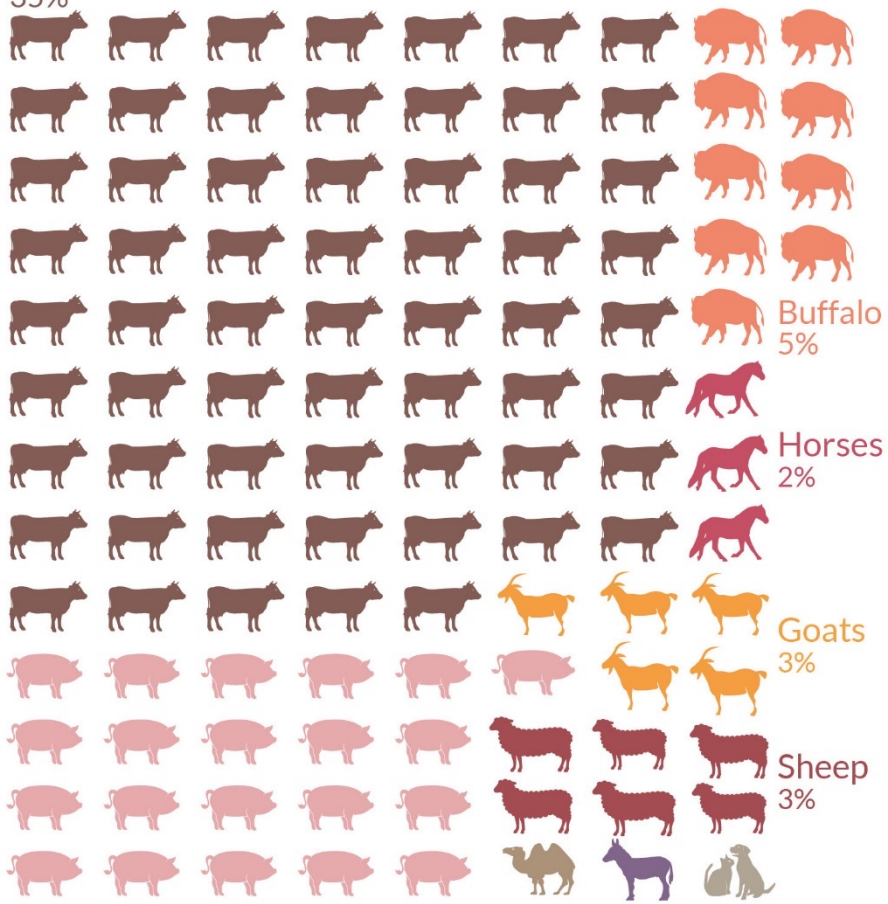
Humans

34% global mammal biomass

Livestock & pets

Poultry are not included

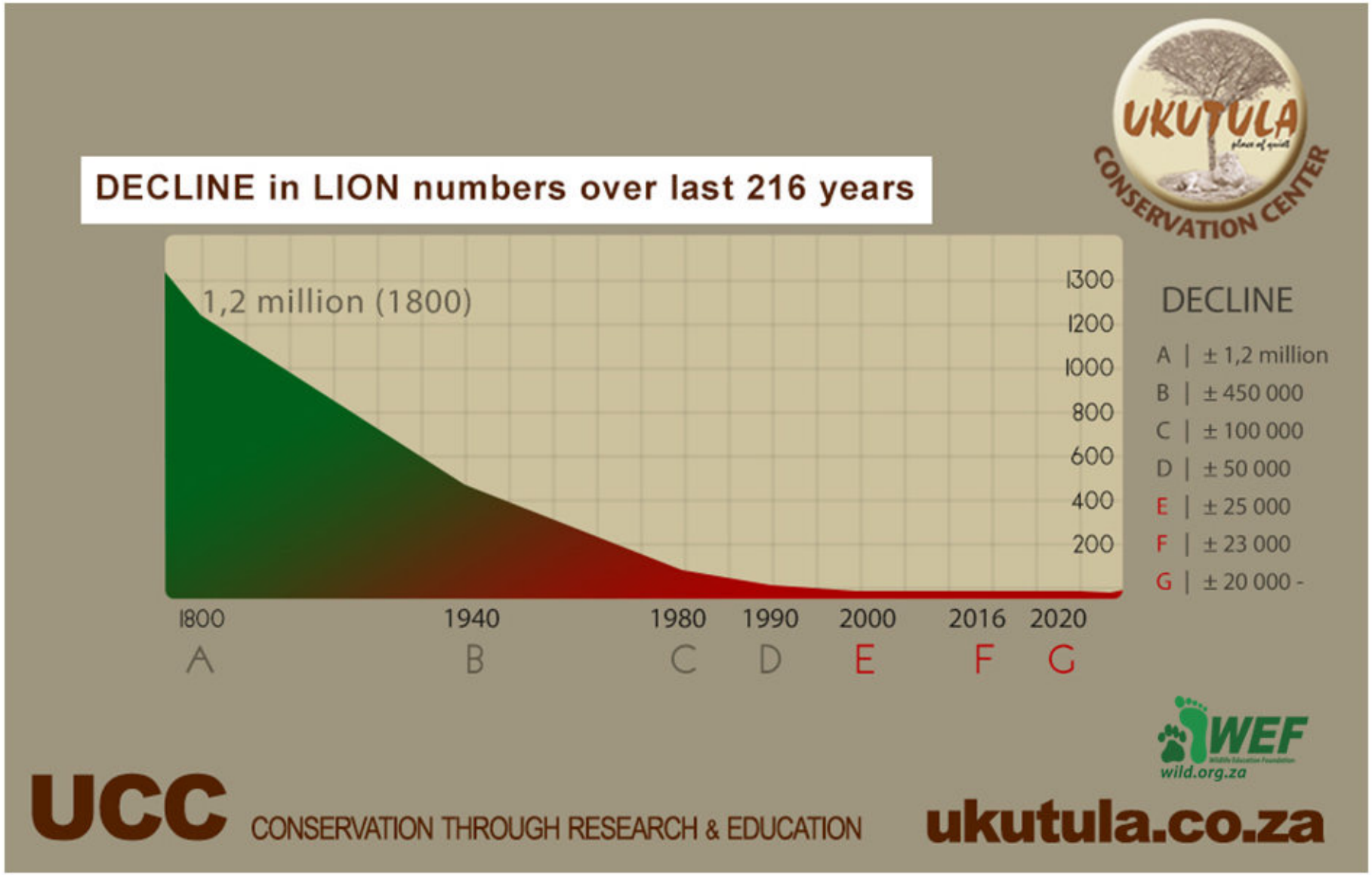
62% global mammal biomass



*Bar-On et al. (2018) provide estimates of livestock only, without estimates of mammalian pets (e.g. cats and dogs).
Pets have been added as an additional category based on calculations from estimates of the number of pets globally and average biomass.

