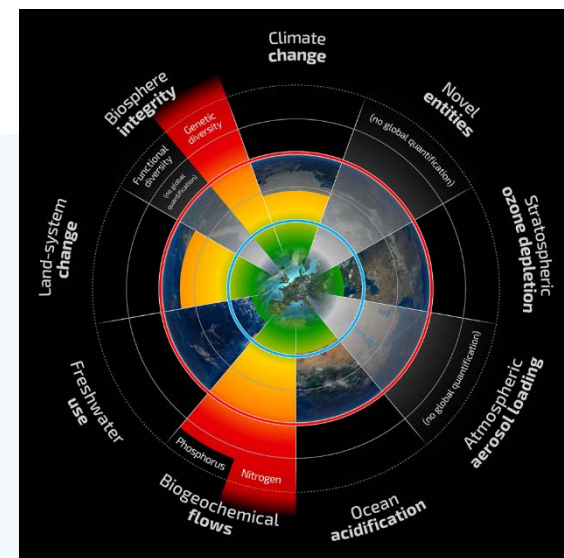


V a VI. Biogeochemické toky P a N

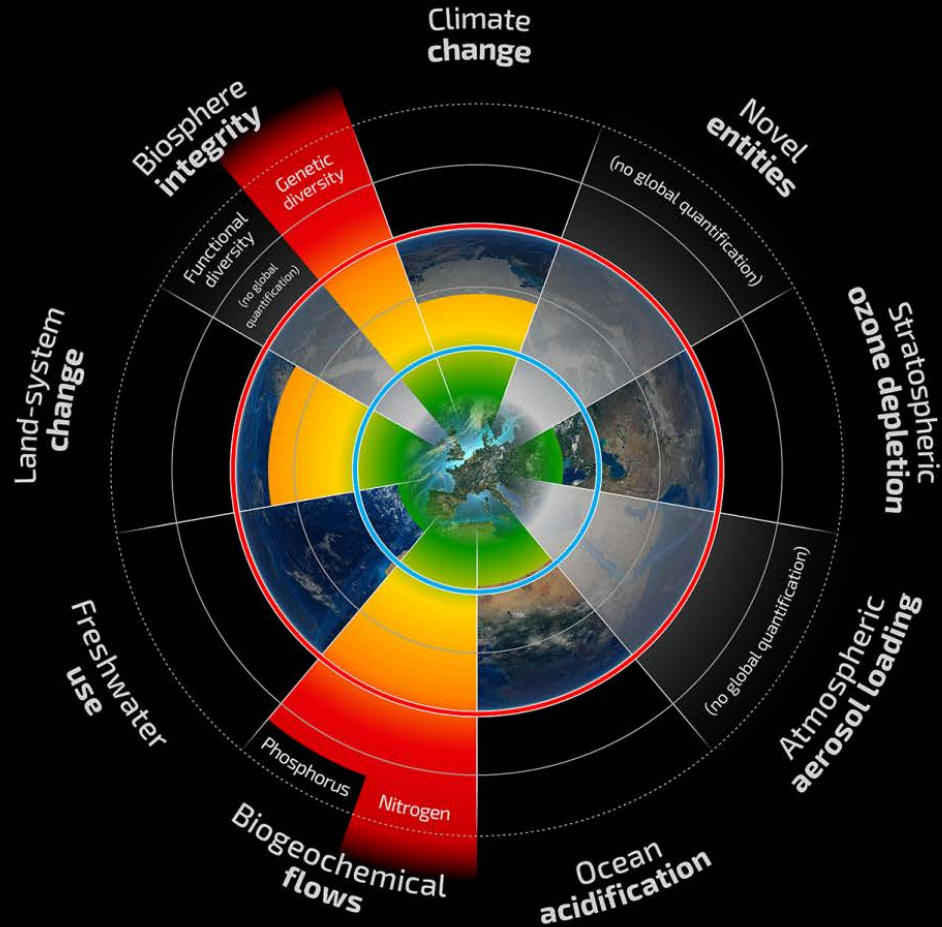
Earth-system process	Control variable(s)	Planetary boundary (zone of uncertainty)	Current value of control variable
Biogeochemical flows: (P and N cycles) (R2009: Biogeochemical flows: (interference with P and N cycles))	<i>P Global:</i> P flow from freshwater systems into the ocean	11 Tg P yr ⁻¹ (11–100 Tg P yr ⁻¹)	~22 Tg P yr ⁻¹
	<i>P Regional:</i> P flow from fertilizers to erodible soils	6.2 Tg yr ⁻¹ mined and applied to erodible (agricultural) soils (6.2-11.2 Tg yr ⁻¹). Boundary is a global average but regional distribution is critical for impacts.	~14 Tg P yr ⁻¹
	<i>N Global:</i> Industrial and intentional biological fixation of N	62 Tg N yr ⁻¹ (62–82 Tg N yr ⁻¹). Boundary acts as a global 'valve' limiting introduction of new reactive N to Earth System, but regional distribution of fertilizer N is critical for impacts.	~150 Tg N yr ⁻¹



Překročení hranic?

