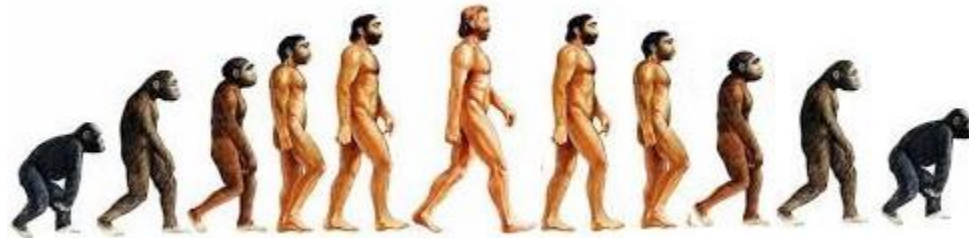


Kuda to ide *Homo sapiens*?

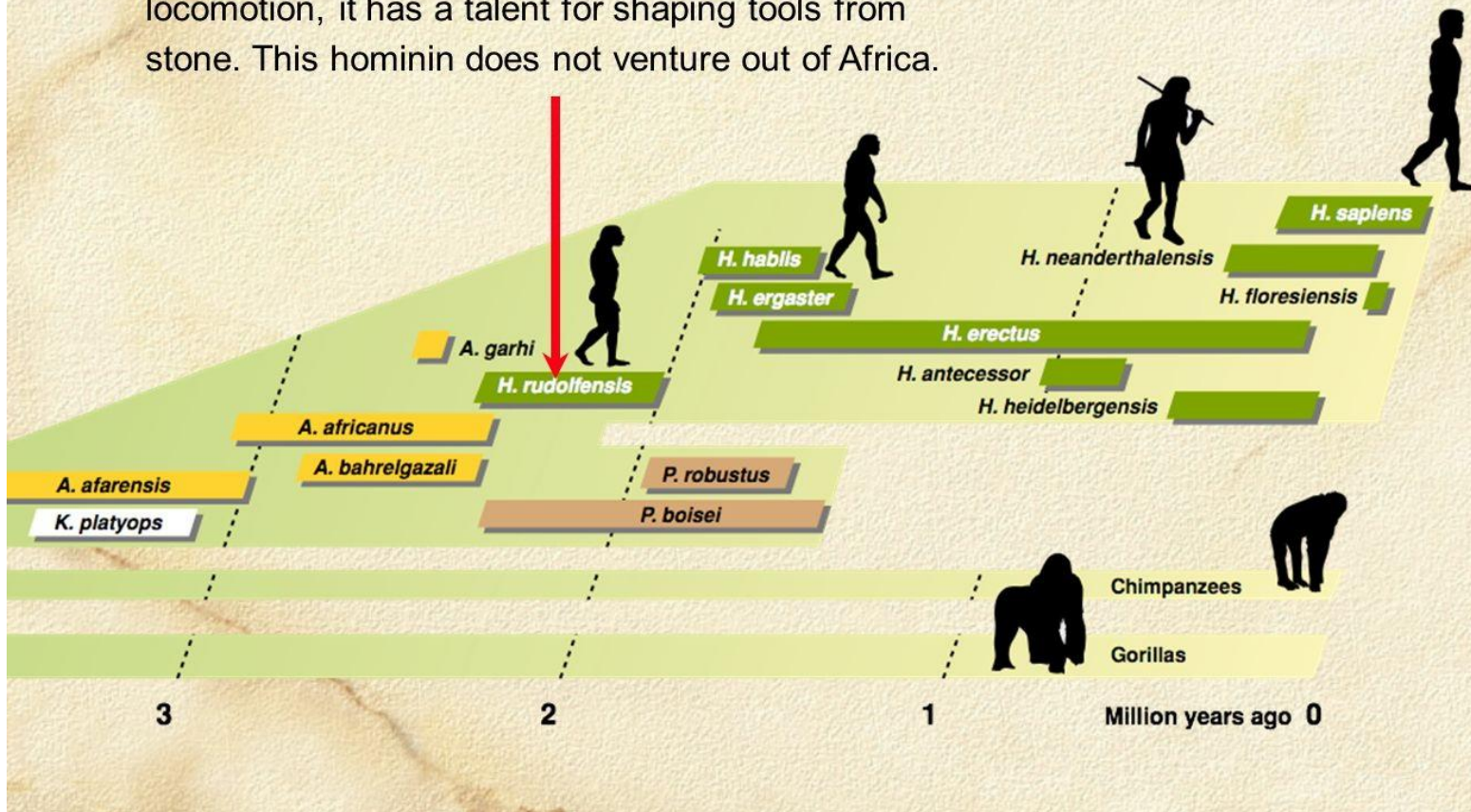


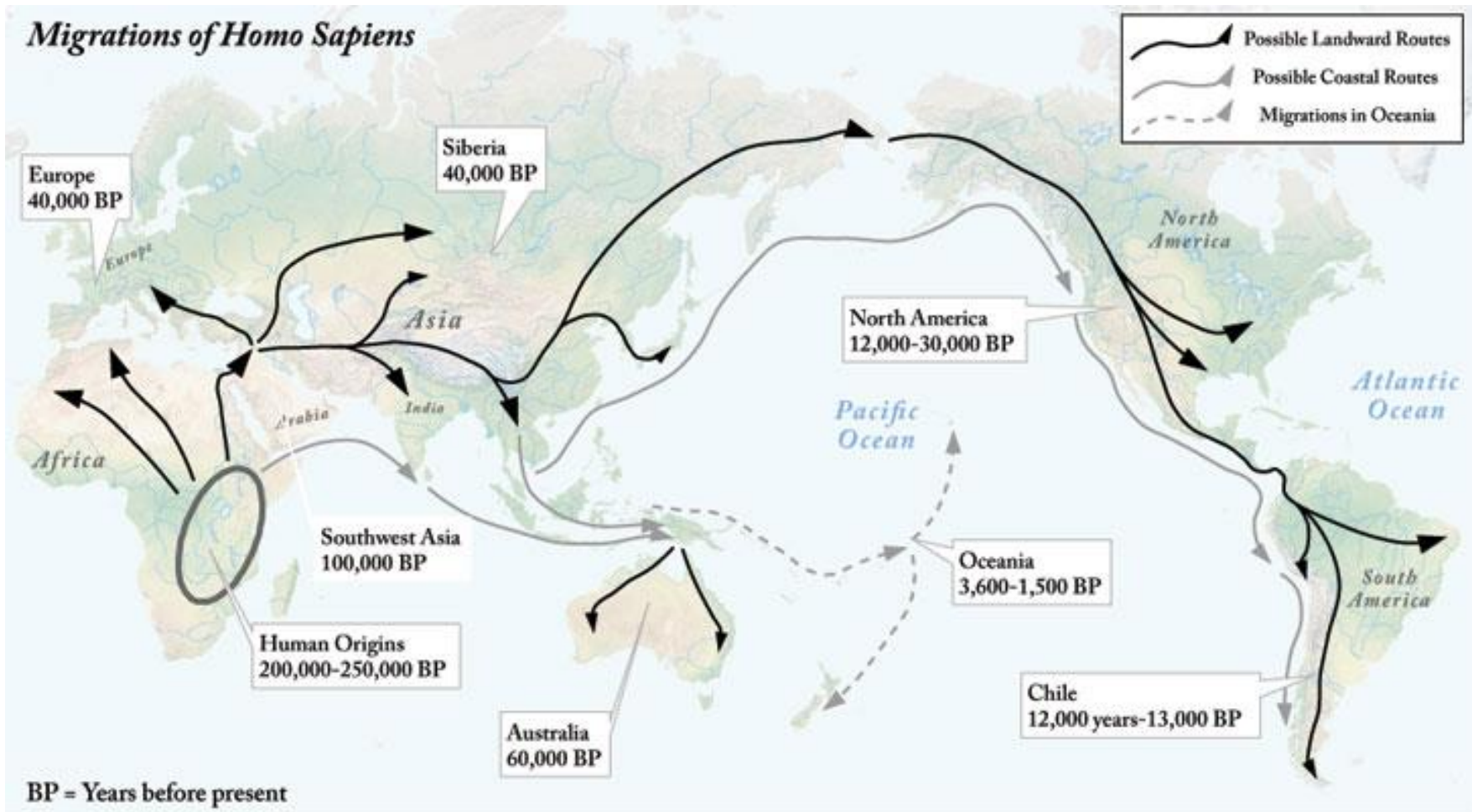
Prof. dr. Toni Nikolić
Prirodoslovno-matematički fakultet
Sveučilište u Zagrebu
toni.nikolic@biol.pmf.hr

Human Evolution Timeline

From a probable **Australopithecine** ancestor emerges the first species of genus **Homo**.

A small-brained species with fully developed bipedal locomotion, it has a talent for shaping tools from stone. This hominin does not venture out of Africa.



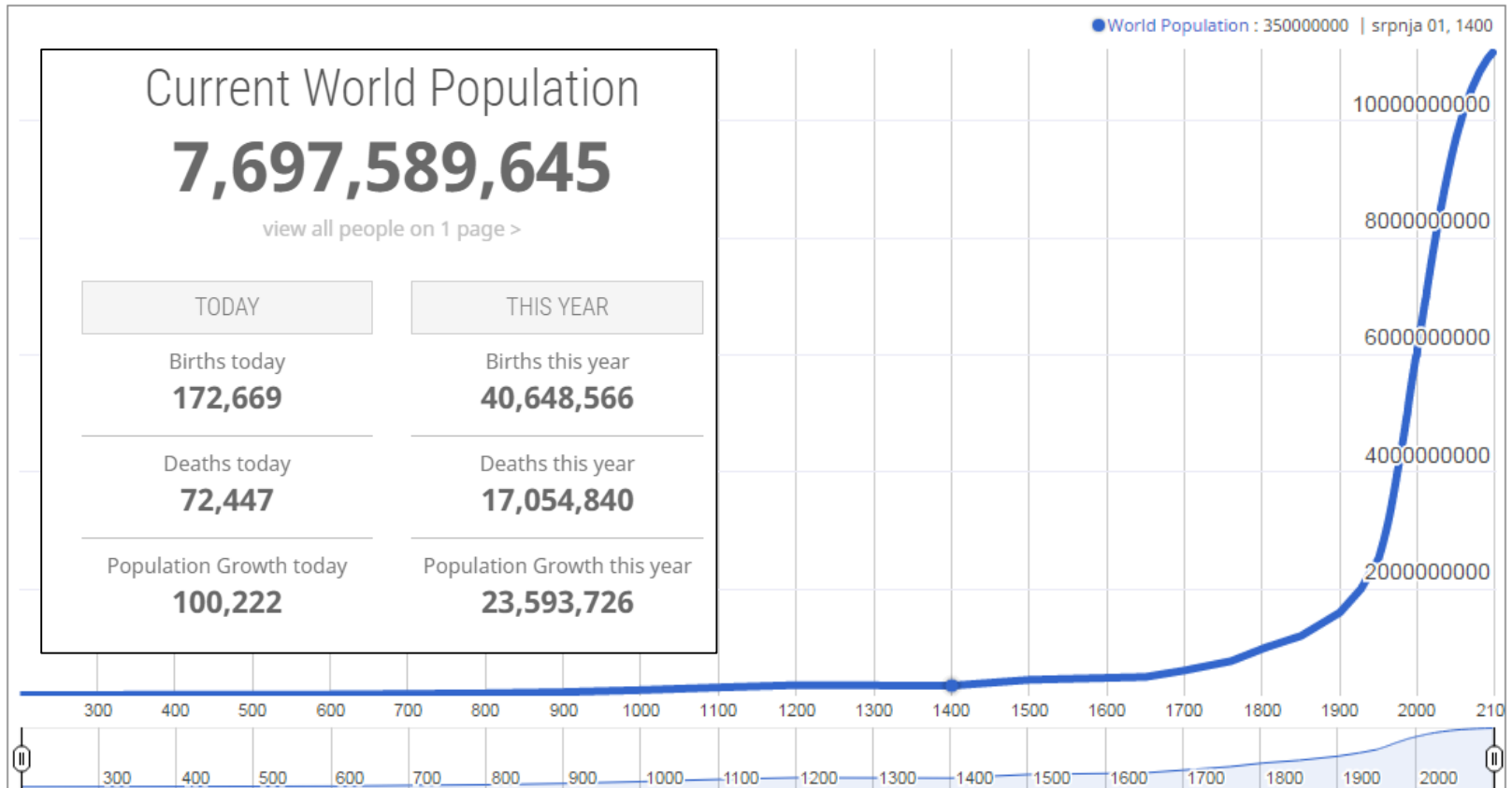


Izvori: National Center for History in the Schools at UCLA in cooperation with San Diego State University.
 World Population History: <http://worldpopulationhistory.org/map/1/mercator/1/0/25/>
 American Museum of Natural History https://www.youtube.com/watch?v=PUwmA3Q0_OE

Osobina	Lovačko-sakupljački	Poljodjelsko-sedentarni
Veličina skupina	80-100	>5000,
Zajednice	raspršene	zbite
Prehrana	raznolika	konzervativna
Broj potomaka/par	1-2	>2 (5-10)
Samoodrživost	velika	mala
Specijalizacije	mala	visoka
Zarazne bolesti	malobrojne	mnogobrojne
Higijenski uvjeti	visoki	niski
Pojam vlasništva	zanemariv	izrazit
Dnevni rad na opstanku (h)	4-6	10-15
Društvena povezanost	izrazita	niska
Sukobi	rijetki	česti
Preinake prostora	nepostojeće ili neznatne	izrazite
Populacija	stabilna	eksponencijalnog rasta

Populacija raste!