Data source: Bar-On et al. (2018). The biomass distribution on Earth. Images sourced from the Noun Project.

OurWorldinData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the author Hannah Ritchie.



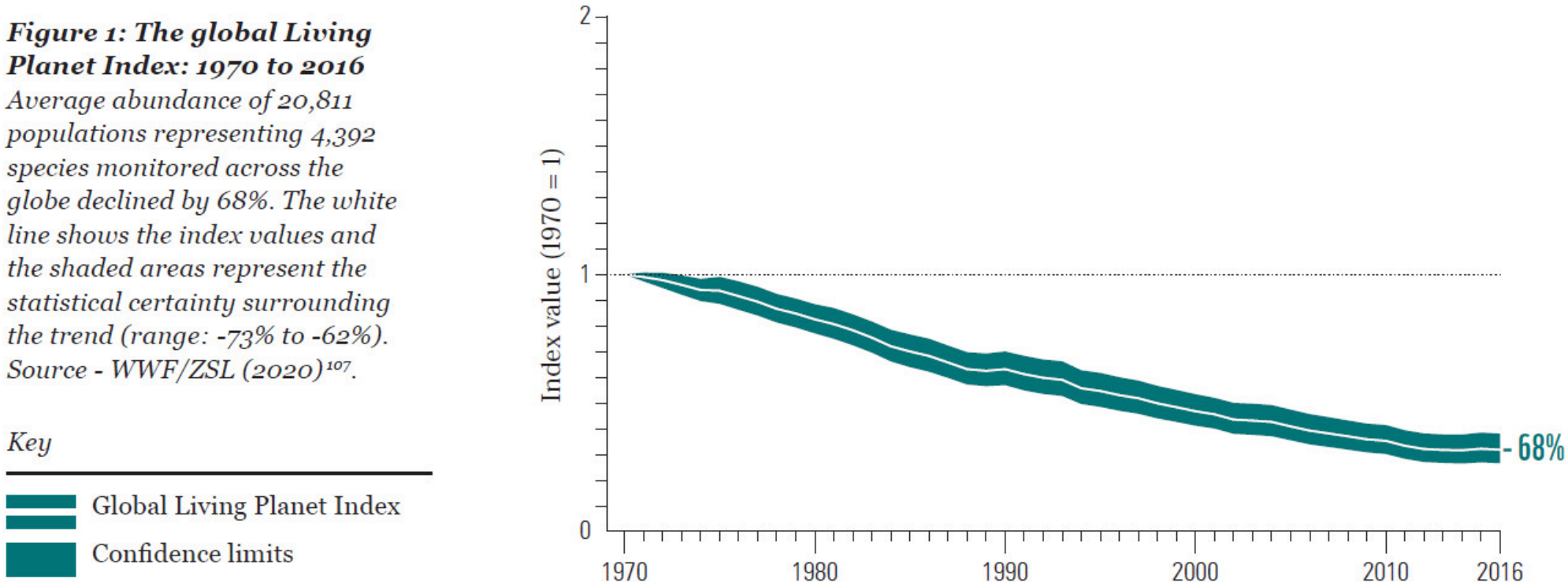
+200 YEARS AGO: 1.200.000 LIONS

TODAY: 20.000 LIONS

THEIR NUMBER WENT DOWN WITH 98% IN TWO CENTURIES

Figure 1: The global Living Planet Index: 1970 to 2016

Average abundance of 20,811 populations representing 4,392 species monitored across the globe declined by 68%. The white line shows the index values and the shaded areas represent the statistical certainty surrounding the trend (range: -73% to -62%). Source - WWF/ZSL (2020)[107].



Planetary Boundaries

after Johan Rockström, Stockholm Resilience Centre et al. 2009

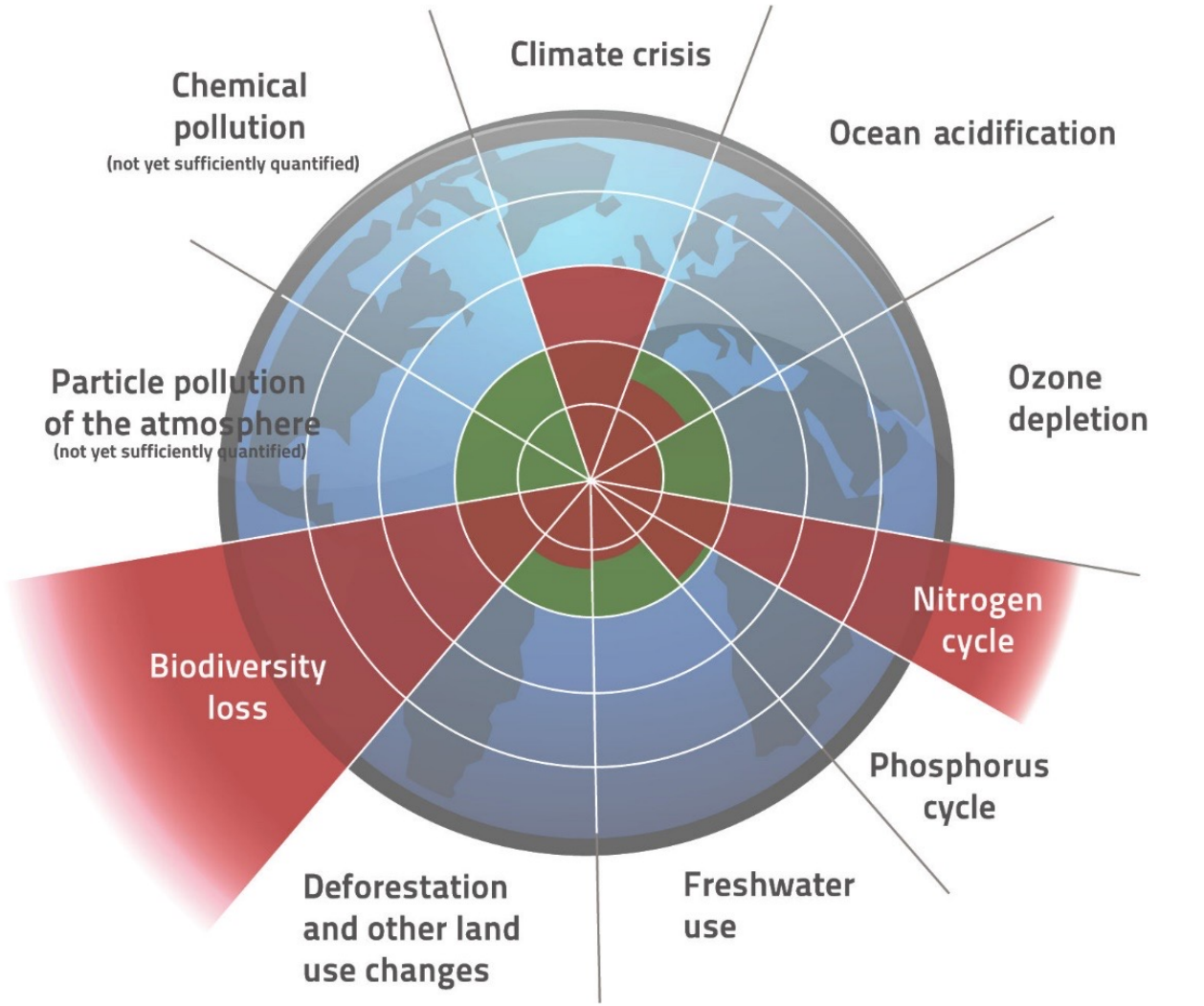


Illustration: Felix Müller (www.zukunft-selbermachen.de) Licence: CC-BY-SA 4.0

GLOBAL COMMENT
WHERE THE WORLD THINKS OUT LOUD

Why climate change is an irrelevance, economic growth is a myth and sustainability is forty years too late