Planetary Boundaries

A safe operating space for humanity

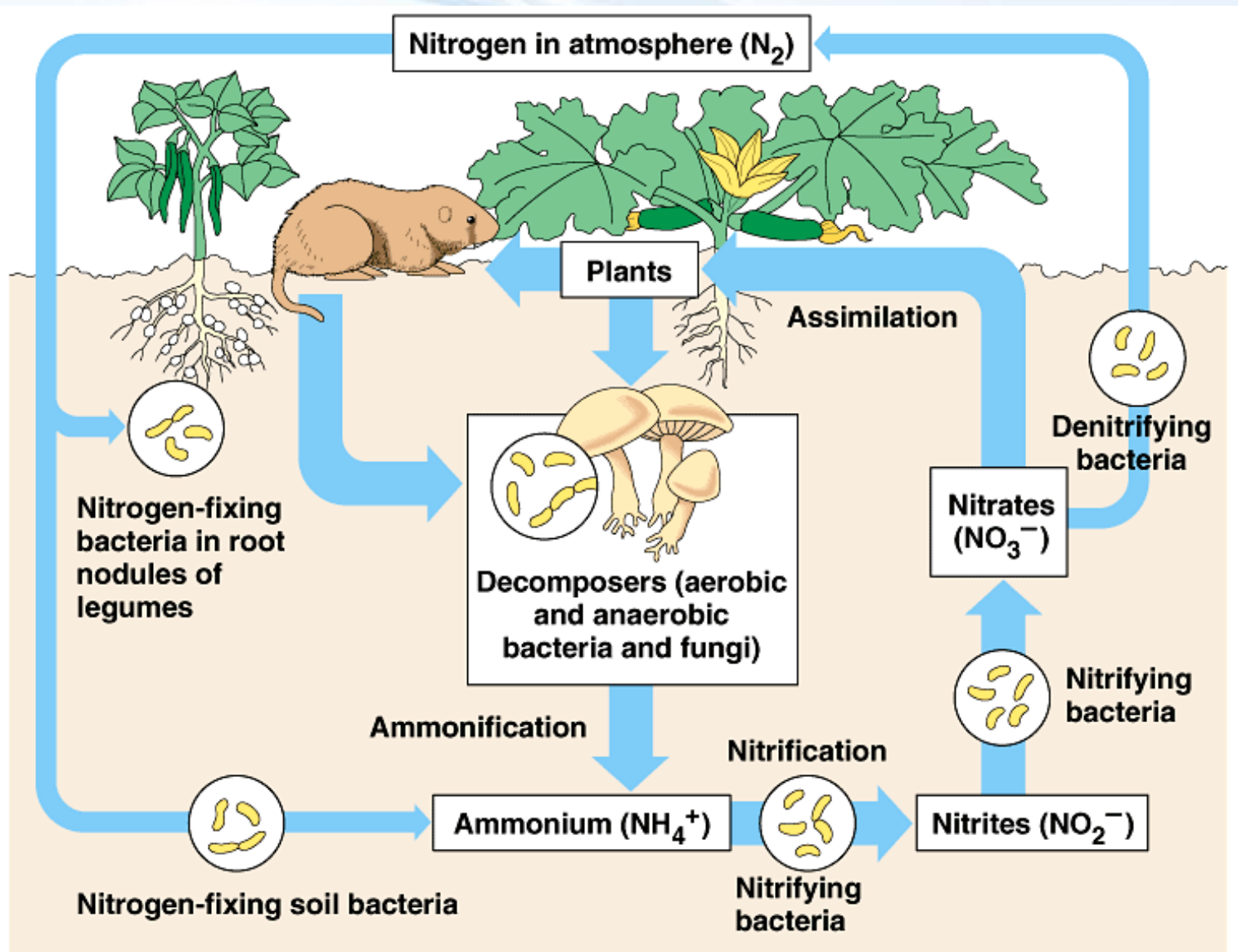


- Beyond zone of uncertainty (high risk)
- In zone of uncertainty (increasing risk)
- Below boundary (safe)
- Boundary not yet quantified



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Dusík



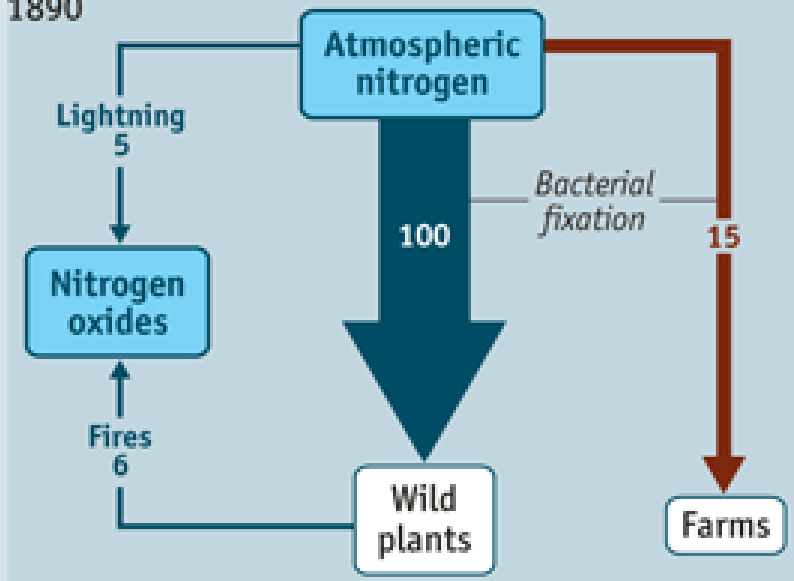
Dusík

- lidskou aktivitou je dnes přeměněno více N_2 na reaktivní formy N, než ve všech terestriálních procesech dohromady
- Haber-Bosch 80 Mt_N /yr, leguminózy 40 Mt_N /yr, spalování fosilních paliv 20 Mt_N /yr, spalování biomasy 10 Mt_N /yr

Unbalancing the cycle

Nitrogen flows, megatonnes

1890



Source: Galloway and Cowling, *Ambio*

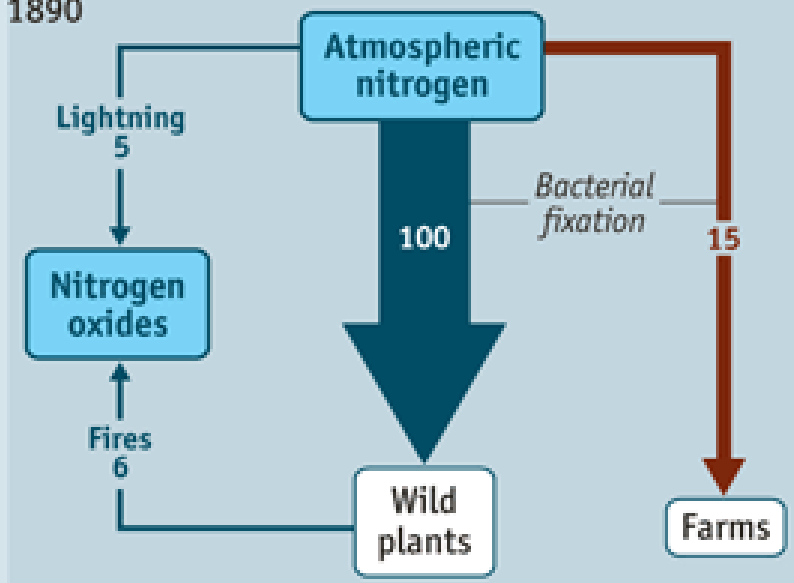
Dusík

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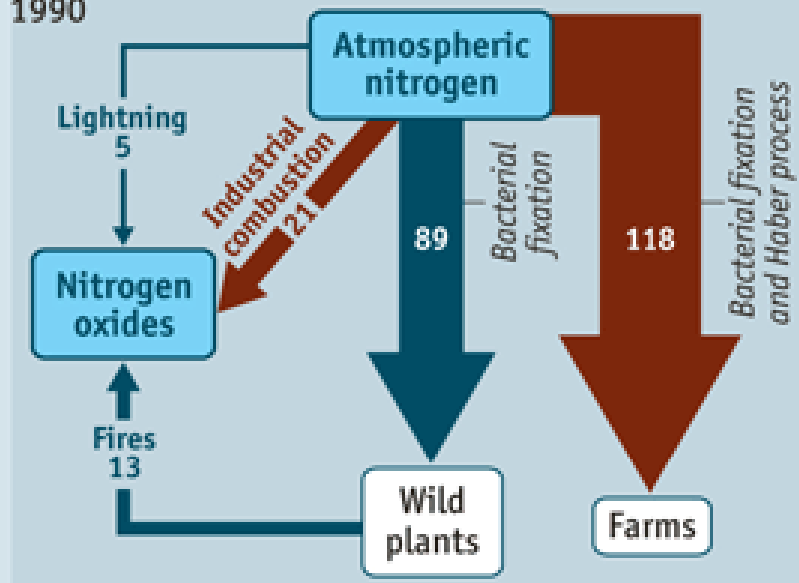
Unbalancing the cycle

Nitrogen flows, megatonnes

1890



1990



Source: Galloway and Cowling, *Ambio*

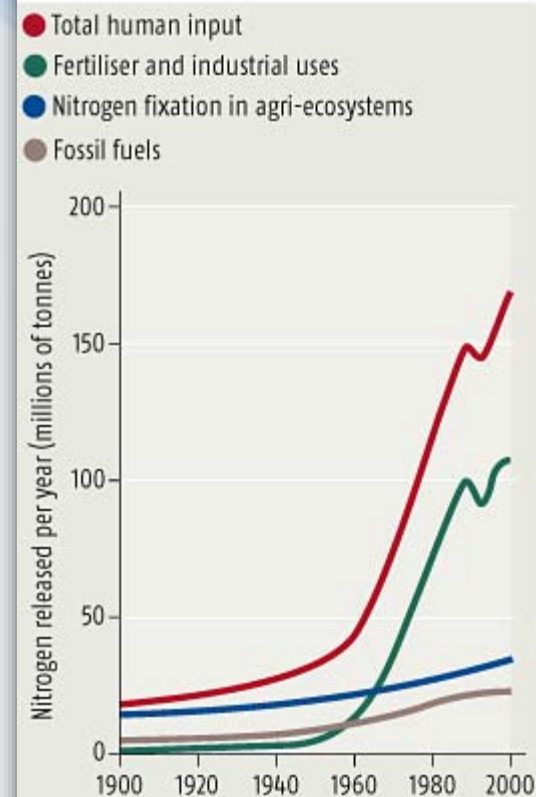
Dusík

- primární důvod výroby reaktivních forem N ?
- většina končí ve vodě - **eutrofizace**
- či v atmosféře - **N_2O je významný skleníkový plyn + O_3 „rozkladač“**
- nebezpečné je celkové snižování pružnosti planetárních subsystémů v důsledku vnášení velkého množství **reaktivního N** do Zemského systému (skleníkový jev + úbytek ozónu + hypoxie vod)