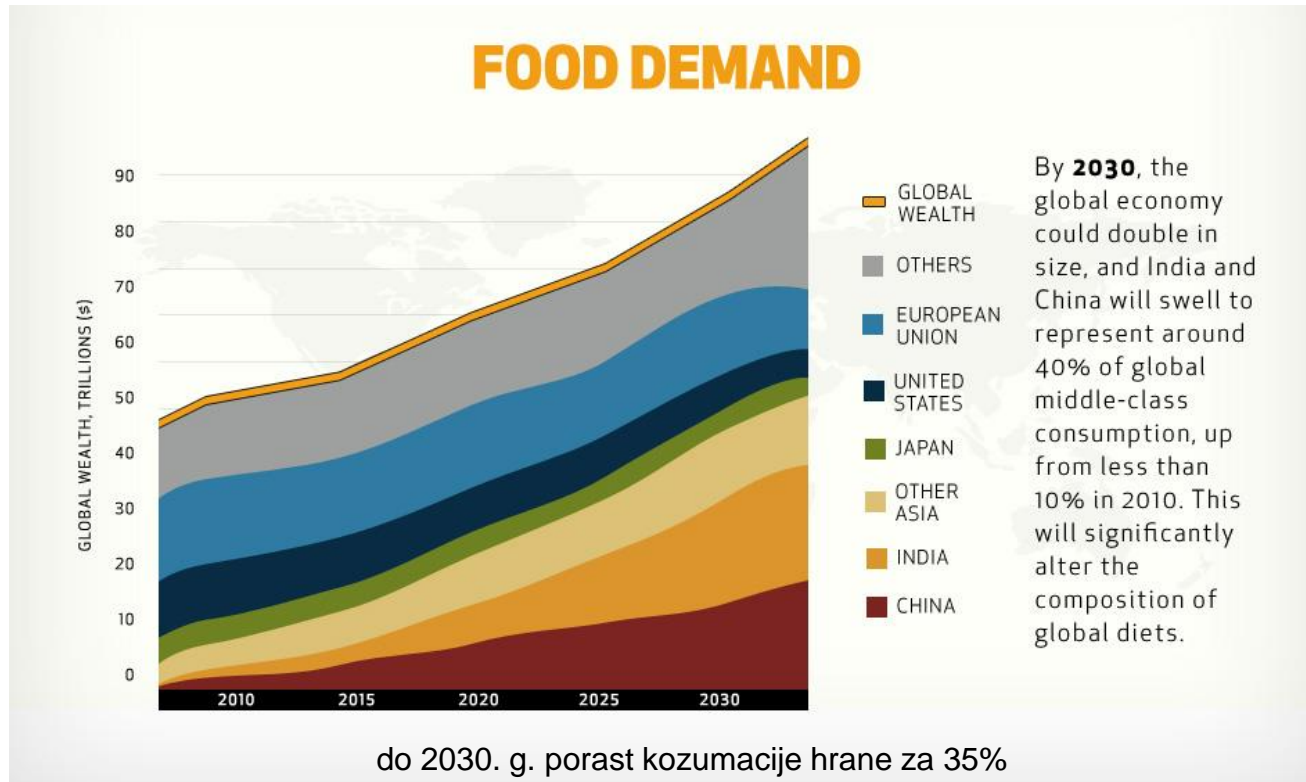
[back to top](#)



prije 8000-10000 g. p.n.e., u začetcima poljoprivrede cca 5 milijuna ljudi
200 mil. 0-te godine
1 milijarda 1804. g.
7 milijardi 2011. g.
11-12 mil. ljudi oko 2100 g.

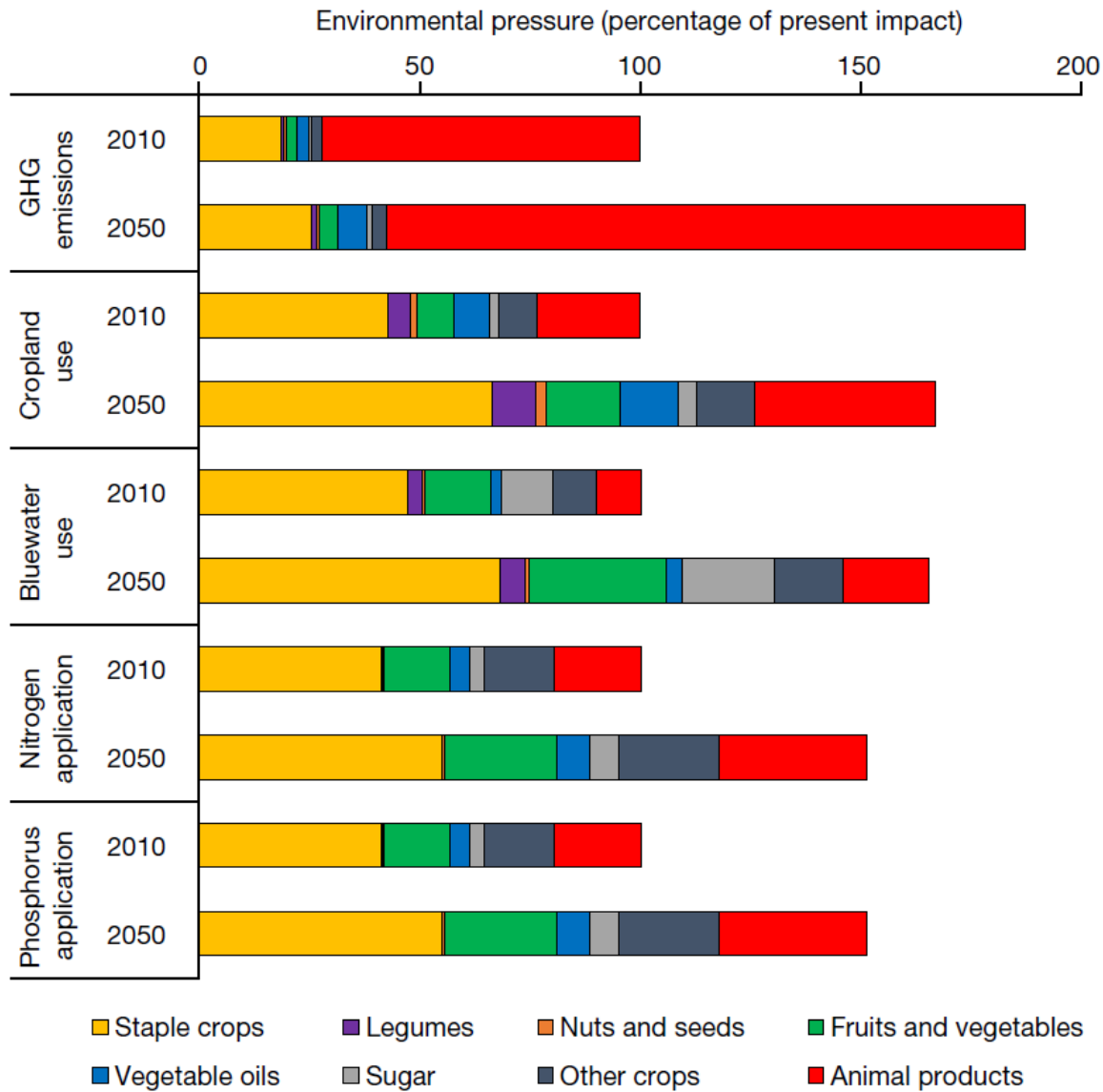
Izvor: Current World Population <http://www.worldometers.info/world-population/>

Raste potrošnja hrane



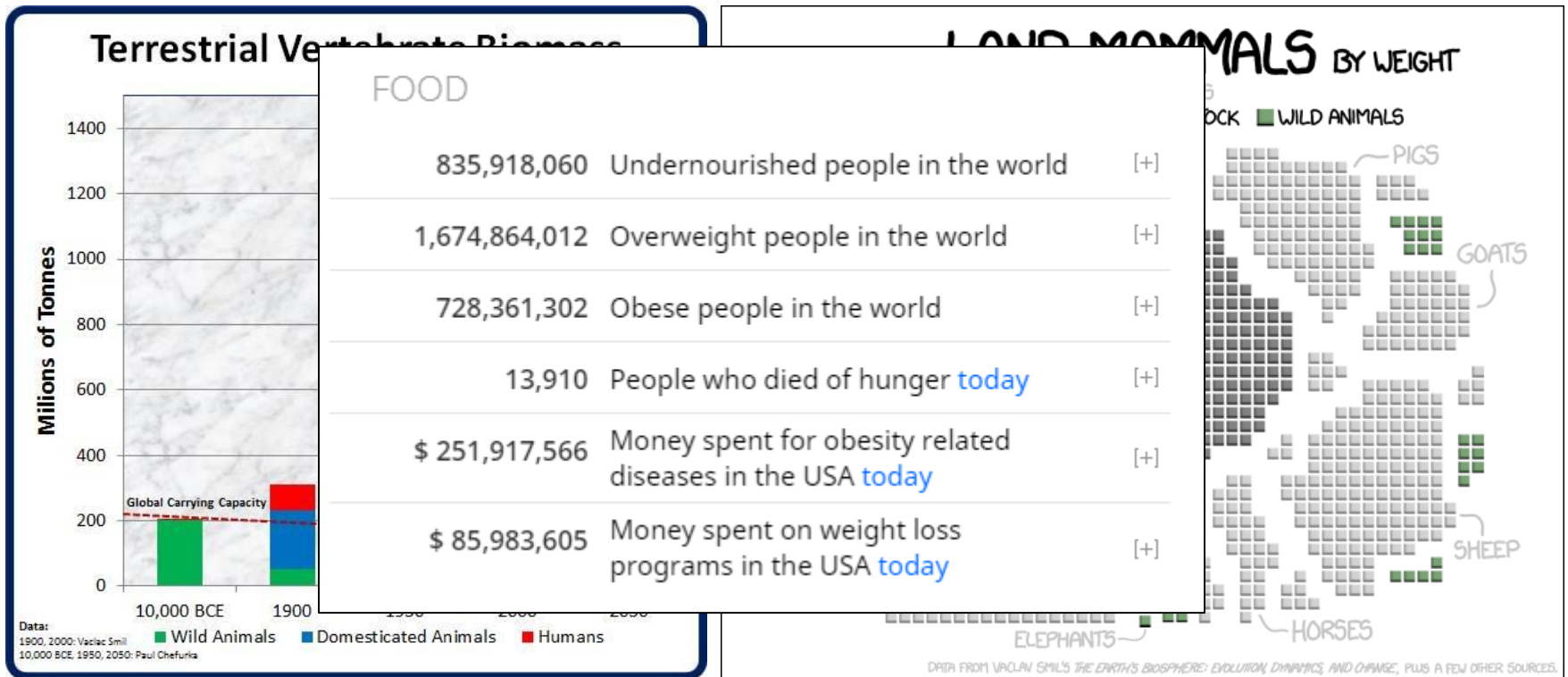
Izvor: The World Bank: Global Consumption Database <http://datatopics.worldbank.org/consumption/>
FAO, IFAD, UNICEF, WFP and WHO. 2018. The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO.