By **Kevin Casey** Posted in Commentary Culture Current Affairs Environment Society

Posted on November 20, 2019

Threats to biodiversity

Changes in land and sea use, including habitat loss and degradation

This refers to the modification of the environment where a species lives, by complete removal, fragmentation or reduction in quality of key habitat. Common changes in use are caused by unsustainable agriculture, logging, transportation, residential or commercial development, energy production and mining. For freshwater habitats, fragmentation of rivers and streams and abstraction of water are common threats.

Species overexploitation

There are both direct and indirect forms of overexploitation. Direct overexploitation refers to unsustainable hunting and poaching or harvesting, whether for subsistence or for trade. Indirect overexploitation occurs when non-target species are killed unintentionally, for example as bycatch in fisheries.

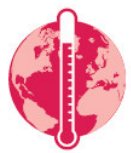
Invasive species and disease

Invasive species can compete with native species for space, food and other resources, can turn out to be a predator for native species, or spread diseases that were not previously present in the environment. Humans also transport new diseases from one area of the globe to another.

Pollution

Pollution can directly affect a species by making the environment unsuitable for its survival (this is what happens, for example, in the case of an oil spill). It can also affect a species indirectly, by affecting food availability or reproductive performance, thus reducing population numbers over time.

Climate change

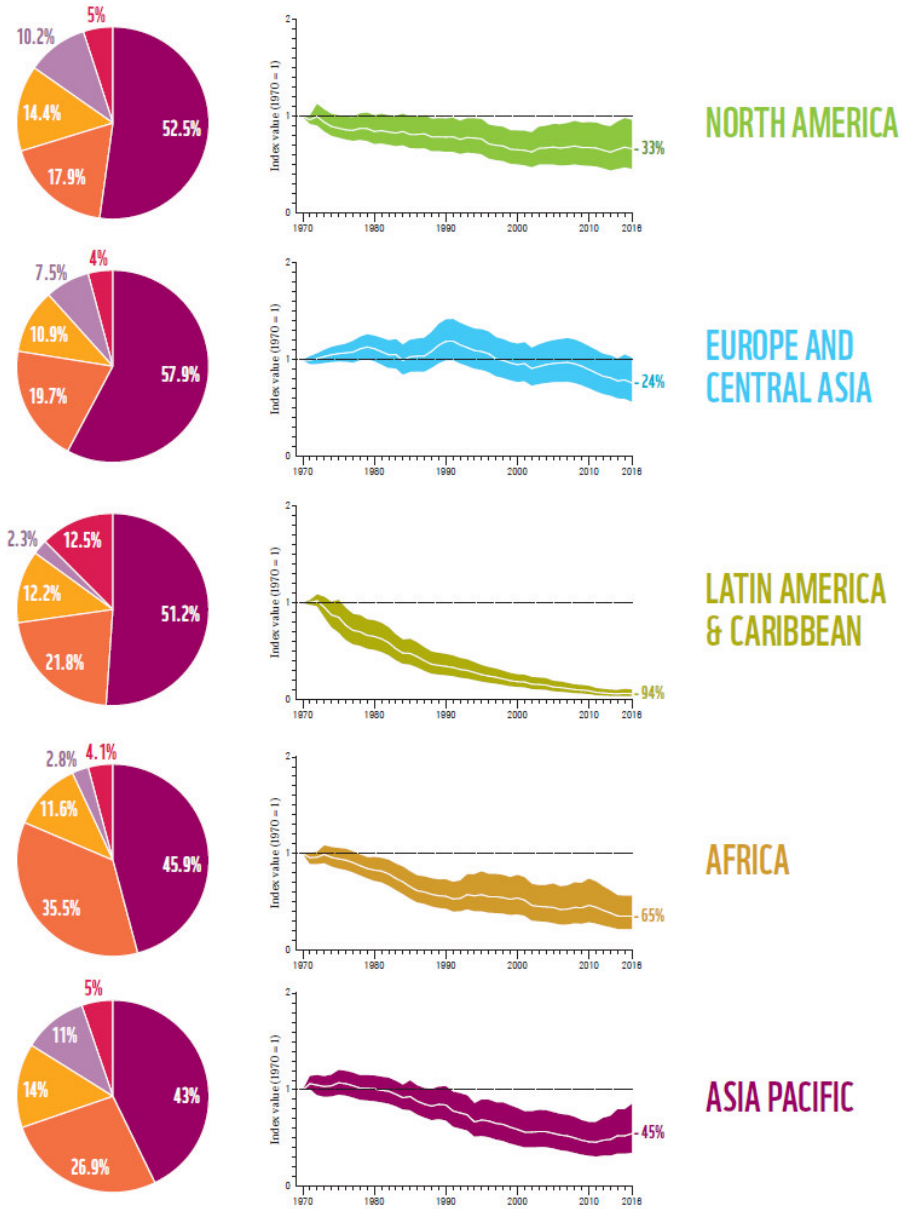


As temperatures change, some species will need to adapt by shifting their range to track a suitable climate. The effects of climate change on species are often indirect. Changes in temperature can confound the signals that trigger seasonal events such as migration and reproduction, causing these events to happen at the wrong time (for example misaligning reproduction and the period of greater food availability in a specific habitat).

Figure 4: Different threat types in the Living Planet Database
Descriptions of the major threat categories used in the Living Planet Database. This classification reflects the direct drivers with the largest global impact as identified by IPBES[1]; it is also followed by the IUCN Red List and is based on the original classification by Salafsky, N. et al. (2010)[10]. Source WWF/ZSL (2020)[107].

Figure 5: The proportion of threats recorded in each category for populations in each IPBES region[9]
The number of populations with threat data available is shown next to the pie chart[107]. The colour of each section refers to the colour for each threat category on the opposite page.