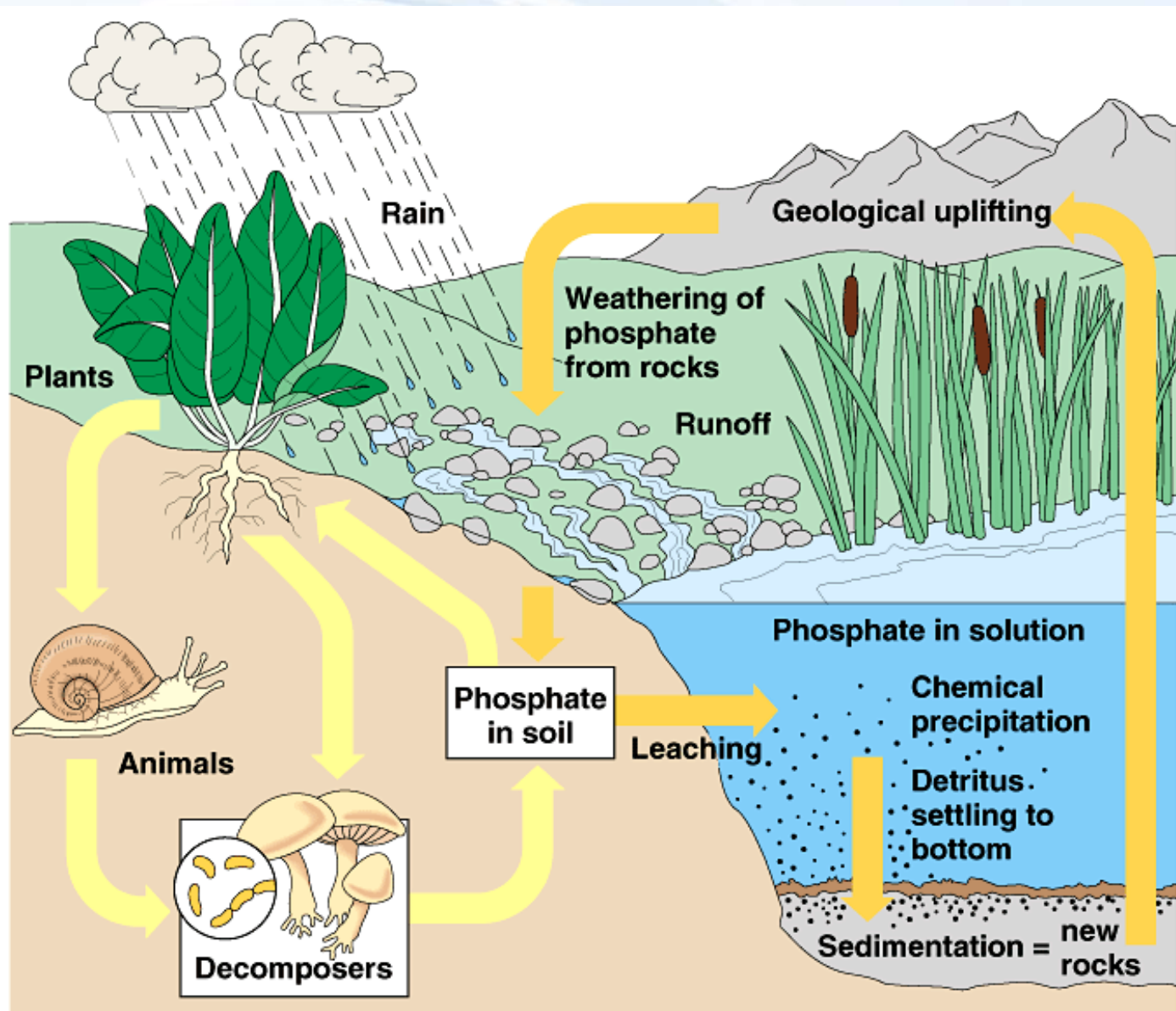


NITROGEN POLLUTION

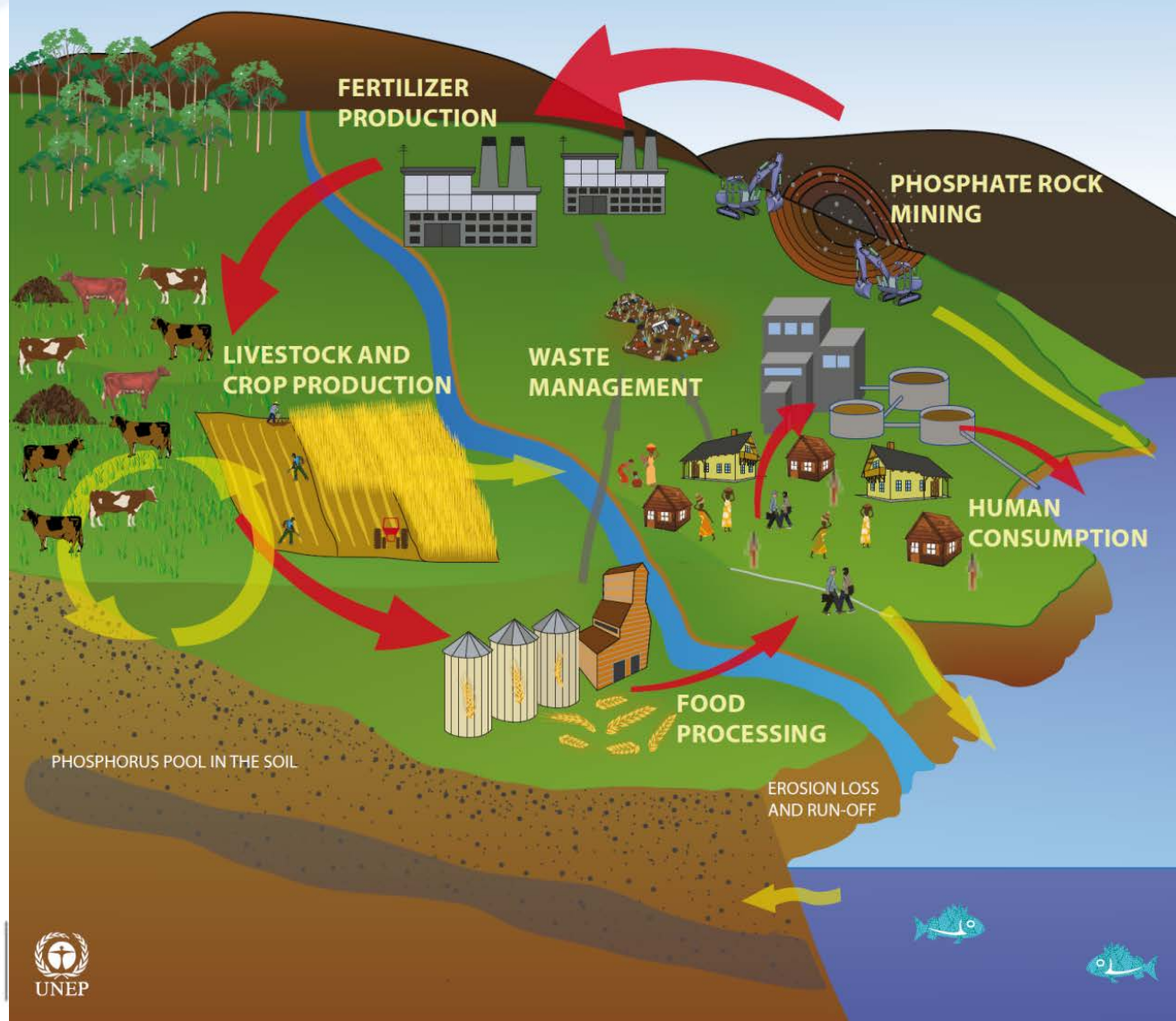
The amount of reactive nitrogen released into the environment is increasing