► Trenutno stanje: <http://www.worldometers.info/>



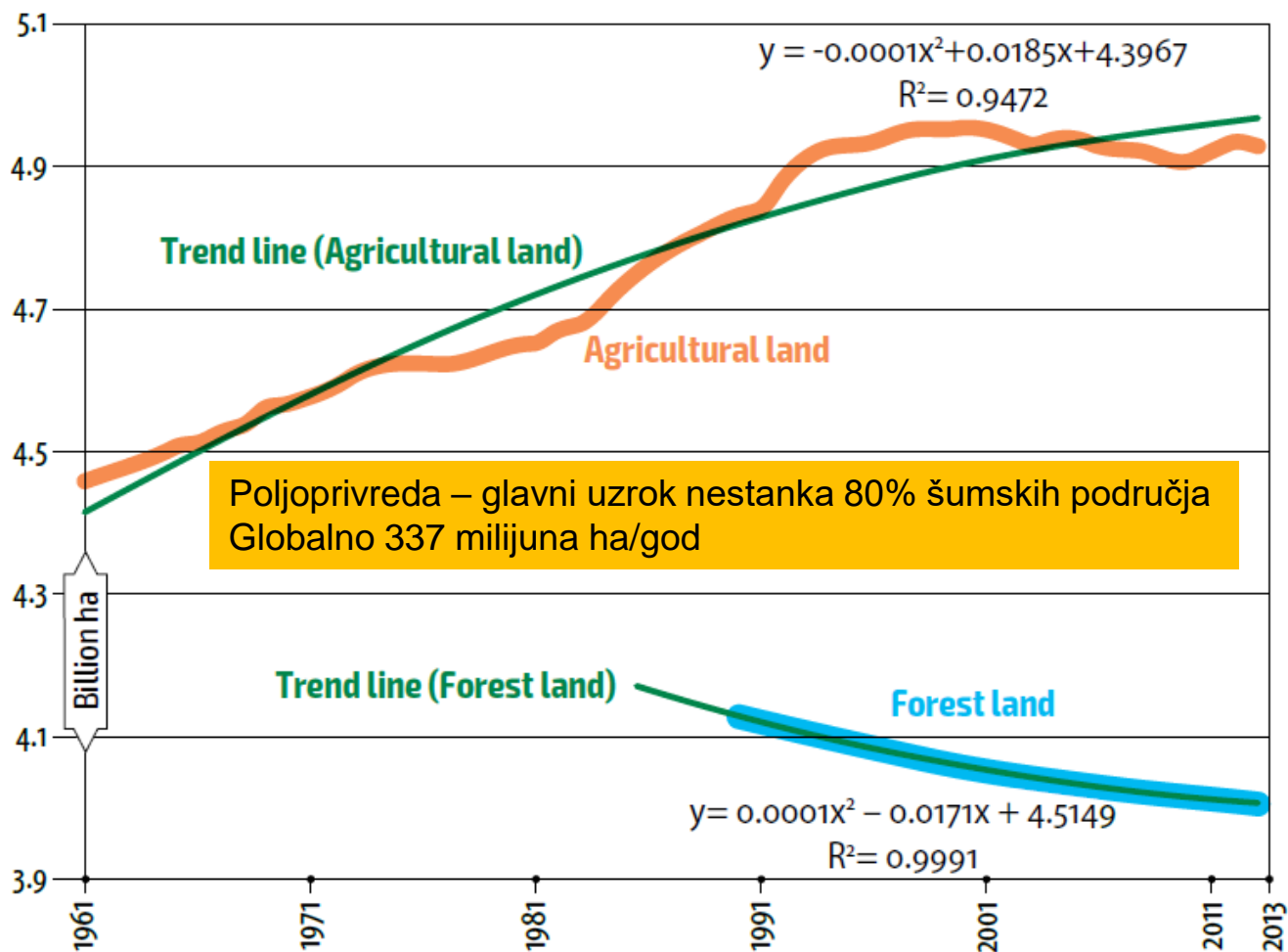
Izvor: Springmann et al. (20189: Nature 562:519-537 (<https://doi.org/10.1038/s41586-018-0594-0>))

Raste udio uzgojene hrane



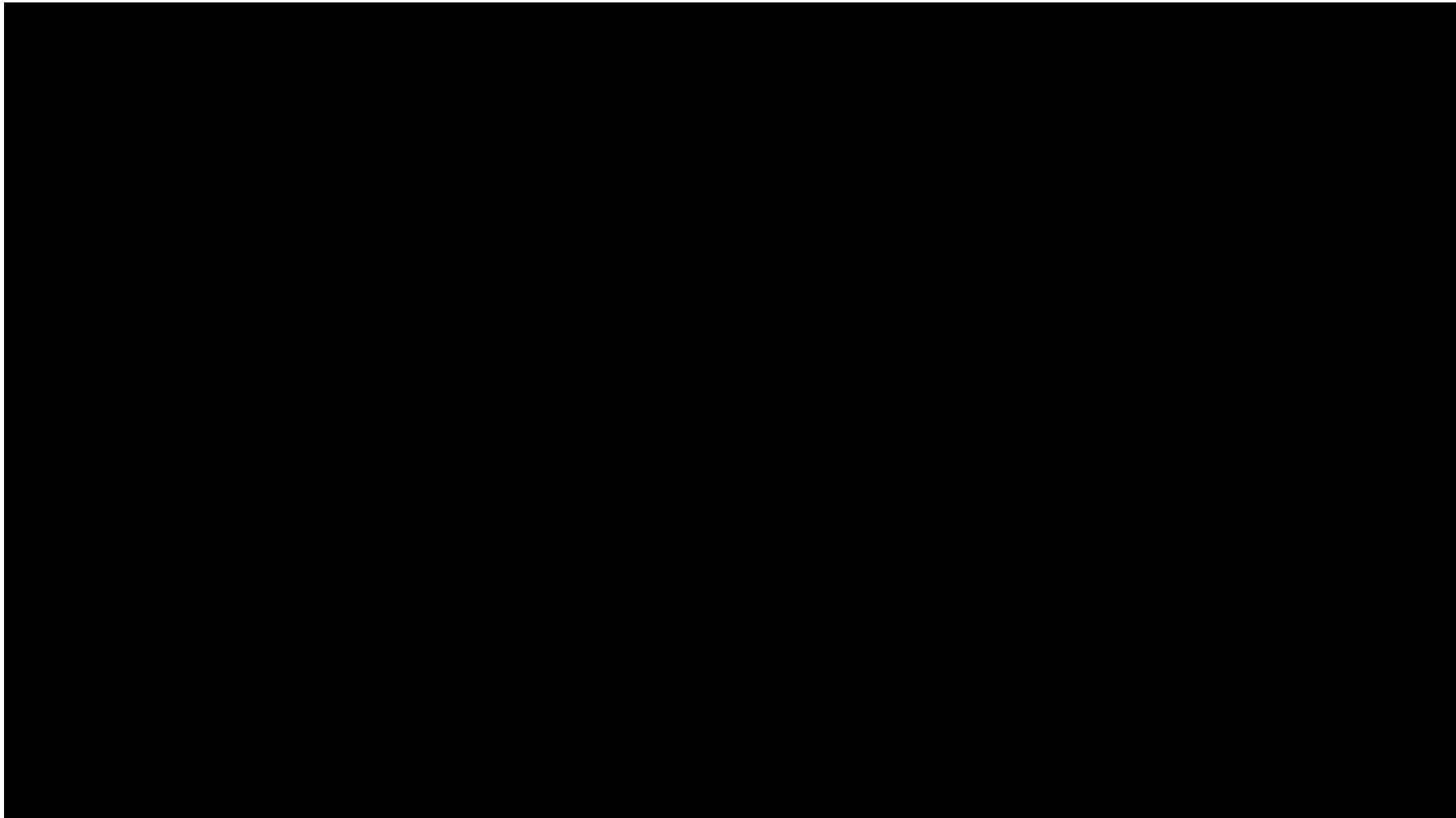
Izvor: Crist i sur. eds. (2012), Schlottmann i sur. (2017)

Figure 3.1 Agricultural and forest land use 1961–2013



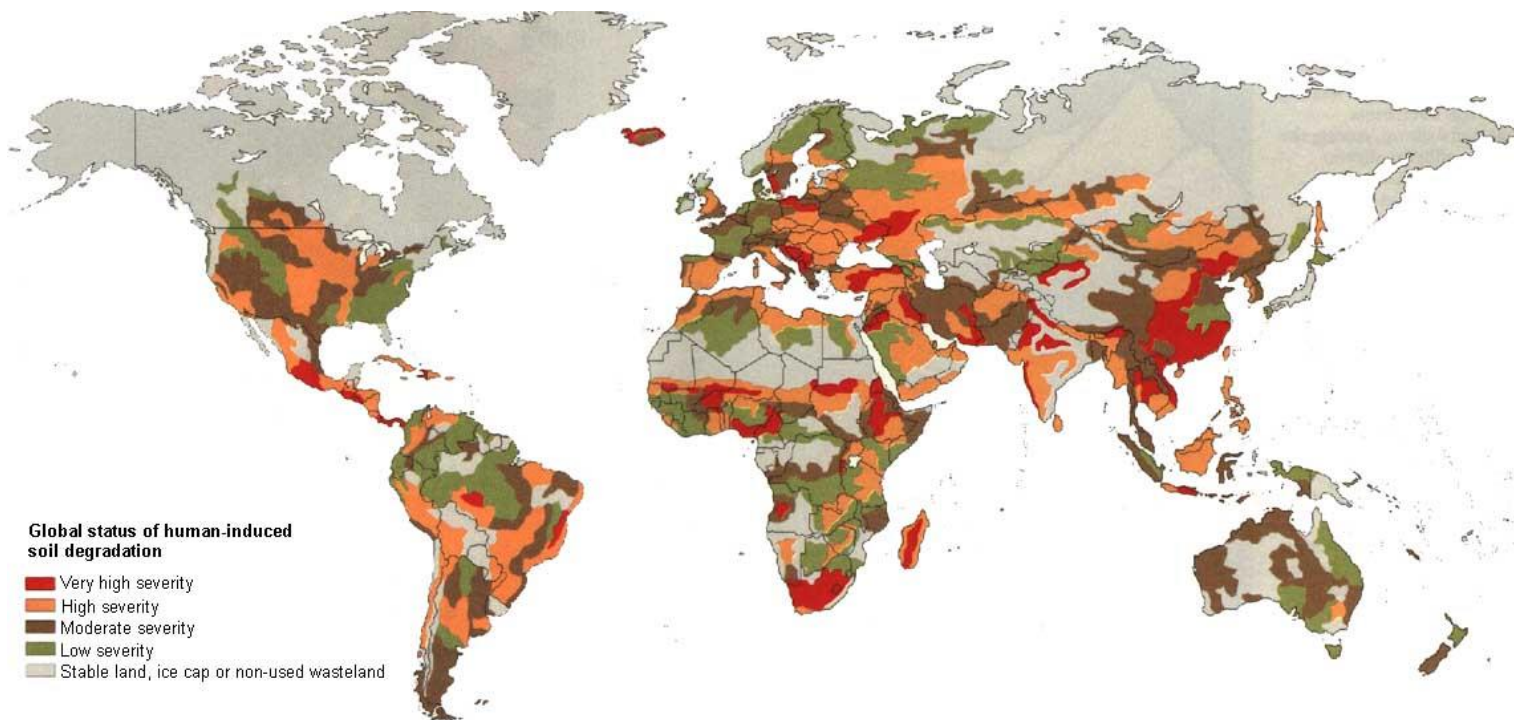
Source: FAO Global Perspectives Studies calculations based on FAO, 2016b.

Izvor: FAO. 2017. The future of food and agriculture – Trends and challenges. Rome. Global Forest Watch (<https://www.globalforestwatch.org>)



Dopunski izvor: FAO (2018): The State of the World's Forests 2018 - Forest pathways to sustainable development. Rome.