Regional threats to populations in the LPI



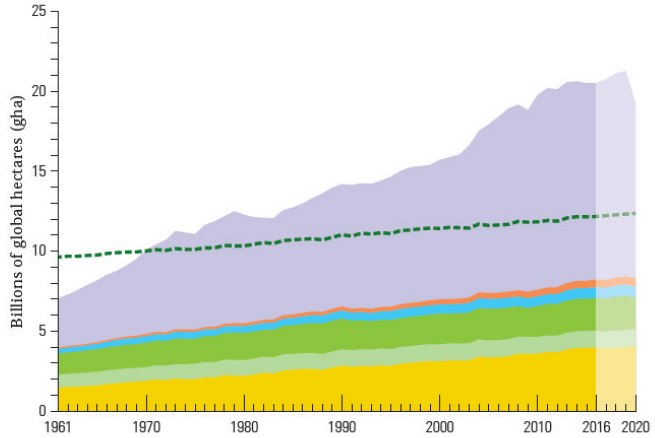
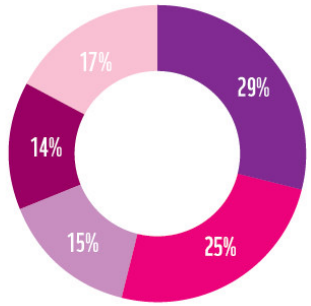


Figure 12: Humanity's Ecological Footprint against Earth's biocapacity in global hectares, 1961-2020
Global overshoot, starting in the early 1970s, has increased since. The COVID-19 related footprint contraction - in lighter colours from 2016 onwards - is an estimate[30,31].

Key

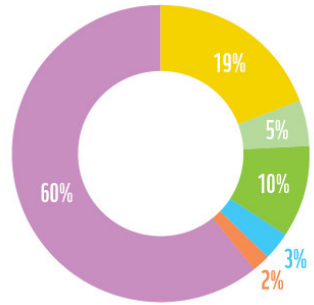
- **Carbon footprint**[34] for absorbing emissions from fossil fuel burning and cement production
- **Built-up land footprint** for accommodating roads and buildings
- **Fishing grounds footprint** for wild and farmed seafood from oceans and freshwater
- **Forest product footprint** for fuel wood, pulp and timber
- **Grazing land footprint** for meat, dairy, leather and wool
- **Cropland footprint** for food, fibre, oil and feed crops, including rubber
- World biocapacity



Humanity's Ecological Footprint by activities

Key

- Food
- Housing
- Personal transportation
- Goods
- Services



Humanity's Ecological Footprint by land use

Key

- Cropland footprint
- Grazing land footprint
- Forest product footprint
- Fishing grounds footprint
- Built-up land footprint
- Carbon footprint

Figure 13: Humanity's Ecological Footprint by land use and by activities
The Ecological Footprint measures how much demand human consumption places on the biosphere and compares it to what ecosystems can renew. In 2020, the world average Footprint amounts to 2.5 global hectares per person, compared to 1.6 global hectares of biocapacity. It can be broken down by area categories (outer circle) or, using Multi-Regional Input-Output Assessments, by activity fields (inner circle)[35,30,29,36].

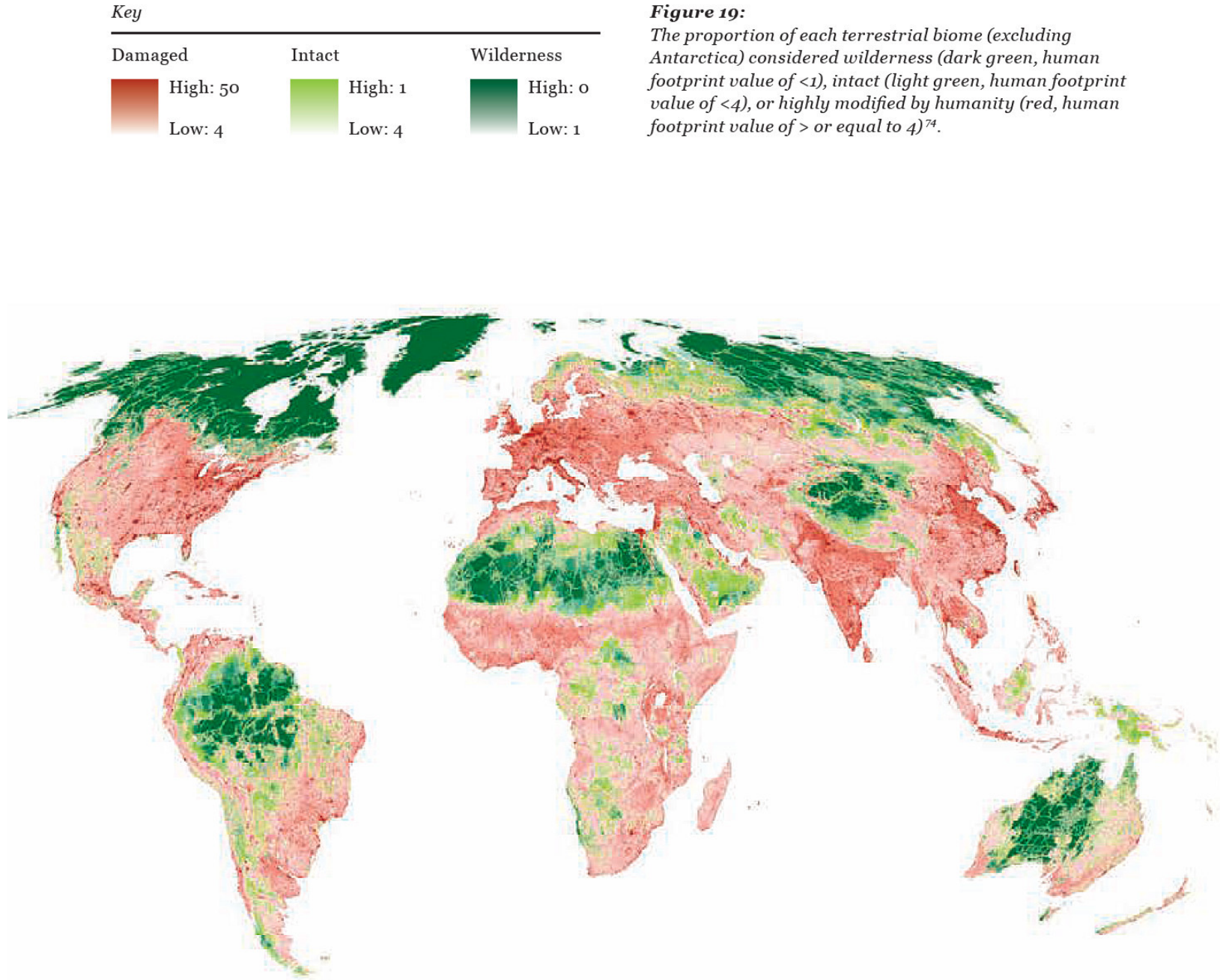


Figure 19:
The proportion of each terrestrial biome (excluding Antarctica) considered wilderness (dark green, human footprint value of <1), intact (light green, human footprint value of <4), or highly modified by humanity (red, human footprint value of > or equal to 4)[74].