Fosfor – přirozený cyklus

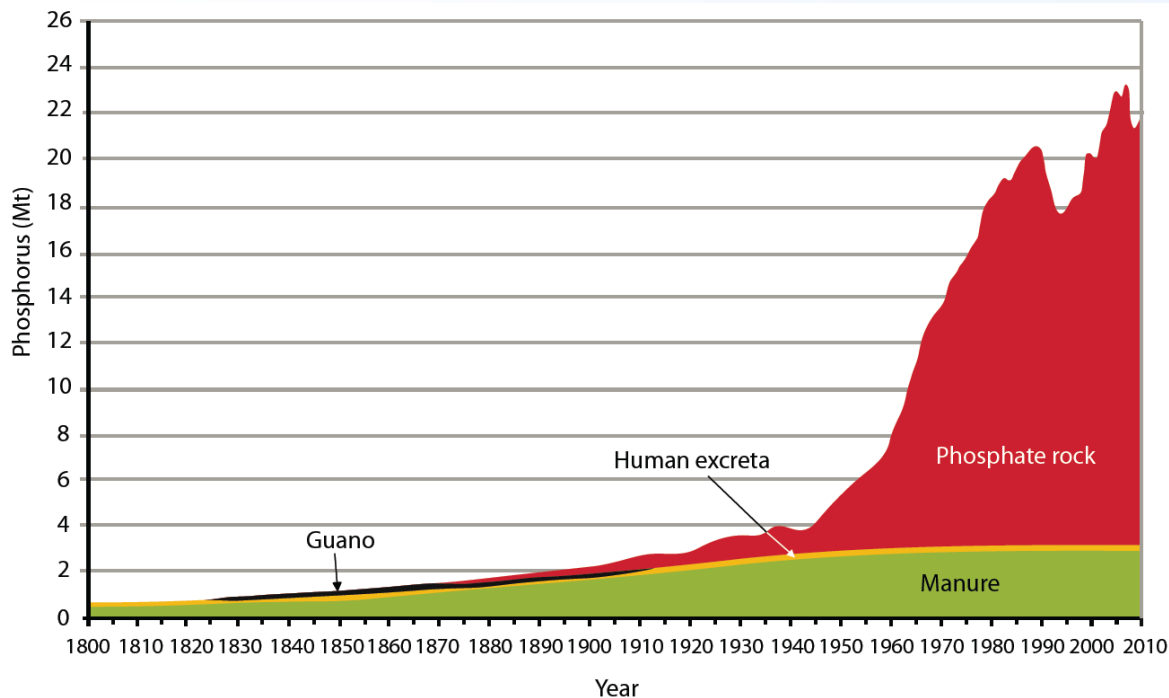


Fosfor – cyklus ovlivněný člověkem



Fosfor

- primární zdroj P v ekosystému – **zvětrávání** či **těžba apatitu**
- lidskou činností proudí do oceánů 8-9x větší množství P než přirozeně
- z 20 Mt_N/yr průmyslového fosforu skončí polovina v mořích
- přítok P do oceánů zvyšuje riziko **anoxických událostí**, práh nastání této události je ale zatím nejasný

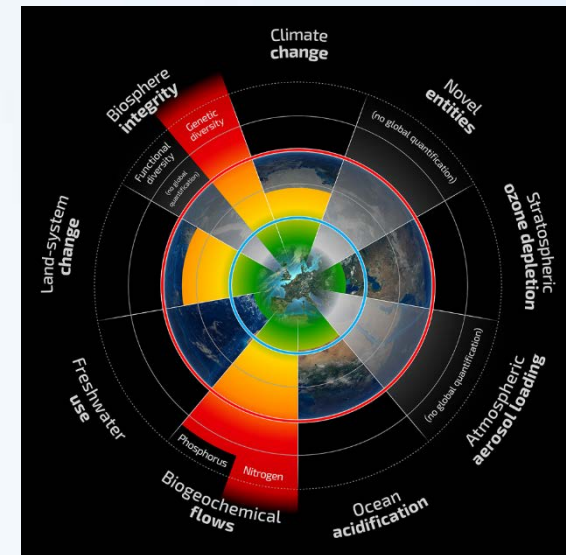


Dopady těžby guana na ostrůvku Nauru



Změny

- ovlivňování biogeochemických cyklů P a N s důsledky:
 - 1) na lokální až regionální úrovni **náhlé změny v jezerních a mořských ekosystémech** (např. anoxie v jezerech a Baltickém moři)
 - 2) nelineární změny z **oligotrofního stavu do eutrofního**