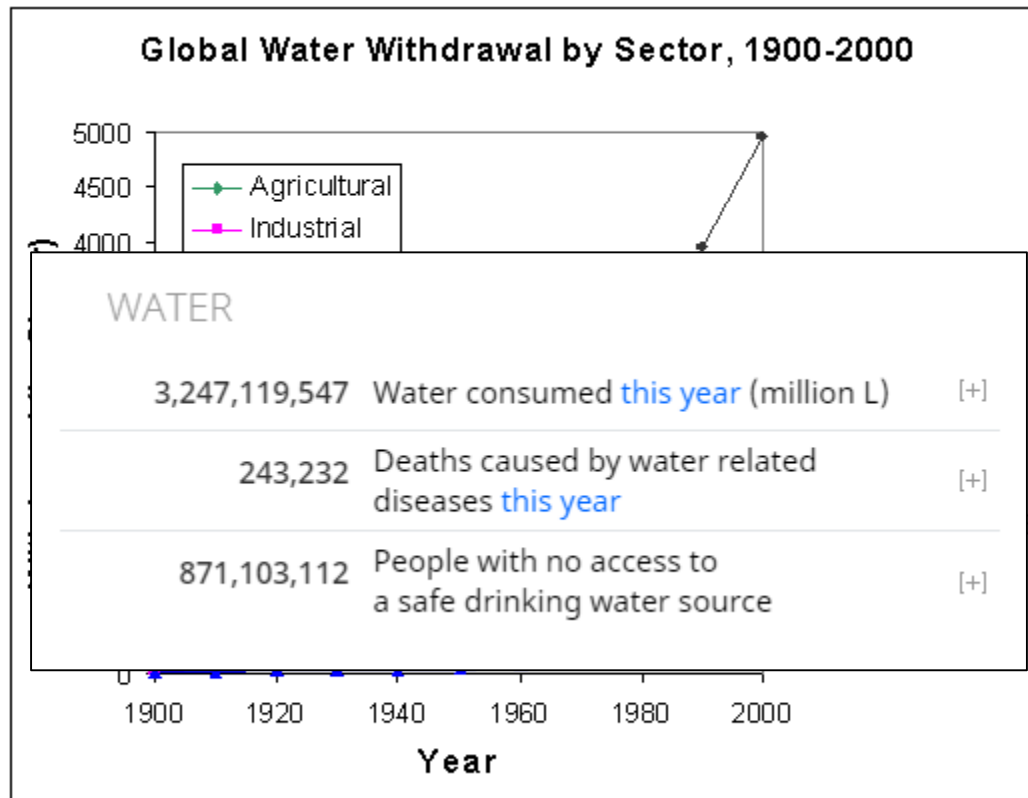
Opada kvaliteta tla



Prva globalna procjena gubitka tla pokazala je da je 38% tla (1,4 milijardi akri), koje se trenutno koristi u poljoprivrednoj proizvodnji degradirano.

Izvor: Food & Agriculture Organisation of the United Nations (<http://www.fao.org/docrep/u8480e/u8480e0d.htm>)
FAO and ITPS. 2015. Status of the World's Soil Resources (SWSR) – Main Report. Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils, Rome, Italy

Raste potrošnja vode



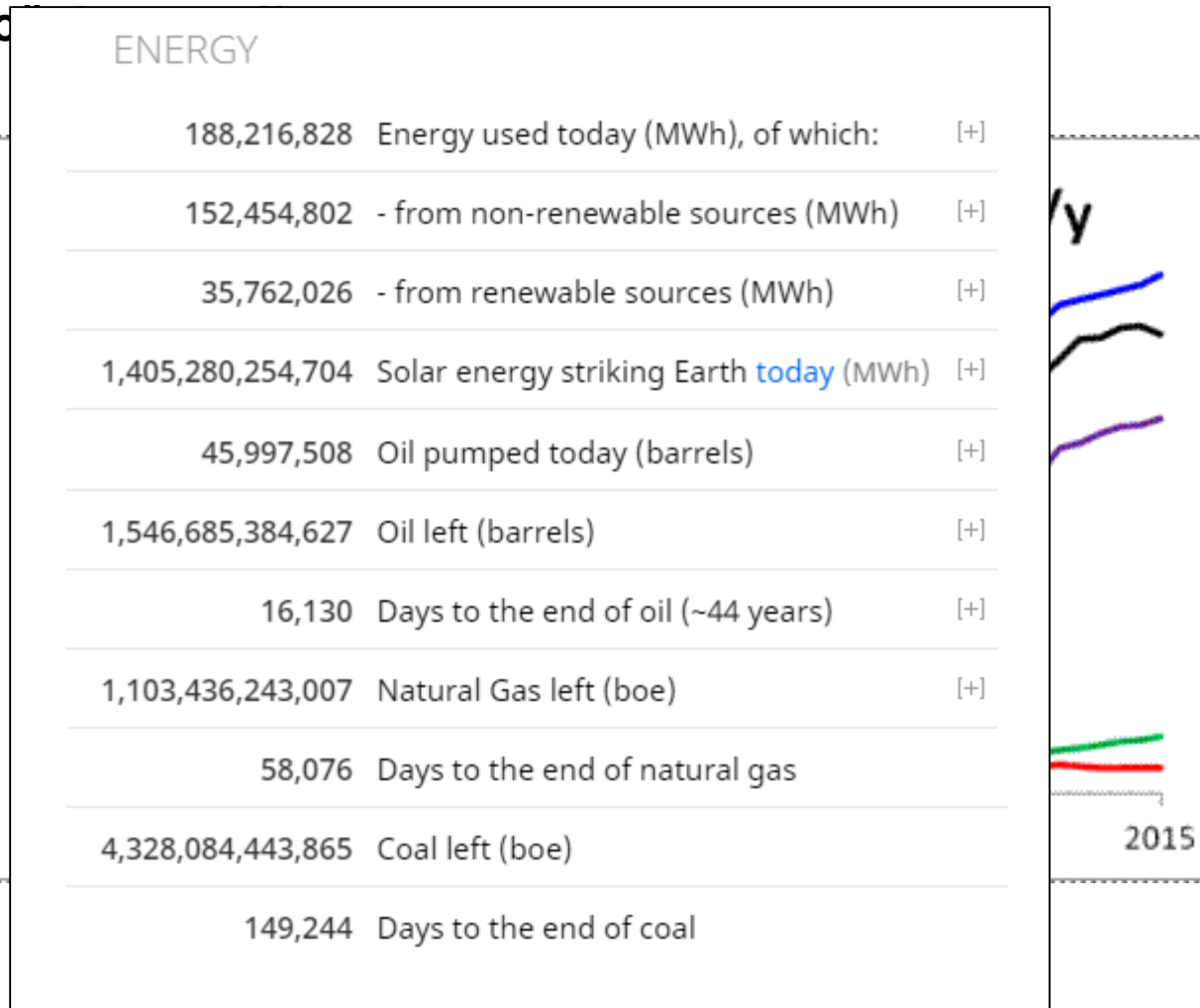
< 3% vode planete je pitko, >2,5% ove vode je u obliku leda, ~0,5% vode je na raspolaganju *Homo sapiensu* i drugim organizmima.

70% poljoprivreda, 20% industrija, 10% osobna potrošnja

Izvor: AQUASTAT - by the Food and Agriculture Organization of the United Nations (FAO): Information System on Water and Agriculture

► Trenutno stanje: <http://www.worldometers.info/>

Raste potreba



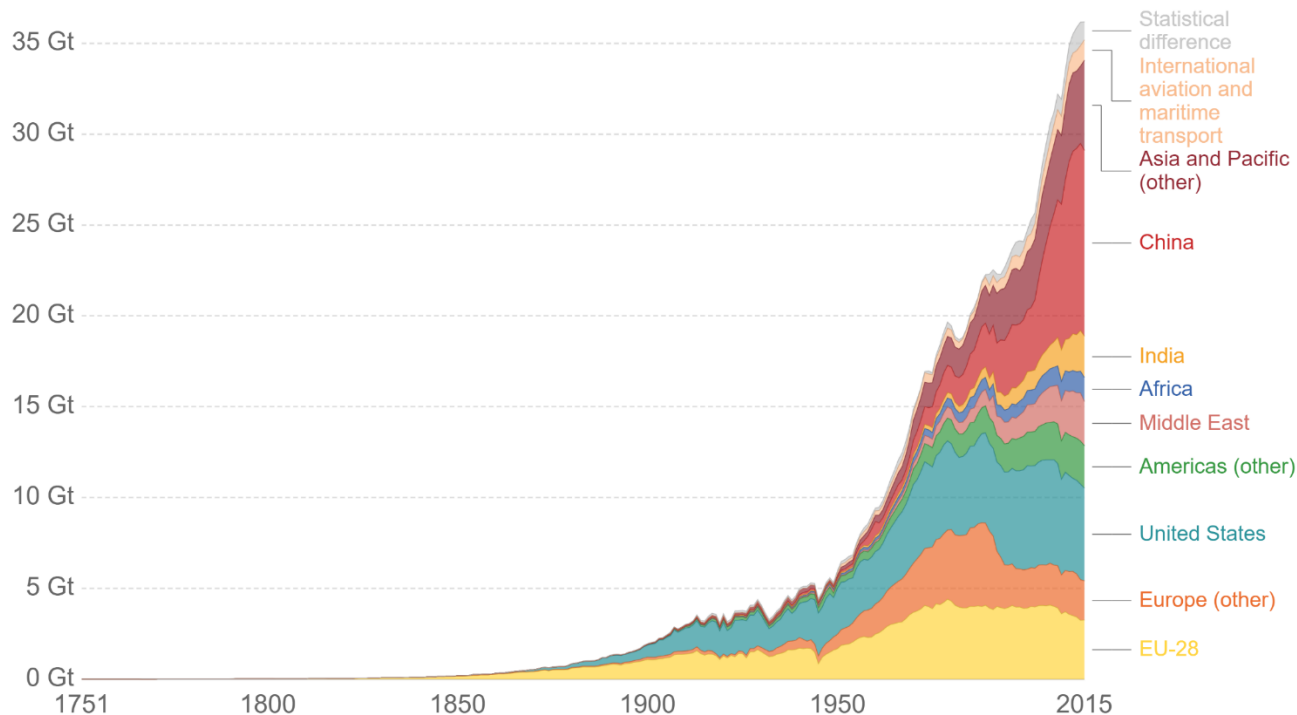
► Trenutno stanje: <http://www.worldometers.info/>

Raste emisija CO2

Annual CO₂ emissions by world region

Annual carbon dioxide (CO₂) emissions measured in billion tonnes (Gt) per year

Our World
in Data



Source: Carbon Dioxide Information Analysis Center (CDIAC)

CC BY

Note: Emissions data have been converted from units of carbon to carbon dioxide (CO₂) using a conversion factor of 3.67. Regions denoted "other" are given as regional totals minus emissions from the EU-28, USA, China and India. Here, we have rephrased the general term "bunker (fuels)" as "international aviation and maritime transport" for clarity.