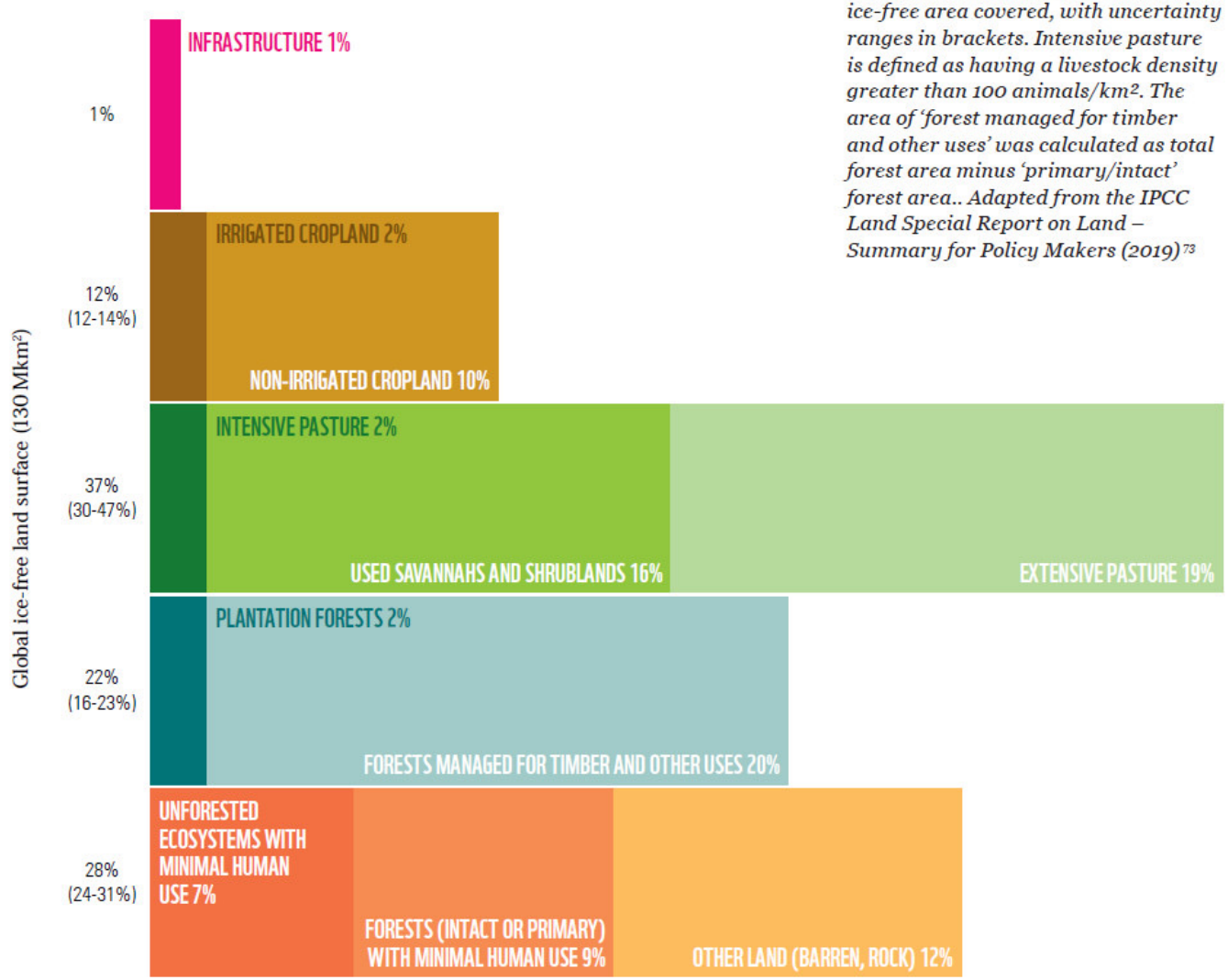


Figure 17: Global land use in circa 2015

The bar chart depicts shares of different uses of the global ice-free land area for approximately the year 2015. Bars are ordered along a gradient of decreasing land-use intensity from left to right. Each bar represents a broad land cover category; the numbers on top are the total percentage of the ice-free area covered, with uncertainty ranges in brackets. Intensive pasture is defined as having a livestock density greater than 100 animals/km². The area of 'forest managed for timber and other uses' was calculated as total forest area minus 'primary/intact' forest area.. Adapted from the IPCC Land Special Report on Land – Summary for Policy Makers (2019)[73]