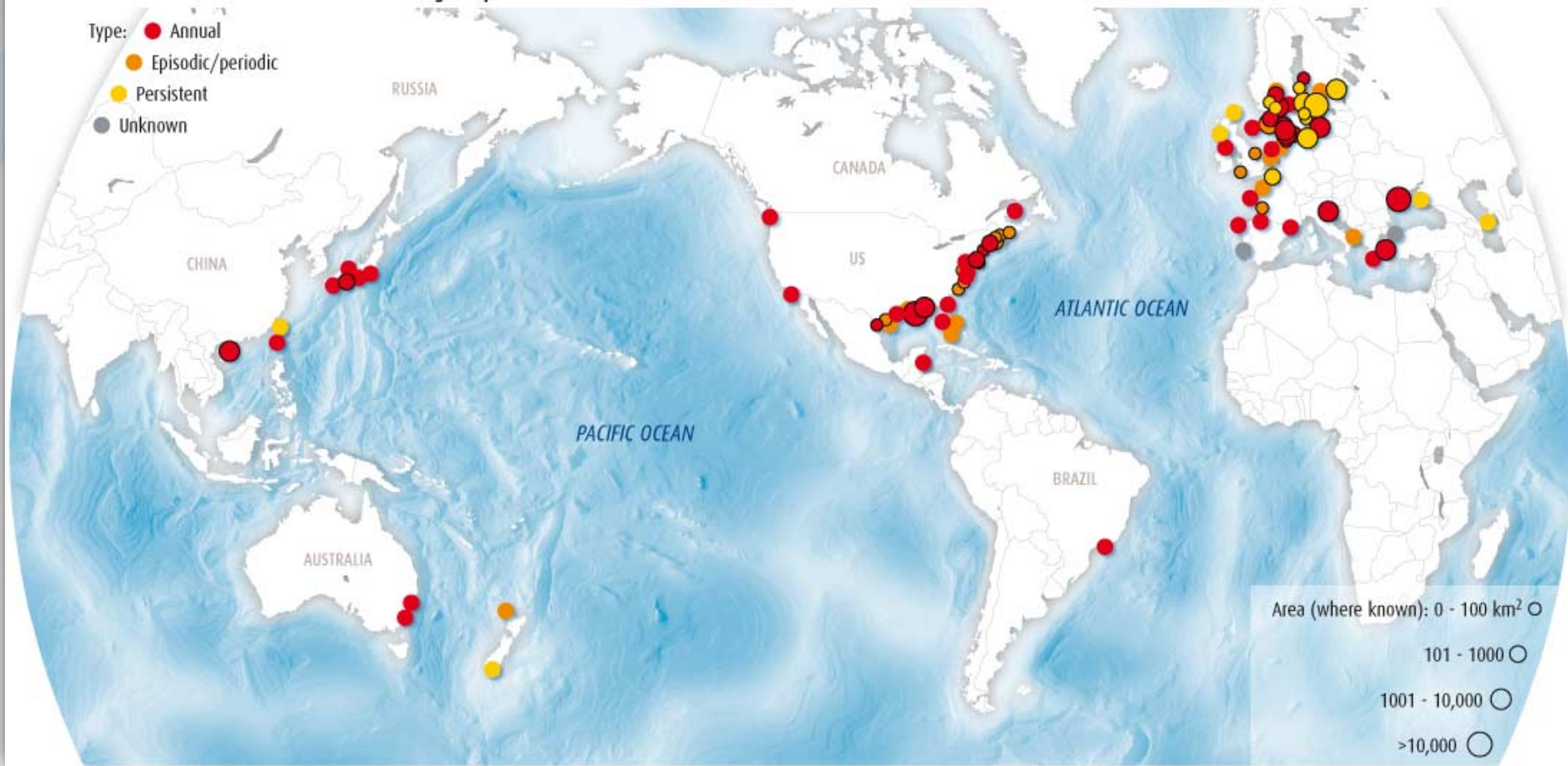


Fosfor + dusík = anoxické zóny v mořích

200 AND COUNTING

The number of dead zones around the world is doubling every decade

- Type:
- Annual
 - Episodic/periodic
 - Persistent
 - Unknown

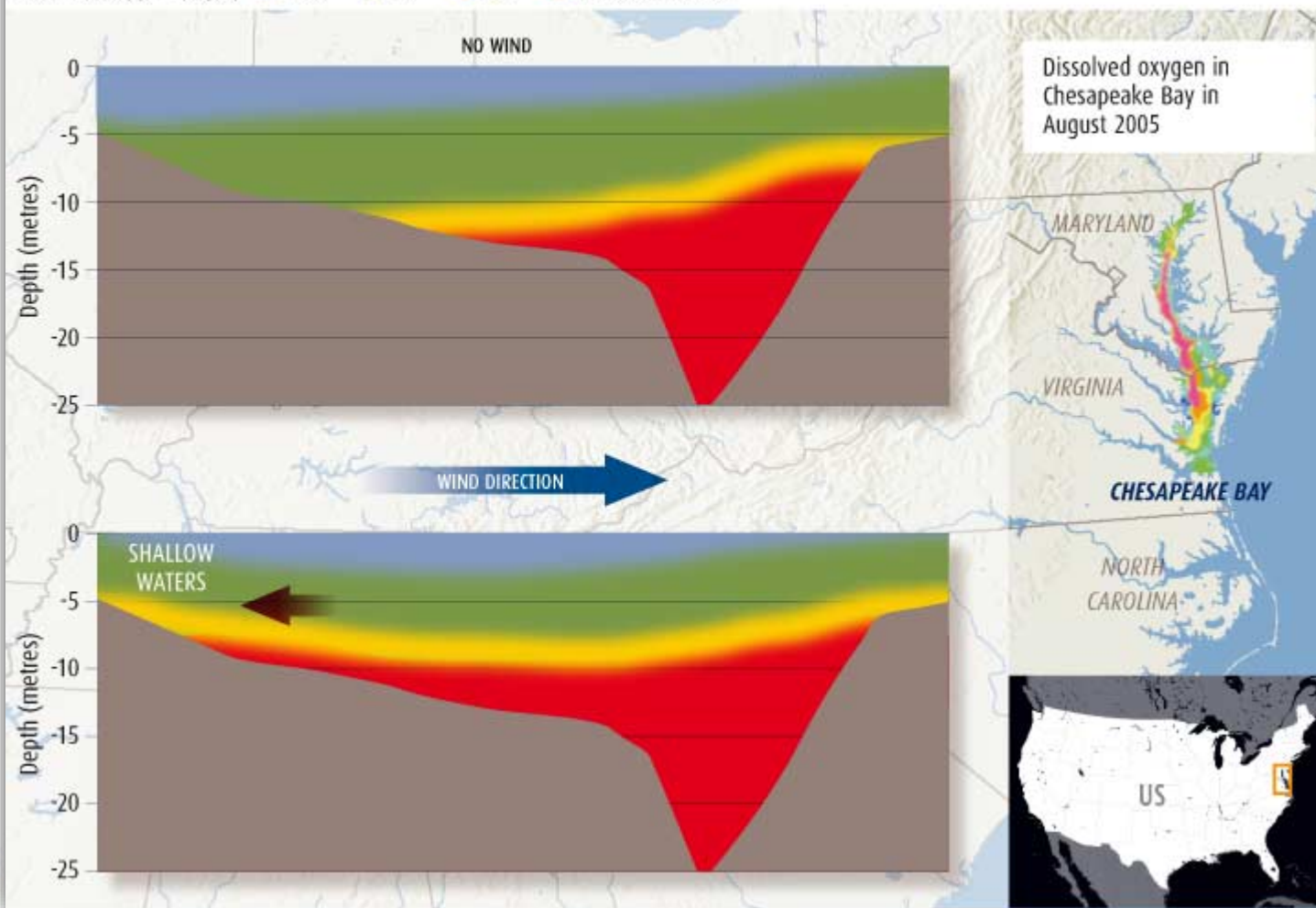


Fosfor + dusík = anoxické zóny v mořích

ANNUAL PLAGUE

Every summer, oxygen levels in Chesapeake Bay plummet. Strong winds can make surface water pile up on one side of the bay, causing the dead zone to spill over into the shallow waters

Dissolved oxygen (mg/l) ● 10.0 ● 5.0 ● 2.5 ● 0.0 (dead zone)



Vznik a zánik anoxických zón – ne vše jasné

My New Scientist

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Pacific dead zone has been shrinking for a century

› 19:00 07 August 2014 by [Anna Williams](#)

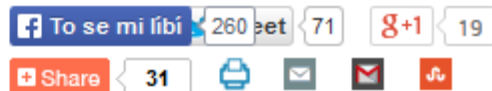
› For similar stories, visit the [Endangered Species](#), [Mysteries of the Deep Sea](#) and [Climate Change](#) Topic Guides

Huge areas of ocean could suffocate as a result of global warming. But one of these "dead zones" has been shrinking for a century, we now know. Freak local conditions may be at work, but the discovery offers hope that at least one region of the ocean will still be breathable.

Most tropical coastlines have [oxygen minimum zones](#), which form when plankton die, sink and get eaten by bacteria, a process that consumes oxygen. The majority of marine animals [cannot breathe in low-oxygen water](#), and either leave or die.

Around the world, [oxygen minimum zones have been growing](#), partly due to [the effects of global warming](#). But one such zone, in the eastern Pacific off the coast of North and Central America, has been bucking the trend, says [Curtis Deutsch](#) of the University of Washington in Seattle.

Using coastal sediments that carry traces of past oxygen levels, Deutsch and his colleagues reconstructed changes in oxygen levels in the eastern tropical Pacific since 1850. They found that the oxygen minimum zone has been shrinking nearly all that time.