Izvor: Hannah Ritchie and Max Roser (2019) - "CO₂ and other Greenhouse Gas Emissions". Published online at OurWorldInData.org. Retrieved from: '<https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>' [Online Resource]

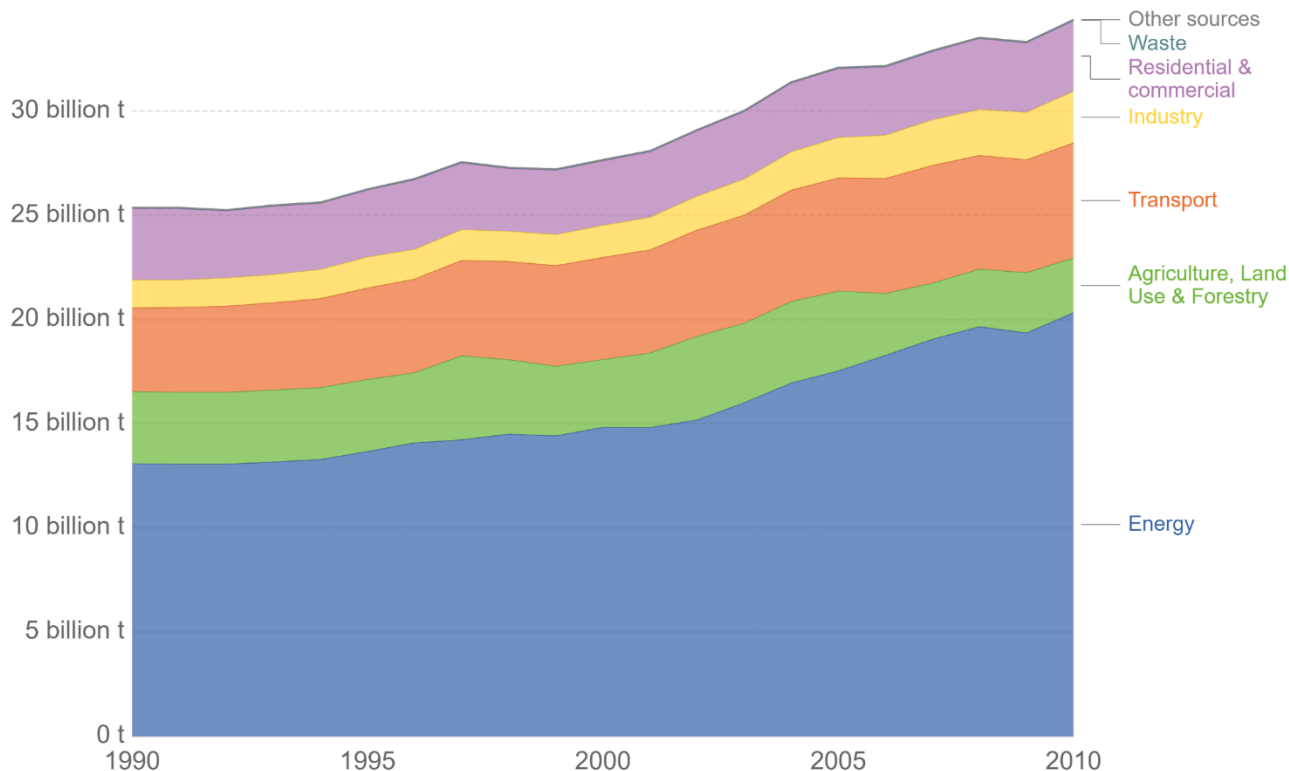
Carbon Dioxide Information Analysis Center <http://cdiac.ornl.gov/>

Raste emisija CO2

Carbon dioxide emissions by sector, World

Carbon dioxide (CO₂) emissions by sector, measured in tonnes per year.

Our World
in Data



Source: UN Food and Agricultural Organization (FAO)

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

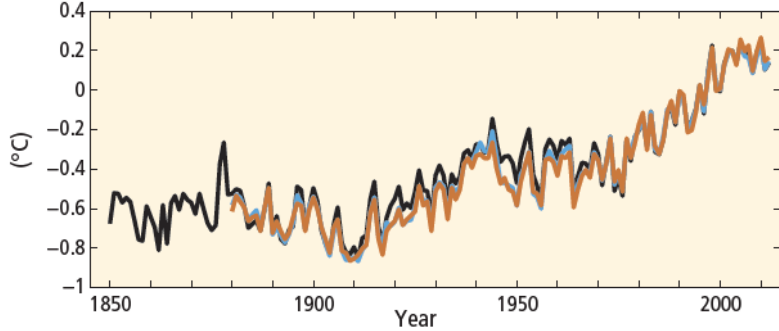
Izvor: Hannah Ritchie and Max Roser (2019) - "CO₂ and other Greenhouse Gas Emissions". Published online at OurWorldInData.org. Retrieved from: '<https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>' [Online Resource]

Carbon Dioxide Information Analysis Center <http://cdiac.ornl.gov/>

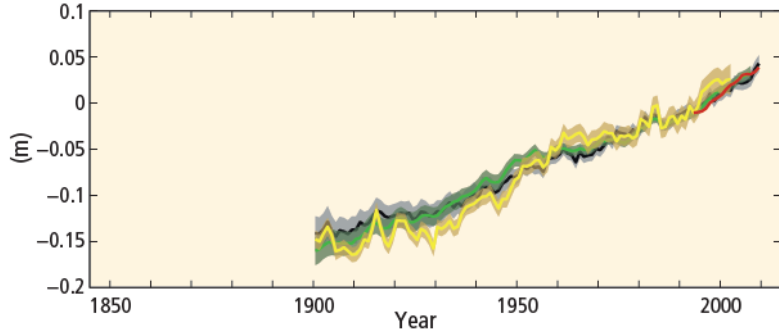
► Trenutno stanje: <http://www.worldometers.info/>

Raste temperatura

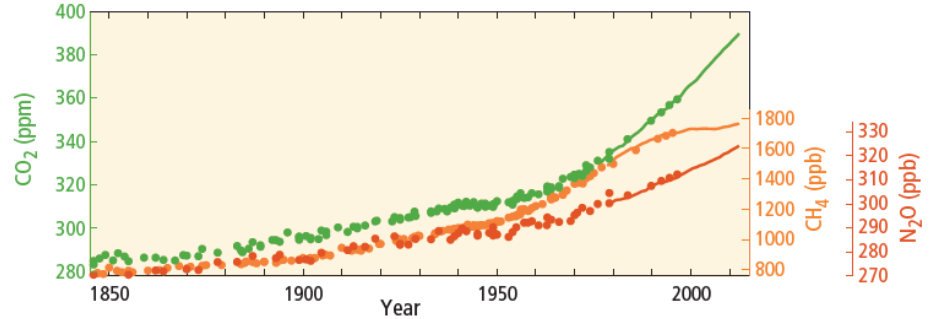
(a) Globally averaged combined land and ocean surface temperature anomaly



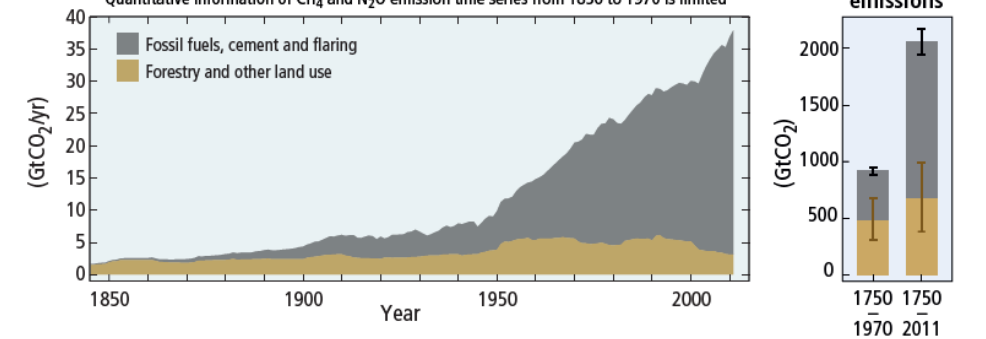
(b) Globally averaged sea level change



(c) Globally averaged greenhouse gas concentrations



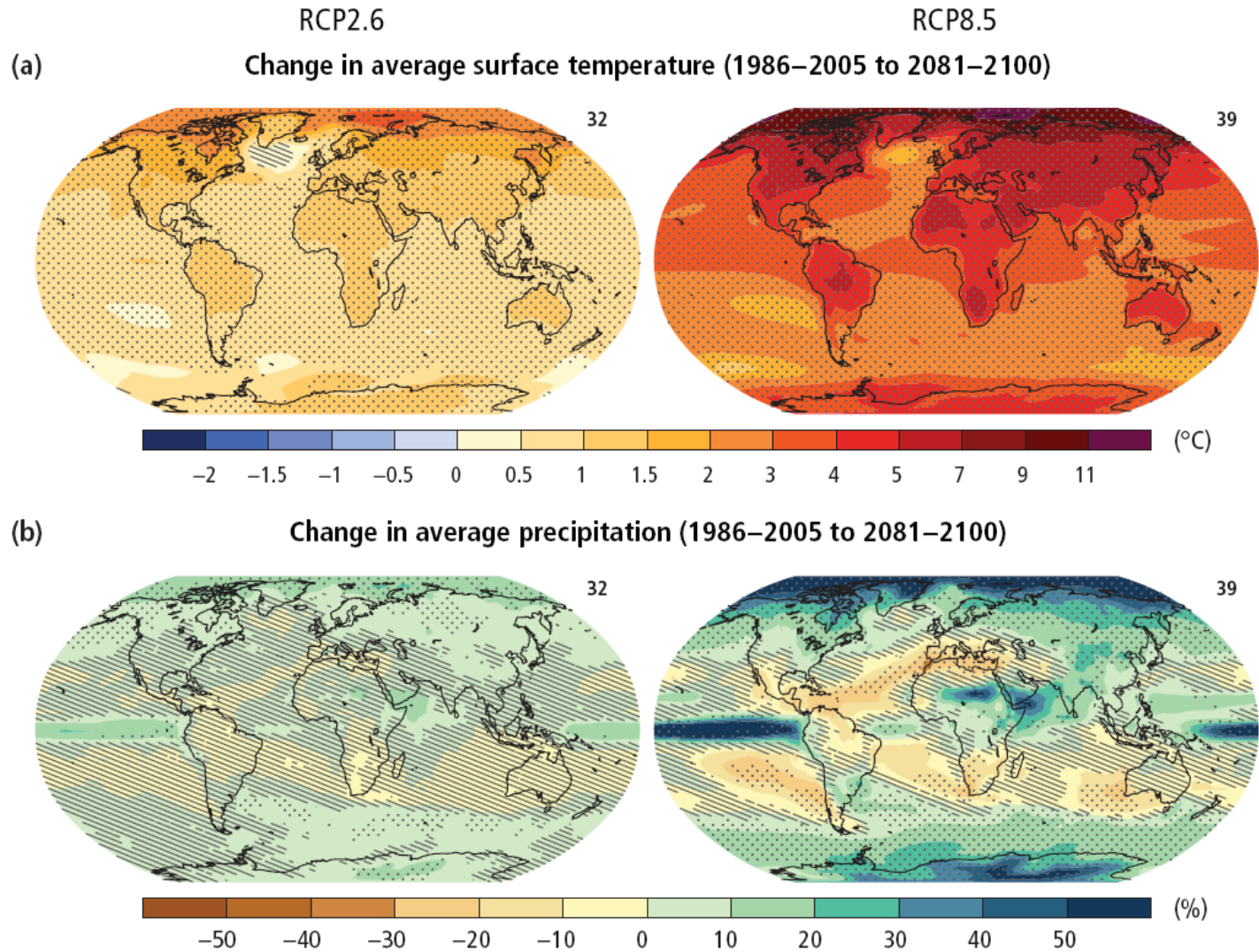
(d) Global anthropogenic CO₂ emissions



u proteklih 2 milijuna godina trebalo je oko 5000 g za porast temperature od 5°C, danas do istog porasta dolazi 20 x brže

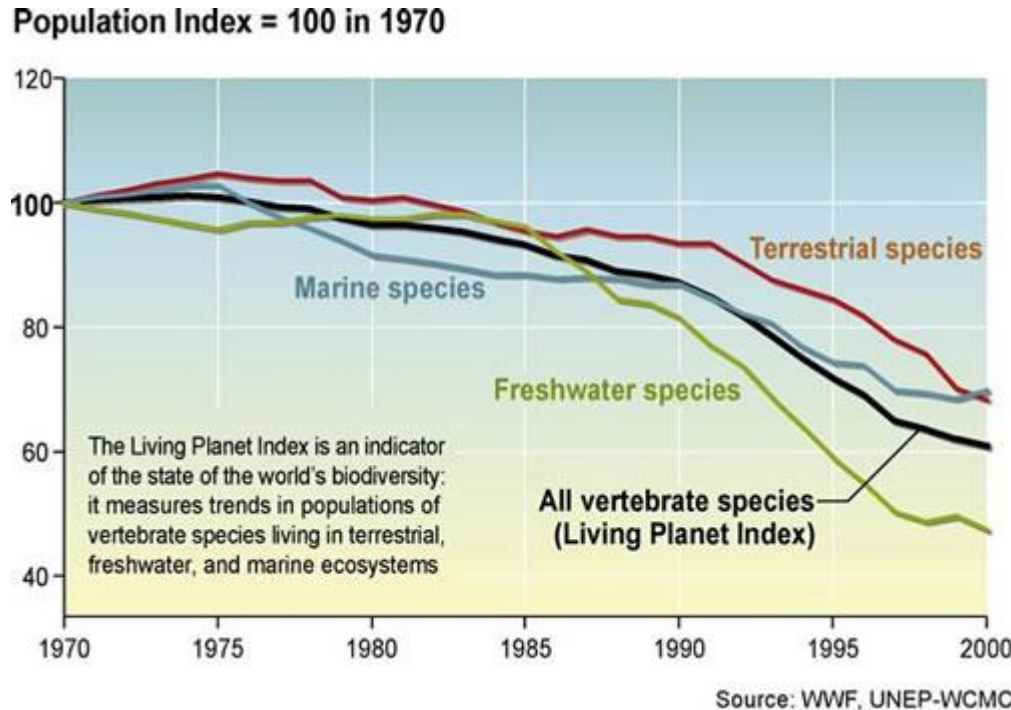
Izvor: IPCC Synthesis Report 2014 <http://www.ipcc.ch/report/ar5/syr/>; IPCC Nobel 2007. g

Populacija raste – raste temperatura



Izvor: IPCC Synthesis Report 2014 <http://www.ipcc.ch/report/ar5/syr/>

Opada bioraznolikost



IN FOCUS NEWS

Habitats such as coral reefs have been hit hard by pollution and climate change.