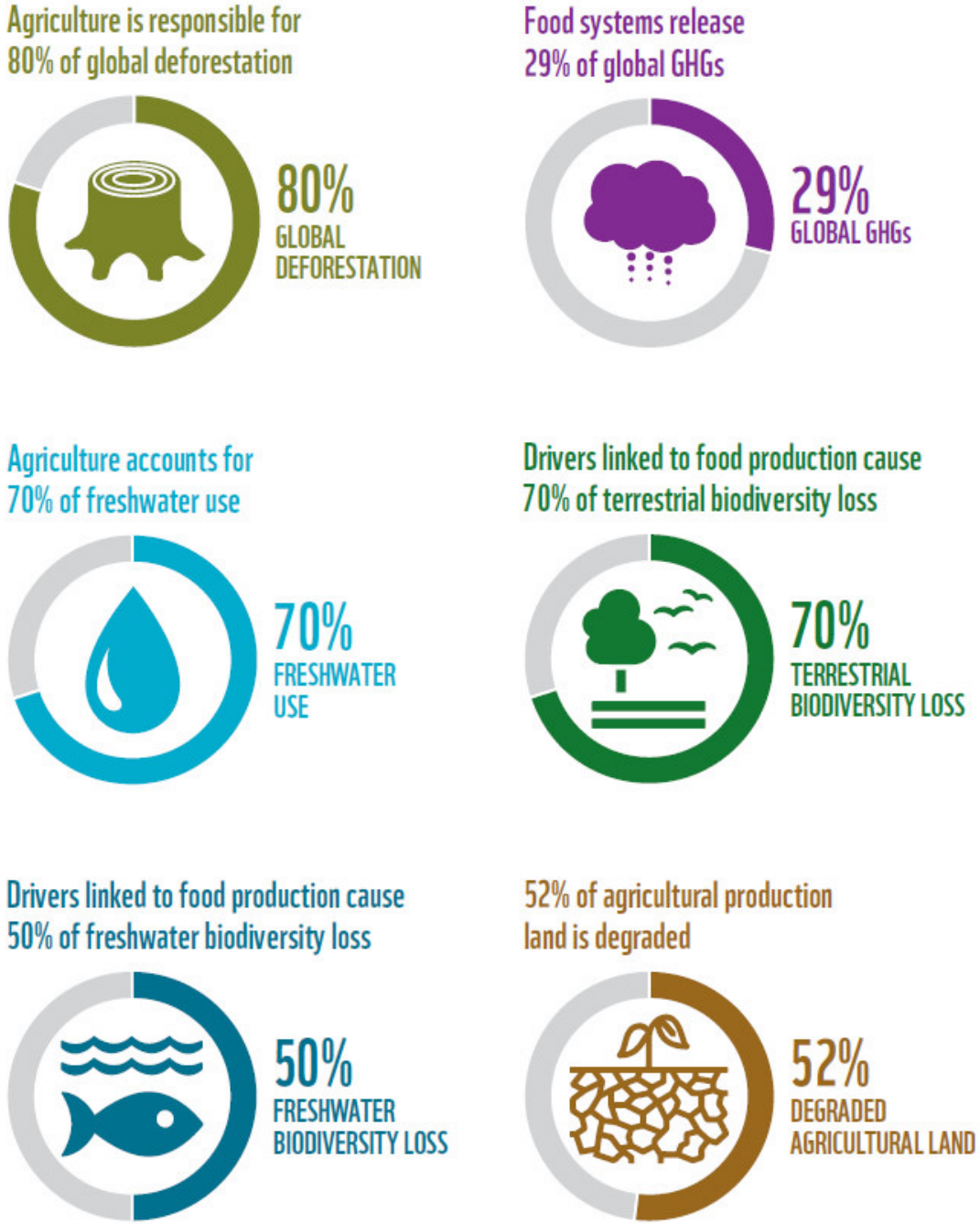


Figure 15: The environmental impacts of food production
Sources: Adapted from CBD (2014)[98], GSDR (2019)[99] and ELD Initiative (2015)[103].

Consumption around the world

Both human demand and natural resources are unevenly distributed across the Earth. The pattern of human consumption of these resources differs from resource availability, since resources are not consumed at the point of extraction. The Ecological Footprint per person, across countries, provides insights into countries' resource performance, risks and opportunities [37, 38, 29].

Varying levels of Ecological Footprint are due to different lifestyles and consumption patterns, including the quantity of food, goods and services residents consume, the natural resources they use, and the carbon dioxide emitted to provide these goods and services.

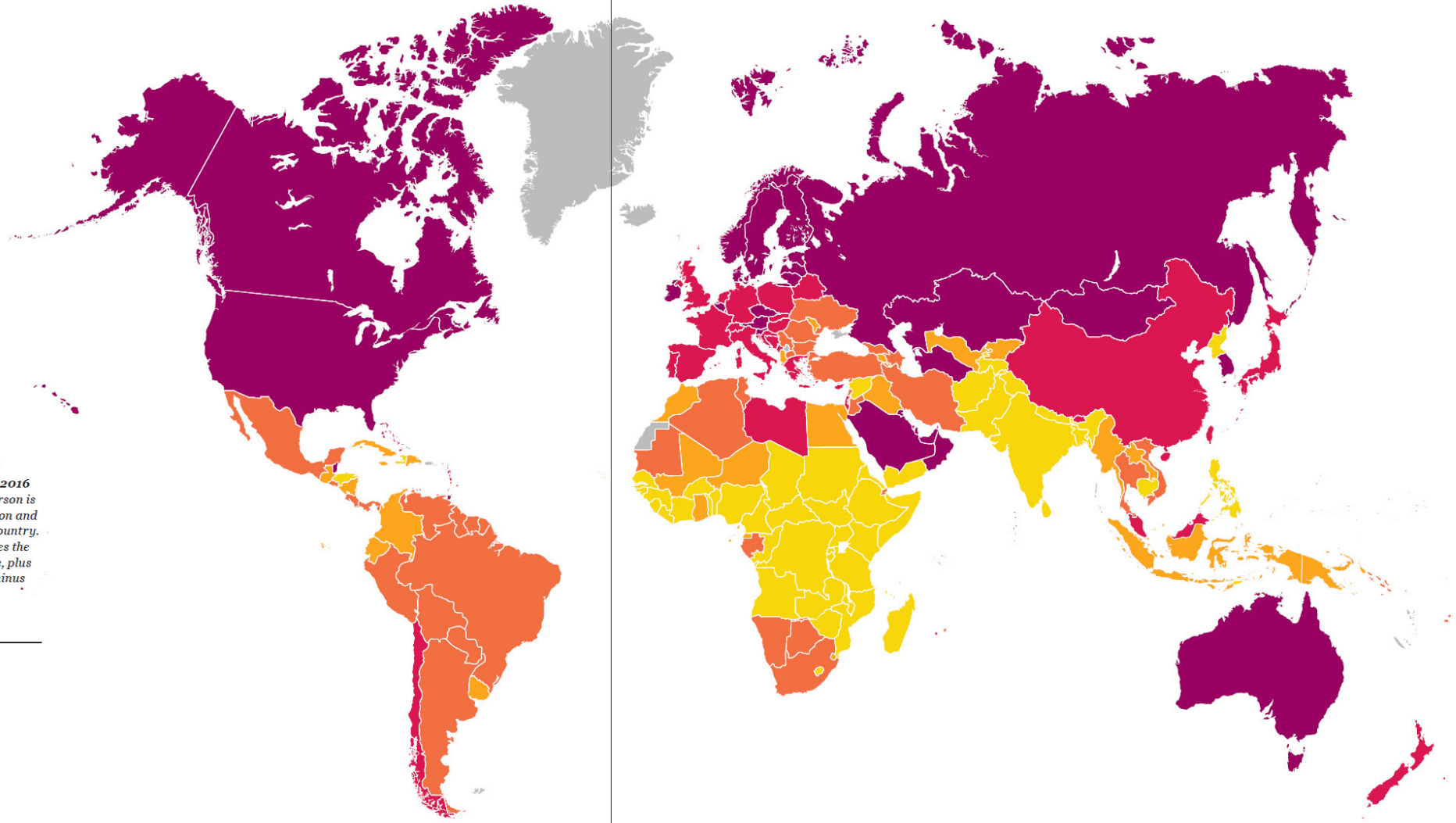
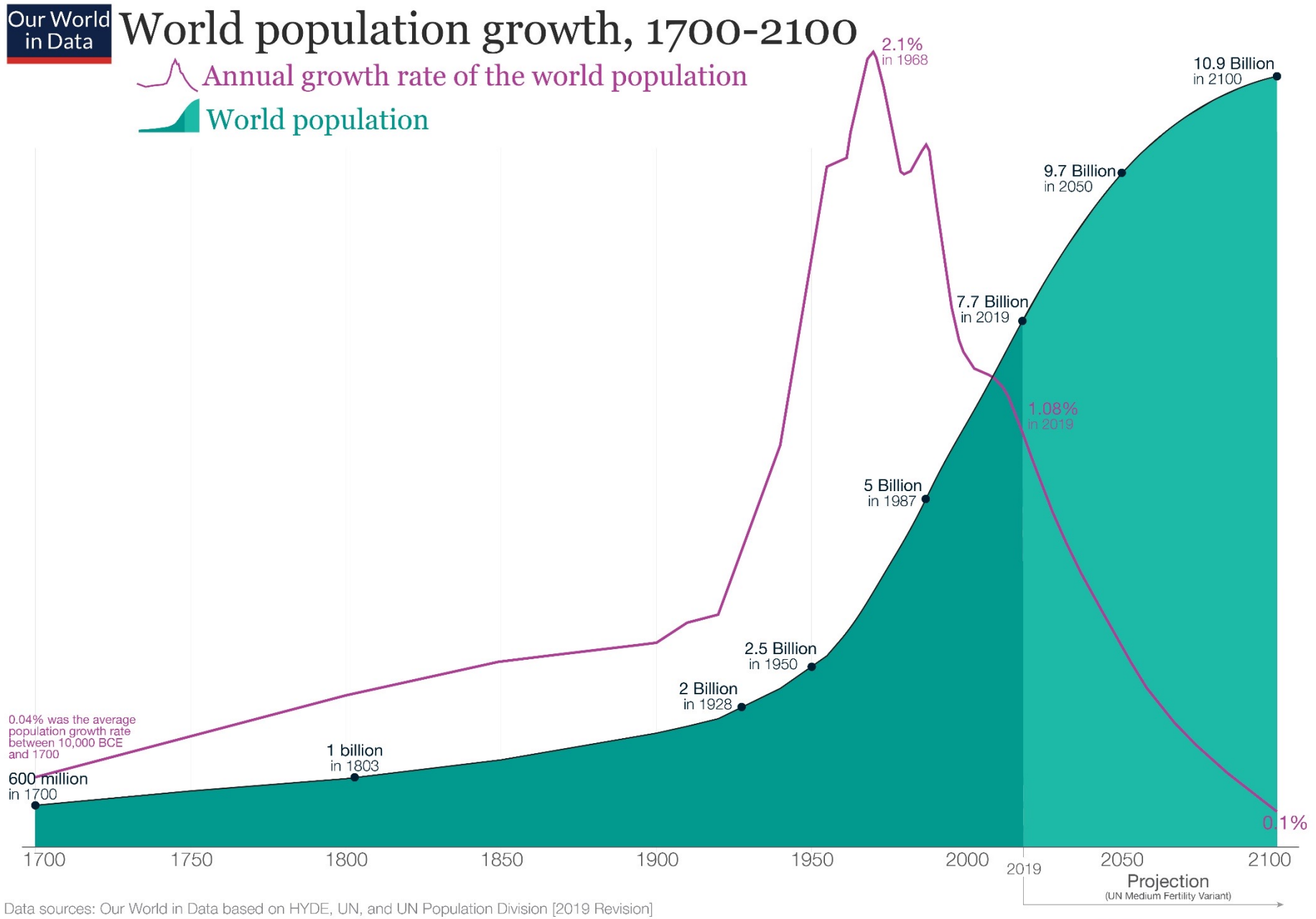