Weakening winds can help dead zones recover
(Image: Image Source/Getty)

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Vznik a zánik anoxických zón – ne vše jasné

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Pacific dead zone has

› 19:00 07 August 2014 by [Anna V](#)
› For similar stories, visit the [Enda](#)

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The oceans are heating, acidifying and choking

› 19:58 04 October 2013 by [Fred Pearce](#)
› For similar stories, visit the [Climate Change](#) Topic Guide

We know the oceans are warming. We know they are acidifying. And now, to cap it all, it turns out they are suffocating, too. A new health check on the state of the oceans warns that they will have lost as much as 7 per cent of their oxygen by the end of the century.

The cascade of chemical and biological changes now under way could see coral reefs irreversibly destroyed in 50 to 100 years, with marine ecosystems increasingly taken over by [jellyfish](#) and toxic algal blooms.

The [review](#) is a repeat of a study two years ago by the [International Programme on the State of the Ocean \(IPSO\)](#), a coalition of scientists. It concludes that things have become worse since the first study.

"The health of the oceans is spiralling downwards far more rapidly than we had thought, exposing organisms to intolerable and unpredictable evolutionary pressure," says [Alex Rogers](#) at the University of Oxford, the scientific director of IPSO.

Deadly trio

Rogers describes a "deadly trio" of linked global threats. The first is global warming: surface sea water has been [warming](#) almost as fast as the atmosphere. The second is [acidification](#) – a result of the water absorbing ever more CO₂ from the atmosphere. The third is [deoxygenation](#).

To see mi libi 626 pet 256 g+1 109
Share 171

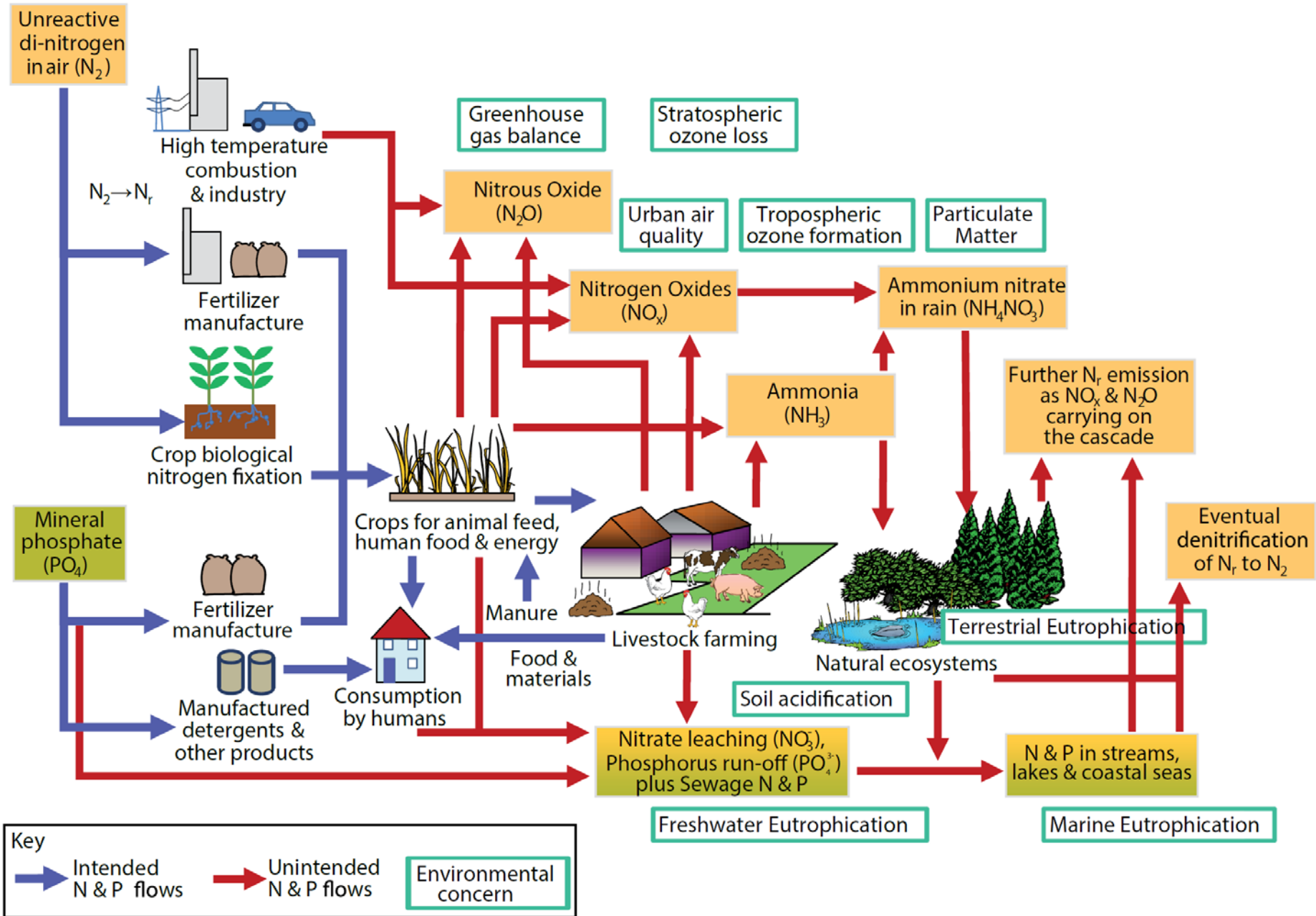


Getting harder to breathe underwater (Image: Incredible Features/Barcroft Media)

ADVERTISEMENT

Hyundai i40 2013, 1.7 CRDI

Simplified view of the nitrogen and phosphate cascade



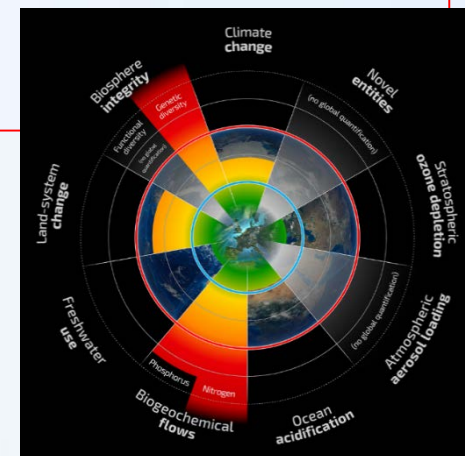
VII. Globální spotřeba vody

Earth-system process	Control variable(s)	Planetary boundary (zone of uncertainty)	Current value of control variable
Freshwater use (R2009: Global freshwater use)	<p><i>Global:</i> Maximum amount of consumptive blue water use ($\text{km}^3\text{yr}^{-1}$)</p> <p><i>Basin:</i> Blue water withdrawal as % of mean monthly river flow</p>	<p><i>Global:</i> $4000 \text{ km}^3 \text{ yr}^{-1}$ ($4000\text{--}6000 \text{ km}^3 \text{ yr}^{-1}$)</p> <p><i>Basin:</i> Maximum monthly withdrawal as a percentage of mean monthly river flow. For low-flow months: 25% (25–55%); for intermediate-flow months: 30% (30–60%); for high-flow months: 55% (55–85%)</p>	$\sim 2600 \text{ km}^3 \text{ yr}^{-1}$