BIODIVERSITY

One million species face extinction

Landmark United Nations report finds that human activities threaten ecosystems around the world.

BY JEFF TOLLEFSON

Up to one million plant and animal species face extinction, many within decades, because of human activities, says the most comprehensive report yet on the state of global ecosystems.

The rate of species extinctions is already tens to hundreds of times higher than the average across the past ten million years. Without drastic action to conserve habitats, the extinction rate will only increase, says a United Nations-backed panel called the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

About 75% of land and 66% of ocean areas have been "significantly altered" by people, driven in large part by agriculture, according to a summary of the work, released on 6 May (see go.nature.com/2v4zbn9). The loss of species and habitats poses as much a danger to life on Earth as climate change does, the IPBES report says.

The analysis distills findings from nearly 15,000 studies and government reports, integrating information from the natural and social sciences. Indigenous peoples and traditional agricultural communities. The report is the first major international appraisal of biodiversity since 2005. Representatives of 132 governments met last week in Paris to finalize and approve it.

"We have never had a single unified statement from the world's governments that unambiguously makes clear the crisis we are facing for life on Earth," says Thomas Brooks, chief scientist at the International Union for Conservation of Nature in Gland, Switzerland, who helped to edit the report. "That is really the absolutely key novelty that we see here."

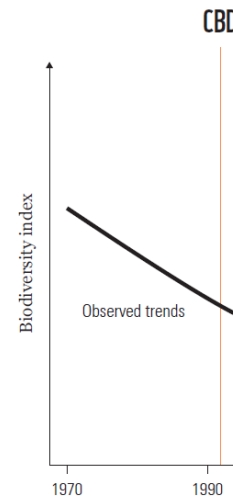
Without "transformative changes" to the world's economic, social and political systems to address this crisis, the IPBES panel projects that major biodiversity losses will continue to 2050 and beyond.

The analysis, which will be released in full later this year, also inextricably links biodiversity loss and climate change. An estimated 5% of all species would be threatened with extinction by 2°C of warming above pre-industrial levels — a threshold that the world could breach in the next few decades, unless greenhouse-gas emissions are drastically reduced.

The biodiversity crisis should be at the top of the global agenda alongside climate, said Anne Larigauderie, IPBES executive secretary, at a 6 May press conference in Paris. "We can no longer say that we did not know," she said.

Brooks says that the IPBES report will help to set the agenda when governments negotiate conservation goals for the next decade at the UN Convention on Biodiversity next year. ■

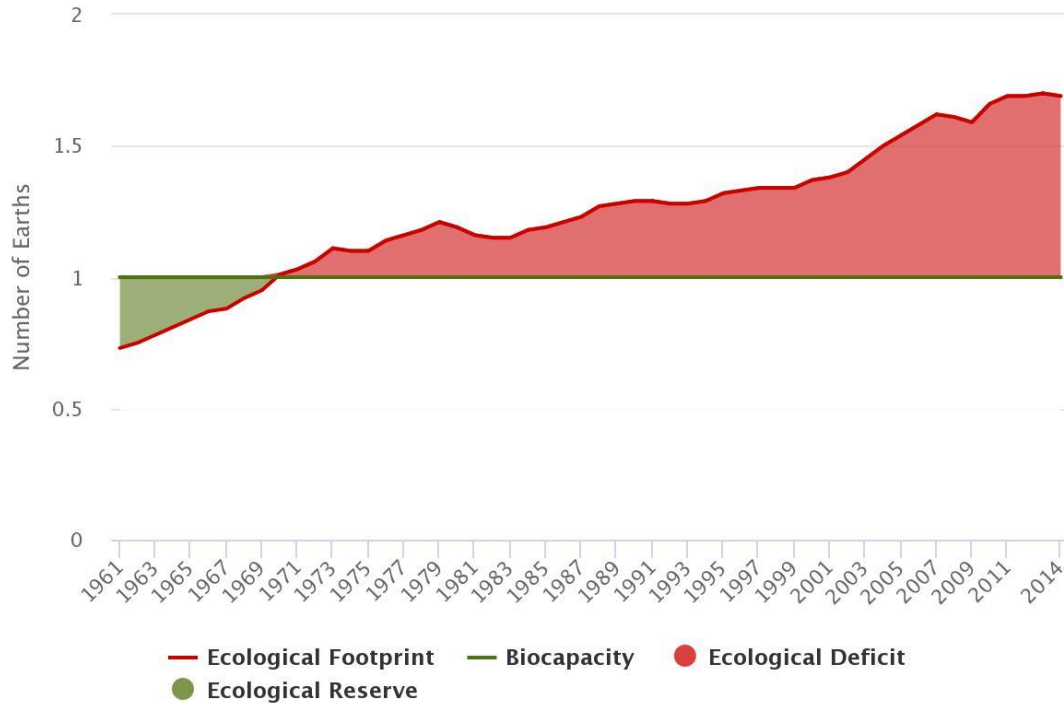
© 2019 Springer Nature Limited. All rights reserved. 9 MAY 2019 | VOL 369 | NATURE | 171



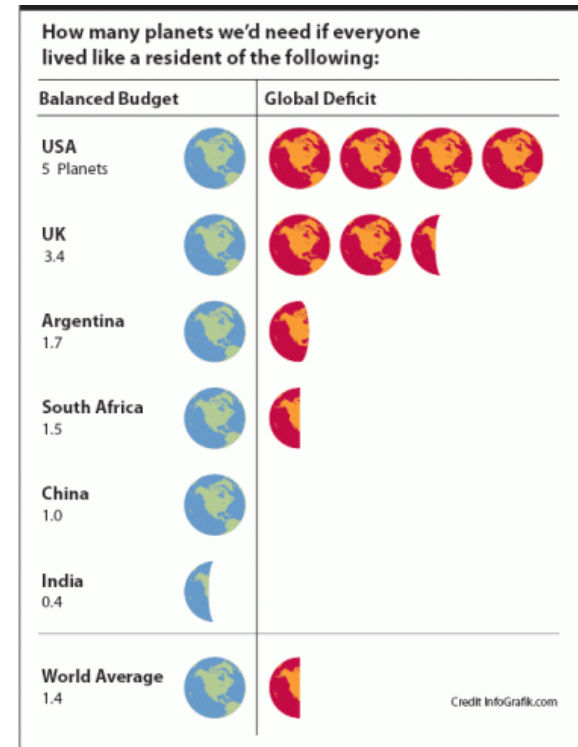
6 masovno izumiranje je u tijeku, 1000 x brže od uobičajene rate nestanka vrsta

Izvor: Center for Biological Diversity http://www.biologicaldiversity.org/programs/biodiversity/elements_of_biodiversity/extinction_crisis/, Living Planet Index by CBD <http://www.livingplanetindex.org/home/index>; vrlo obimna literatura

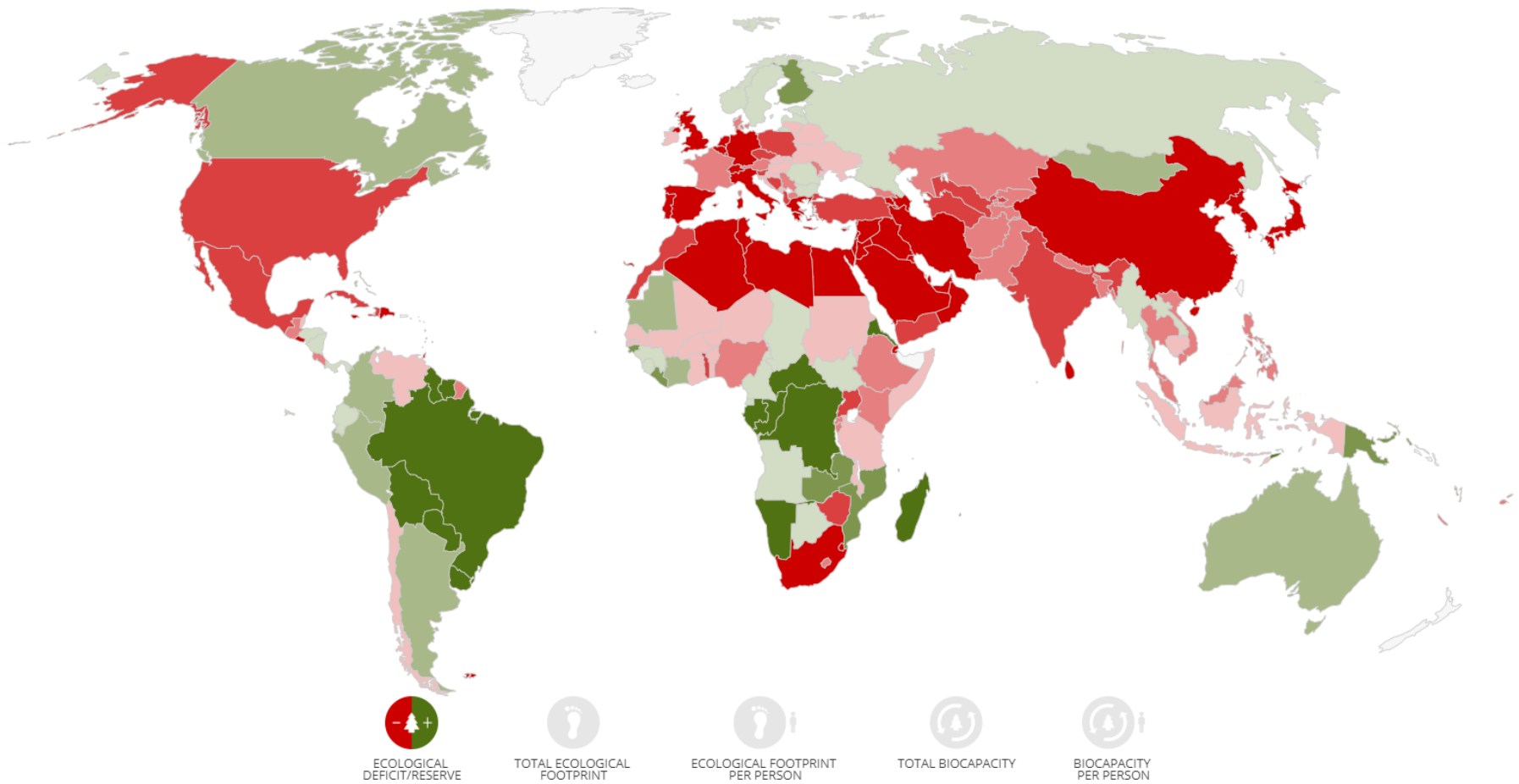
World



Global Footprint Network, 2018 National Footprint Accounts



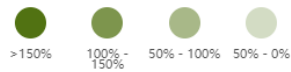
Izvor: Global Footprint Network <http://www.footprintnetwork.org/>



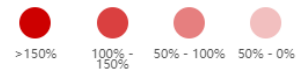
ECOLOGICAL DEFICIT/RESERVE

An ecological deficit occurs when the [Ecological Footprint](#) of a population exceeds the [biocapacity](#) of the area available to that population. A national ecological deficit means that the nation is importing biocapacity through trade, liquidating national ecological assets or emitting carbon dioxide waste into the atmosphere. An ecological reserve exists when the biocapacity of a region exceeds its population's Ecological Footprint.