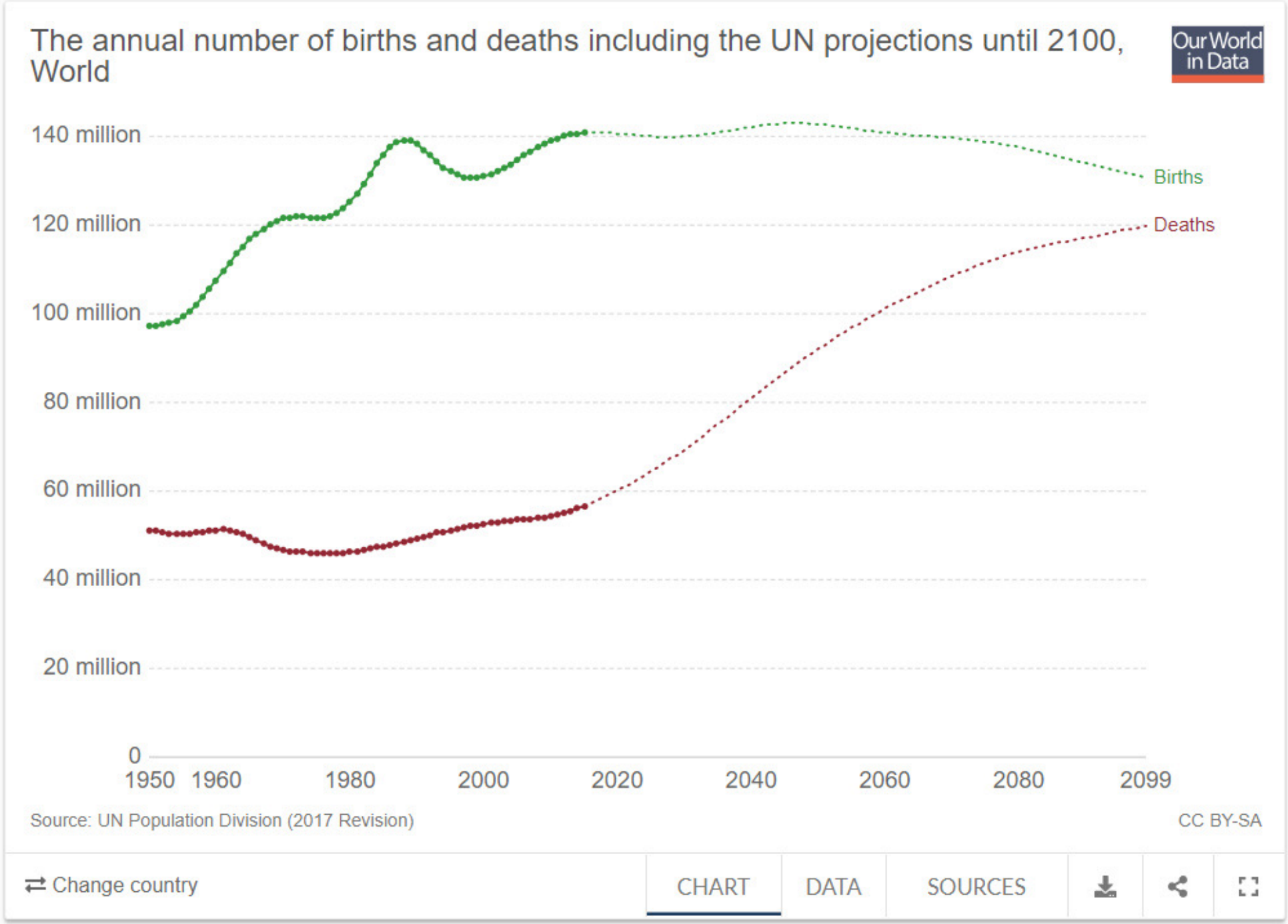
Figure 14: Global map of the Ecological Footprint of consumption per person in 2016
The Ecological Footprint per person is a function of both total population and rates of consumption within a country. A country's consumption includes the Ecological Footprint it produces, plus imports from other countries, minus exports [31].