Boundary: No more than 4000 km^3 of fresh water consumed per year

Current level: 2600 km^3 per year

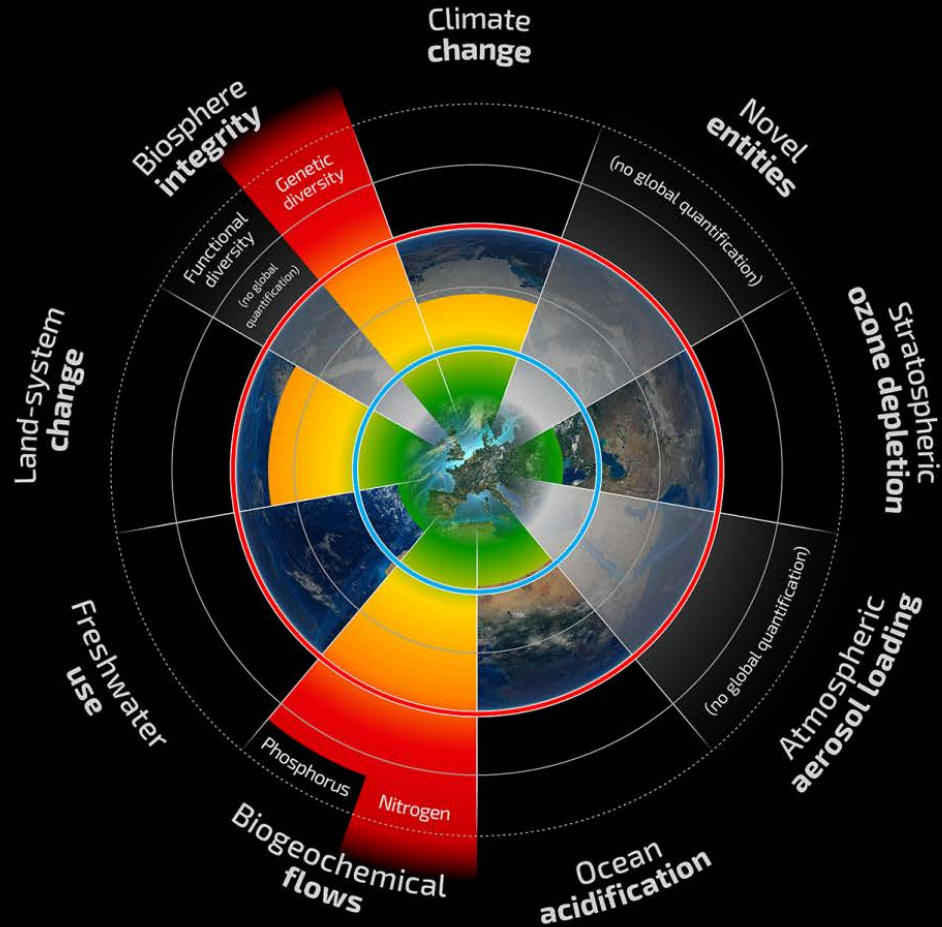
Diagnosis: Boundary will be approached by mid-century



Překročení hranic?

Planetary Boundaries

A safe operating space for humanity



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Nedostatek sladké vody

- člověk je dominantní silou měnící globálně tok vody v řekách
- přibližně 25 % vody z povodí vůbec nedoteče do oceánů
- vážné důsledky pro stav biodiverzity, produkci potravin, zdravotní rizika, snižování pružnosti ter. a aqua. ekosystémů

8 Mighty Rivers Run Dry From Overuse

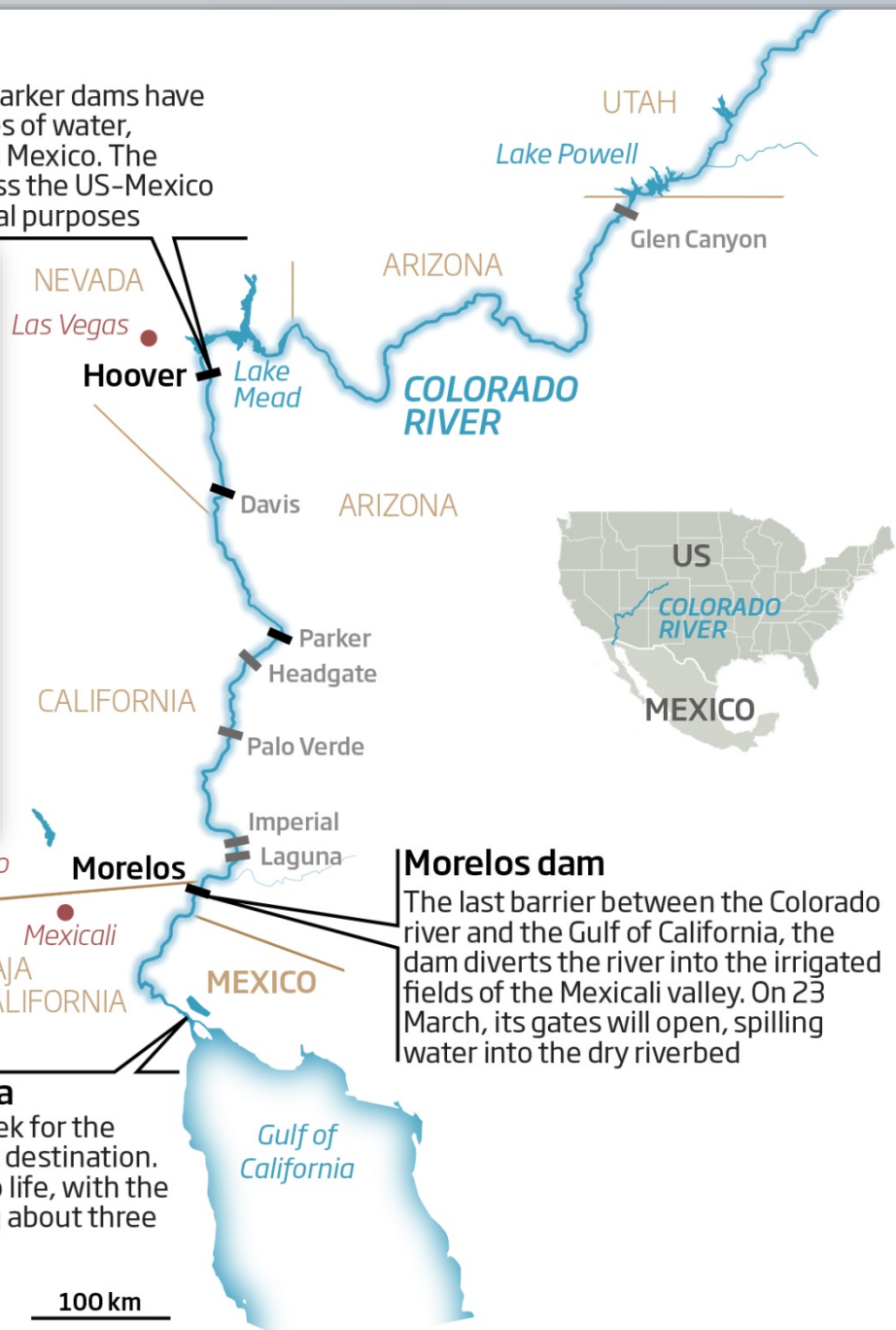
[Main](#) [About the Freshwater Initiative](#) [Restoring Rivers](#) [Reducing Water Use](#) [News](#) [Videos](#)



Colorado

Hoover dam

The Hoover, Davis and Parker dams have released 130 billion litres of water, destined for the delta in Mexico. The water will be first to cross the US-Mexico border for environmental purposes



Morelos dam

The last barrier between the Colorado river and the Gulf of California, the dam diverts the river into the irrigated fields of the Mexicali valley. On 23 March, its gates will open, spilling water into the dry riverbed

Colorado river delta

It could take up to a week for the water pulse to reach its destination. The delta will burst into life, with the first saplings appearing about three weeks after the flood



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Aralské Jezero - Kazachstán, Uzbekistán



Aralské Jezero

What has happened...