BIOCAPACITY CREDITORS
BIOCAPACITY GREATER THAN FOOTPRINT



BIOCAPACITY DEBTORS
FOOTPRINT GREATER THAN BIOCAPACITY



Izvor: Global Footprint Network <http://www.footprintnetwork.org/>

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Archive > Volume 550 > Issue 7675 > Outlook > Article

NATURE | OUTLOOK

Sea change


Sarah DeWeerd

Nature 550, S54–S58 (12 October 2017) | doi:10.1038/550S54a
Published online 11 October 2017

PDF Citation Rights & permissions Article metrics

The increasing acidity of our seas is a threat to marine life that for many species may be impossible to overcome.

Subject terms: Climate-change impacts · Marine biology · Marine chemistry



Editors' pick

Image credit: Neil Brand/vivid

How the Syrian conflict is forcing a new approach to data

Science jobs

natureevents directory

18 September 2013

Asia Pacific Vascular Biology Organization Conference
17 November 2017 – 20 November 2017
Pearl River New City, Tianhe District, Guangzhou, China

Biopharma Innovation Cup 2018
16 July 2018 – 24 July 2018
Frankfurt, Germany

The 1st AsiaEvo Conference
18 April 2018 – 20 April 2018
Dameisha, Yankui Road, Yantian District, Shenzhen, China

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Archive > Volume 501 > Issue 7467 > News Feature > Article

NATURE | NEWS FEATURE


Climate science: Rising tide

Researchers struggle to project how fast, how high and how far the oceans will rise.

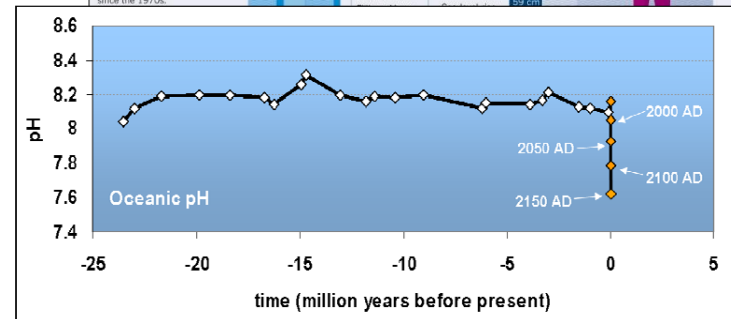
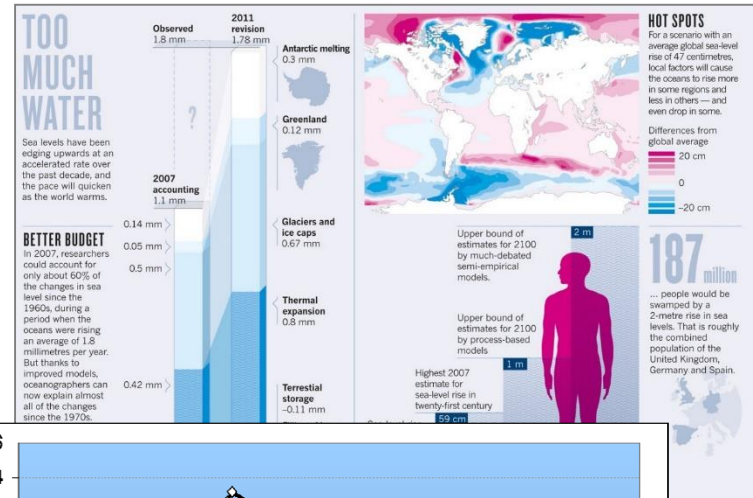
Nicola Jones

18 September 2013

The undead



To stay young, kill zombie cells

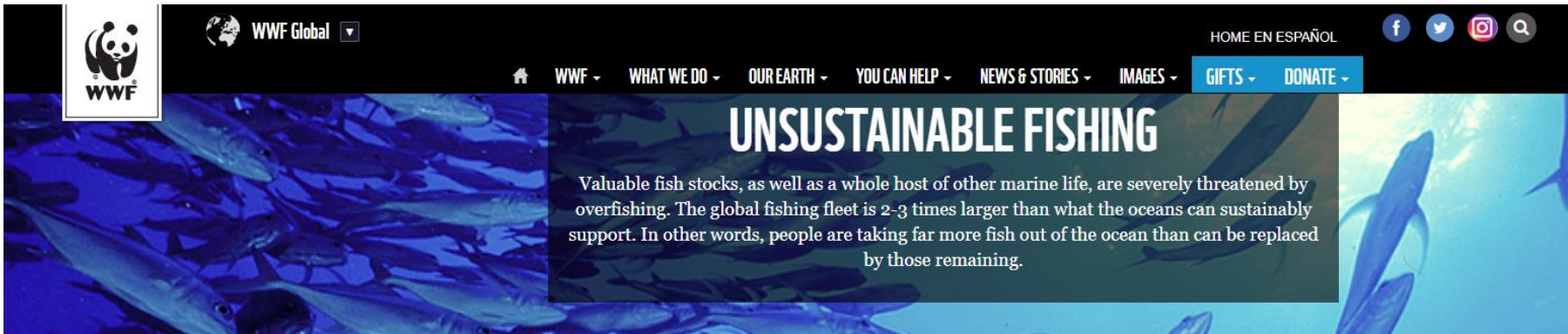


Razina mora porasla je 10 – 20 cm od 1900. g. Većina ledenjaka koji nisu smješteni neposredno na polovima se smanjuju, a obim i debljina arktičkog ledenog pokriva se smanjuje tijekom ljeta sve više.

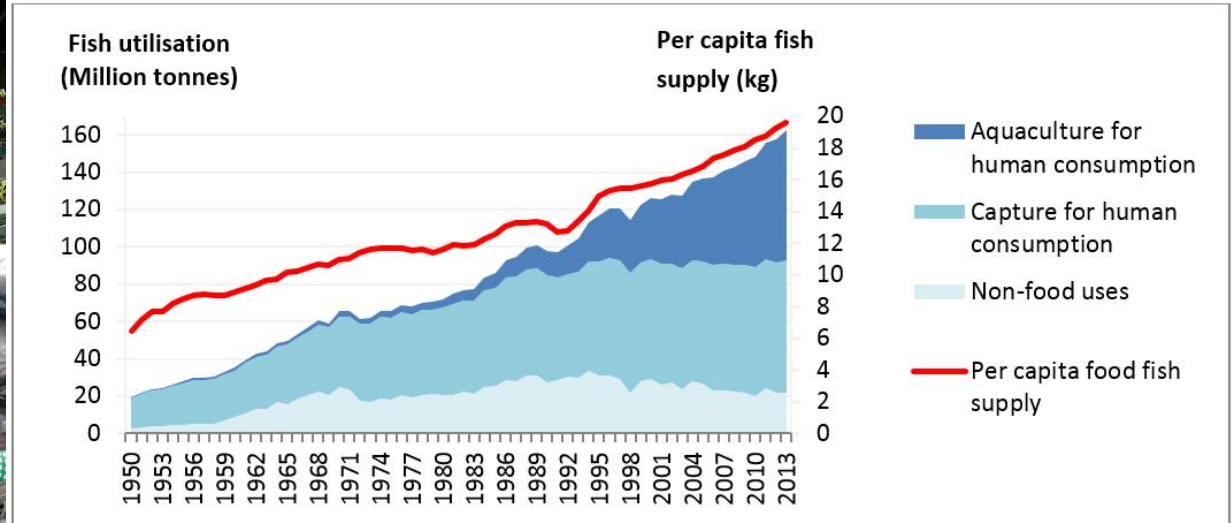
„about 40% of anthropogenic CO₂ has been absorbed by the seas ...”

s pH 8,2 → 7,7 do 2100. g.

Izvor: www.iucn.org



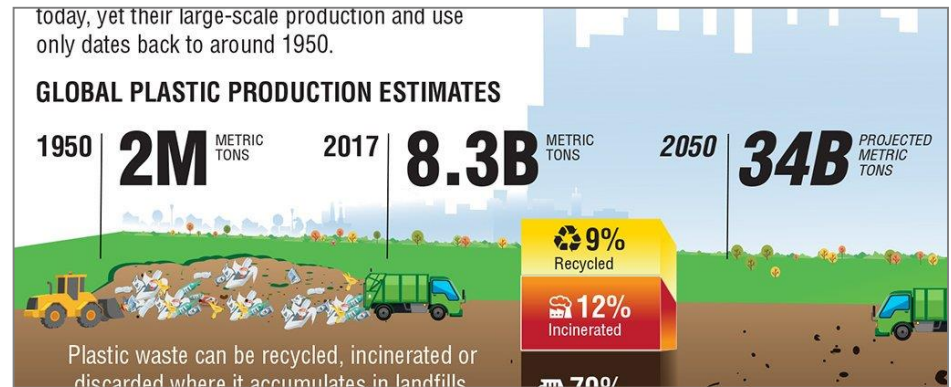
53% of the world's fisheries are fully exploited, and 32% are overexploited, depleted, or recovering from depletion*



FAO je procijenio da je 75% svjetskog ribarstva iznad razine prirodne obnovljivosti ribljeg fonda

ltd., itd, npr.:

- 6-12% manjeg prinosa glavnih žitarica do 2050. s 2°C porasta temperature (Nature)
- 2017. > 8 mil. t/god plastičnog otpada (razgradnja 500 - 1000 g)
- od 1998. g. više od 45 % stanovništva živi s ≤ 2\$ dnevno - istovremeno 20% najbogatijeg dijela ljudske populacije uživa u 85% globalnog BDP-a. Razlike između najbogatijih i najsiromašnijih su sve veće.
- 54% populacije živi u gradovima s trendom porasta na 60% do 2030.
- socijalne, ekonomske, političke i dr. promjene
- migracije stanovništva
- neočekivani događaji
- ltd.



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SMARTNEWS *Keeping you current*

Climate Change Is Already Causing Mass Human Migration

When temperatures are high, Pakistani men are 11 times more likely to move out of town

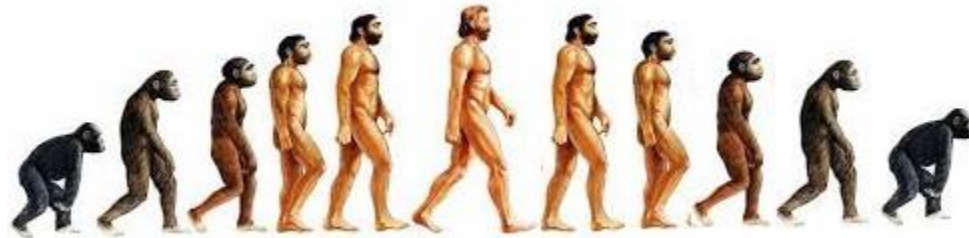
PHOTO OF THE DAY

Playing in the Alley
PHOTO OF THE DAY»

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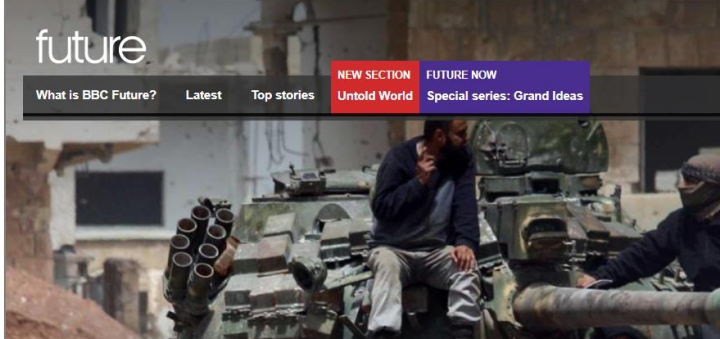
Kuda to ide *Homo sapiens*?



Mjere opstanka

međunarodne konvencije (Rio, Bern, Ramsar, Kyoto, Pariz i mnoge druge)
redukcija emisija plinova
zaštićena područja
smanjenje onečišćenja (geografski lokalizirano)
smanjenje potrošnje energije
postupna tranzicija na obnovljive izvore energije
recikliranje otpada
bolje zbrinjavanje otpada
energetski učinkovitiji postupci
uštede u potrošnji energije
certificirana roba (npr. FSC - Forest Stewardship Council)
smanjenje upotrebe pesticida
obrazovanje
senzibilizacija i medijska pokrivenost
novi časopisi, preusmjeravanje znanstvenih napora
ekonomske preinake (npr. “zeleni krediti”)
ekološka makroekonomija
itd.