Data sources: Our World in Data based on HYDE, UN, and UN Population Division [2019 Revision]
This is a visualization from OurWorldinData.org, where you find data and research on how the world is changing.

Licensed under CC-BY by the author Max Roser.

IETS NA 2100 ZAL DE WERELDBEVOLKING EINDELIJK IN AANTAL BEGINNEN AFNEMEN
ALS WE AAN ELKE SOORT PLANT, MENS EN DIER EEN GEZONDE HOEVEELHEID ECOSYSTEEMRUIMTE WILLEN GEVEN DAN KAN DE AARDE
1 MILJARD MENSEN AAN (footprint USA vandaag), 2 à 3 MILJARD MENSEN (footprint Europa vandaag) en 3 à 4 miljard mensen (zero CO2 uitstoot en weinig vlees eten)


The annual number of births and deaths including the UN projections until 2100, World
Our World in Data
140 million
120 million
100 million
80 million
60 million
40 million
20 million
0
1950
1960
1980
2000
2020
2040
2060
2080
2099
Births
Deaths
Source: UN Population Division (2017 Revision)
CC BY-SA
Change country
CHART
DATA
SOURCES

OVERSHOOT = TOTAL IMPACT IS BIGGER THAN WHAT EARTH CAN STAND

TOTAL IMPACT = AVERAGE IMPACT PER PERSON x NUMBER OF PEOPLE

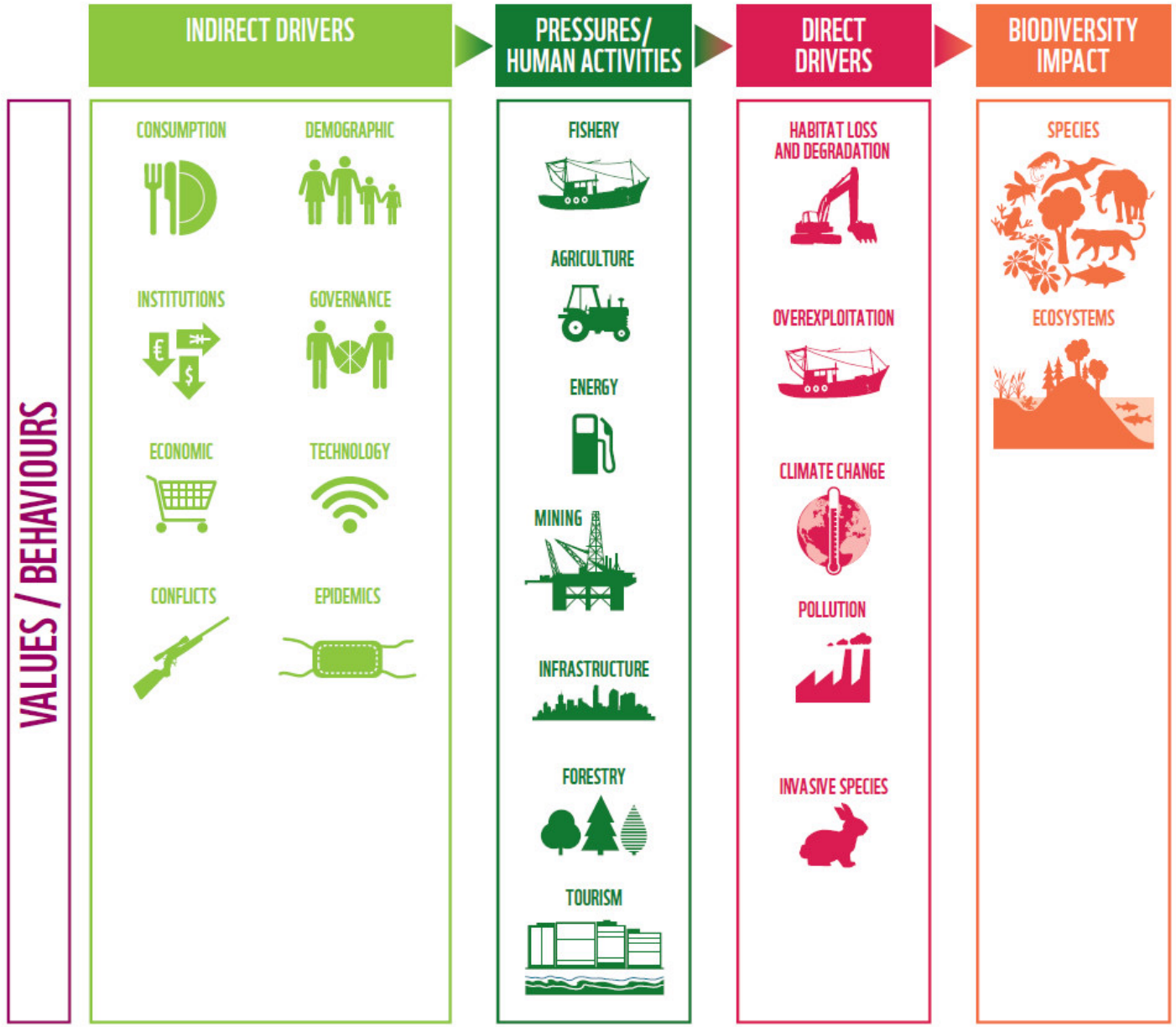
AVERAGE IMPACT PER PERSON = AVERAGE (LAND USE + EMISSIONS + WASTE)

NUMBER OF PEOPLE = BIRTH RATE

CAUSES OF IMPACT ARE POTENTIAL VECTORS OF CHANGE

REDUCING OUR LAND USE – GIVE LAND BACK TO NATURE • Causes of land use: food, housing, raw materials. • Agriculture: smaller surface, less red meat, less land to feed livestock. • Undo urban sprawl: densify all forms of built land use, free standing housing should be forbidden. • All housing above 50 units per hectare (the minimum needed for a feasible heat net). • Maximum rewilding. New nature with restricted respectful accessibility.	ECONOMICAL MODEL • Stock market driven max. profit economy or economy driven by max. quality of life for all life forms? • Private concentration of shares (hard capitalism) or public concentration of shares (communism) do not work. • Socio-capitalism: a genuine sharing economy with access to shares for all people. • Growth of value creation and turnover of services, reduction of turnover of goods, reduced land use.
BIRTH RATE • Depends on level of education, equal rights for women, health care system. • Development aid and equal distribution of wealth. No low-income countries.	GOVERNANCE • Nobody stays behind. A more equal society reduces polarisation and reduces extremist votes. • Sharing economy takes care of redistribution of wealth.

Threats to nature and the drivers and pressures behind them



N
Google Earth

In Meeuwen, deelgemeente van Oudsbergen, zijn zondagnacht twee shetlandpony's doodgebeten door een wolf © VTM Nieuws

Boerenbond en burgemeester vragen zich af of wolf wel in België thuishoort: "Mensen durven 's avonds niet meer buiten wandelen"