Da li je to dovoljno? Da li je dovoljno brzo i efikasno?



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March 26, 2017

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UK world sport football opinion culture business lifestyle fashion environment tech travel

home > environment > climate change > wildlife energy pollution

Carbon footprints

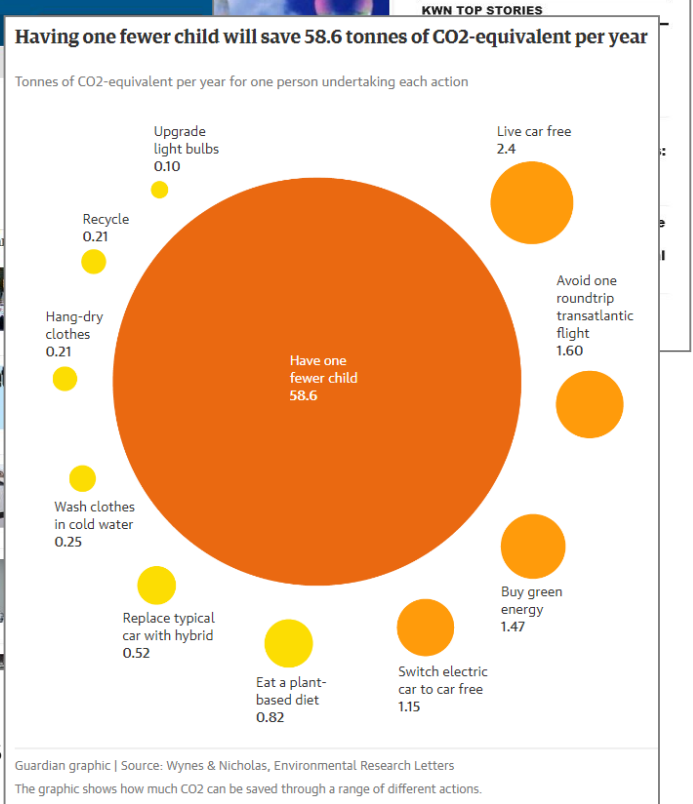
Want to fight climate change? Have fewer children

Next best actions are selling your car, avoiding flights and going vegetarian, according to study into true impacts of different green lifestyle choices

91,833 1,406
Damian Carrington
Environment editor
@dpcarrington
Wednesday 12 July 2017 05:45 BST

Can you bring yourself to have one fewer of these? Photograph: fstop Images GmbH/Alamy

The greatest impact individuals can have in fighting climate change is to have one fewer child, according to a new study that identifies the most effective ways people can cut their carbon emissions.



Nikolić T., Apr-2019.

Kuda to ide Homo sapiens

This is the most dangerous time for our planet

Stephen Hawking

We can't go on ignoring inequality, because we have the means to destroy our world but not to escape it



Most popular

New York attack: five Argentinian friends named among eight killed - latest

Regrets

What is your biggest regret? Here are people's devastatingly honest answers

Environment

Earth insight

Nasa-funded study: industrial civilisation headed for 'irreversible collapse'?

Natural and social scientists develop new model of how 'perfect storm' of crises could unravel global system

227,611 1,673

Nafeez Ahmed

Friday 14 March 2014 18.28 GMT



This Nasa Earth Observatory image shows a storm system circling around an area of extreme low pressure in 2010, which many scientists attribute to climate change. Photograph: AFP/Getty Images

A new study partly-sponsored by Nasa's Goddard Space Flight Center has highlighted the prospect that global industrial civilisation could collapse in coming decades due to unsustainable resource exploitation and increasingly unequal wealth distribution.

Noting that warnings of 'collapse' are often seen to be fringe or controversial, the study attempts to make sense of compelling historical data showing that "the

Most popular

New York attack: five Argentinian friends named among eight killed - latest

Regrets

What is your biggest regret? Here are people's devastatingly honest answers

It's a cliché: Trump scraps visit to North Korean border

Sayfallo Saipov named as suspect in New York truck attack killings

Mourinho defends Lukaku penalty snub in Manchester United's win over Benfica

DOOMSDAY

Stephen Hawking wants humanity to leave Earth as soon as possible

By Mike Wehner • Published June 22, 2017 • BGR



File photo: April 9, 2013. British cosmologist Stephen Hawking, who has motor neuron disease, gives "History of Mankind" to workers at Cedars-Sinai Medical Center in Los Angeles. (AP Photo/Cedars-Sinai, Photo/Cedars-Sinai, Eric Reed)

Renowned astrophysicist Stephen Hawking has been extremely recent months about his feelings that humanity needs to get off Earth as soon as possible. With a troubled climate, ever growing population mounting risks of apocalypse at our own hands, Hawking has stated that we'll need a new place to live as soon as 100 years.

Humanity has 100 years to colonize other planets or die out: Stephen Hawking

By Rahul Kavvappa

National Online Journalism Global News

Comments 10 Facebook 2.4k Twitter Email Print



File photo of Stephen Hawking on Aug. 29, 2012. AP Photo/Matt Durham, FILE

Physicist Stephen Hawking has issued a dire ultimatum to humankind: start inhabiting extraterrestrial lands in the next century, or prepare to face extinction.

Video proizveden od strane Joint Special Operations University (JSOU, SAD) koje vodi U.S. Special Operations Command, a u sklopu predavanja “The Emerging Terrorism Threat.” Nije namjenjen javnosti, procurio je iz Pentagona 2014-te! Megagradovi do 2030. sa 60% ukupnog stanovništva planete i 70% svjetskog BDP-a - kako s time na kraj?

<https://arstechnica.com/tech-policy/2016/10/bizarre-leaked-pentagon-video-is-a-science-fiction-story-about-the-future-of-cities/>



Footage: Pentagon video

Here Comes The Sun – There Goes The Ice, spelled out in semaphore by artist Chris Wainwright, using the Arctic dusk as his canvas.

THE FUTURE IN PRACTICE
THE STATE OF SUSTAINABILITY LEADERSHIP 2012



2052: A global
for the next fo

Professor Jorgen Randers



Glavni pokretači
negativnih
trendova,
prepreke:

1. Kapitalizam
2. Politika
3. Nacionalizam
4. Demokracija

What should be done? - Ideally

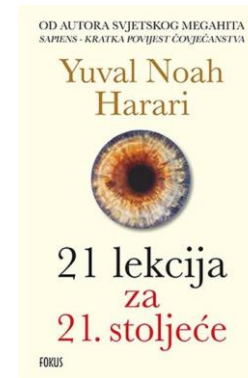
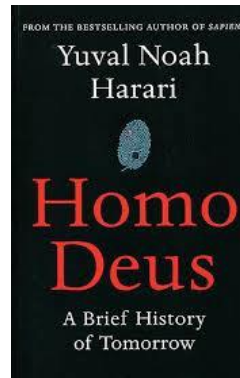
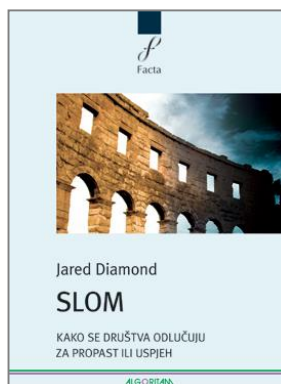
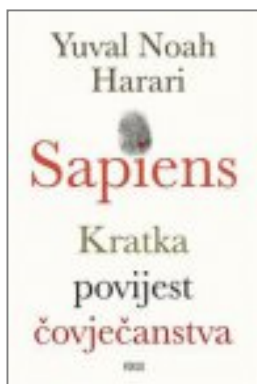
1. Further slow population growth
Introduce 1-child policy – first in rich world
2. Cut CO2 emissions – first in the rich world
Ban the use of coal, oil and gas from 2024
3. Reduce poverty in the poor world
Give them a climate-friendly energy system
4. Reduce the ecological footprint of the rich world
Legislate compulsory vacation
5. Temper national short termism
Establish supra-national institutions
6. Reduce the focus on income growth
Establish “increase in well-being” as a new goal

BI NORWEGIAN BUSINESS SCHOOL

J Randers 19

Povjesno-antropološki aspekti:

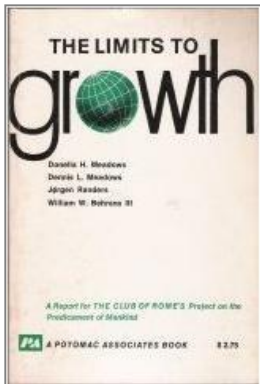
1. **Diamond J. (2007):** Sva naša oružja (zarazne bolesti, čelik i puške). Agoritam, Zagreb, 508. (pogledajte <https://www.youtube.com/watch?v=rP8vkG3dmQ>)
2. **Diamond J. (2007):** Slom (Kako se društva odlučuju za propast ili uspjeh). Agoritam, Zagreb, 648. (pogledajte <https://www.youtube.com/watch?v=IESYMFtLlis>)
3. **Harari Y. N. (2015):** Sapiens - Kratka povijest čovječanstva. Fokus komunikacije, Zagreb, 480. (pogledajte <https://www.youtube.com/watch?v=UTchioiHM0U>)
4. **Harari Y. N. (2017):** *Homo deus* – kratka povijest sutrašnjice. Fokus, Zagreb. (pogledajte <https://www.youtube.com/watch?v=4ChHc5jhZxs>)
5. **Harari Y. N. (2019):** *21 lekcija za 21. stoljeće*. Fokus, Zagreb. (pogledajte https://www.youtube.com/watch?v=Bw9P_ZXWDJU)



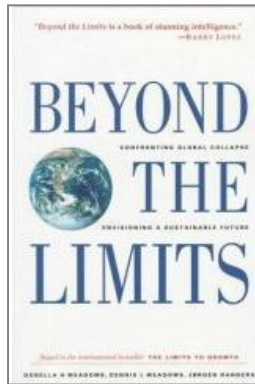
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1. **Carson R. (1962):** Silent Spring. Crest Book, Greenwich, 155.
2. **Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972):** The limits to growth. New York, 102.
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4. **Meadows, D., Randers, J., Meadows, D. (2004):** Limits to growth: The 30-year update. Chelsea Green Publishing, 338.
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7. **Millennium Ecosystem Assessment (2005):** Living Beyond Our Means. Natural assets and human well-being. Statement from the Board. Island Press, Washington, DC, 28.

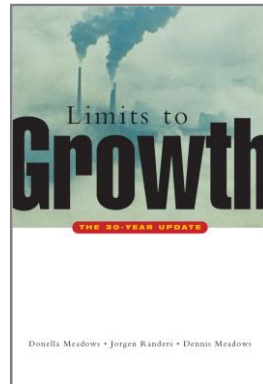
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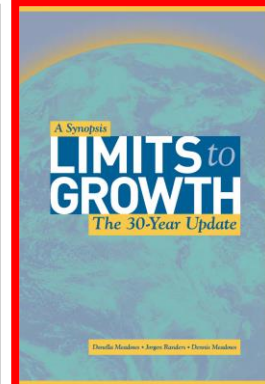
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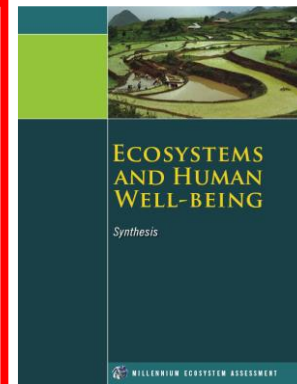
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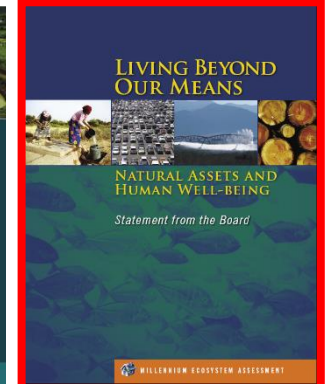
5



6



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2. **Krugman P. (2014):** Odmah okončajmo ovu krizu! Agoritam, Zagreb, 248. (pogledajte <https://www.youtube.com/watch?v=KrfRS07CAHc>) (Nobel 2008)
3. **Harvey D. (2014):** Kratka povijest neoliberalizma. VBZ, Zagreb, 256.