In 1989-1990, the Aral Sea separated into two parts: the 'Large Aral' and the 'Small Aral'



1957
from a map



1977
from satellite images



1982
from satellite images



1984
from satellite images

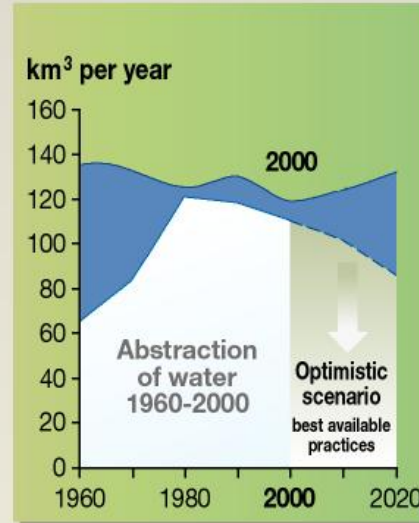
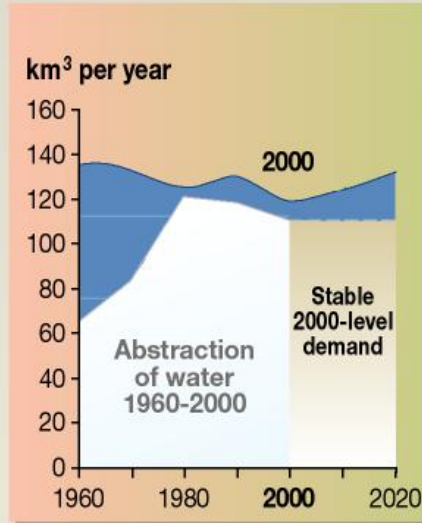
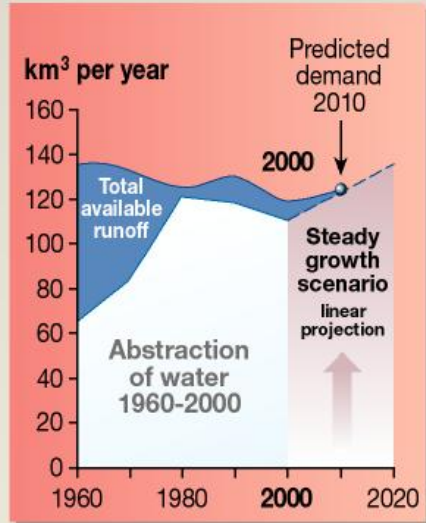


1993
from a map

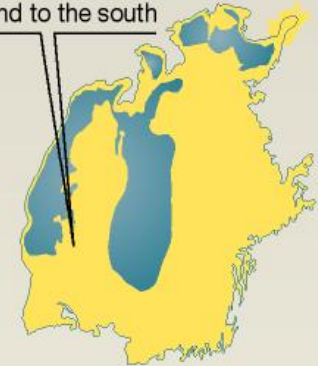


November 2000
from satellite images

What could happen...



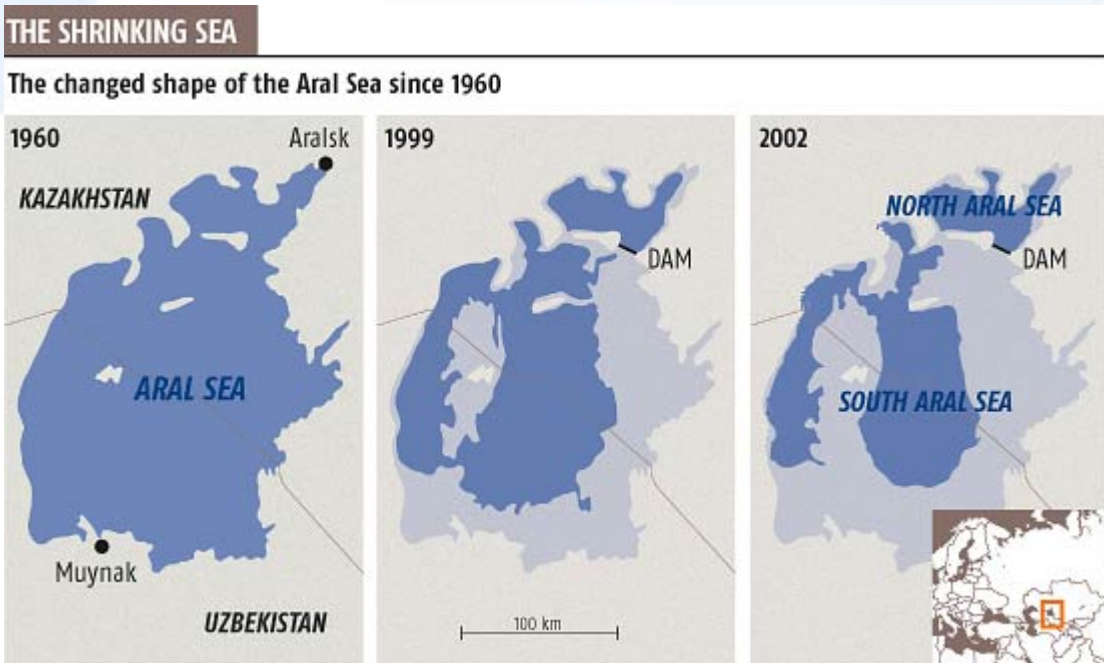
Between November 2000 and June 2001, Vozrojdeniya Island joined the mainland to the south



November 2007
from satellite images

Sources: Nikolai Denisov, GRID-Arendal, Norway (especially for the graphics below); Scientific Information Center of International Coordination Water Commission (SIC ICWC); International Fund for Saving the Aral Sea (IFAS); The World Bank; National Aeronautics and Space Administration (NASA); United States Geological Survey (USGS), *Earthshots : Satellite images of environmental change*, United States Department of the Interior, 2000.

Aralské Jezero - Kazachstán, Uzbekistán



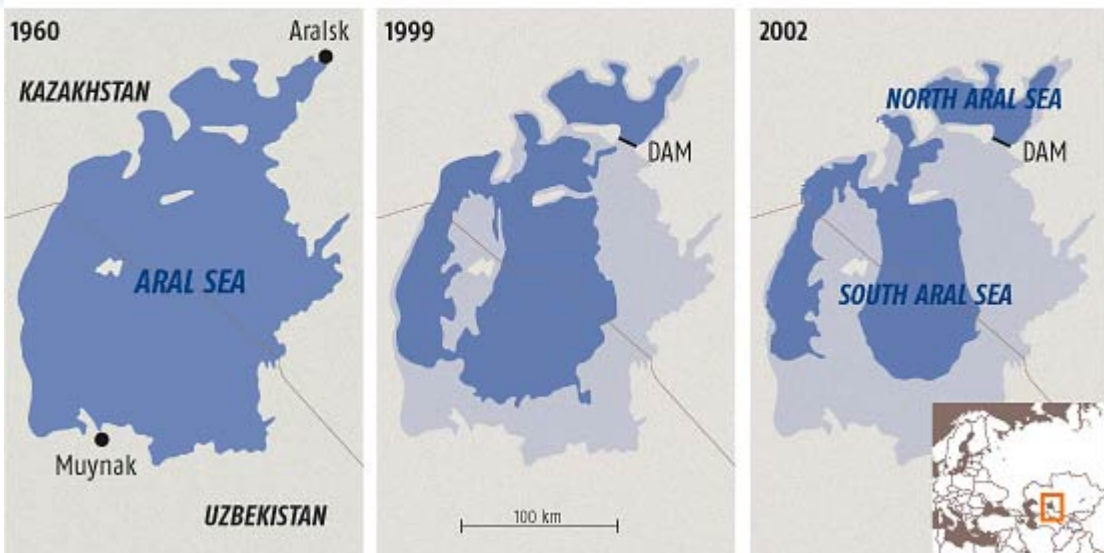
- 2005 postavena přehrada mezi S a J částí
- co následovalo?



Aralské Jezero - Kazachstán, Uzbekistán

THE SHRINKING SEA

The changed shape of the Aral Sea since 1960



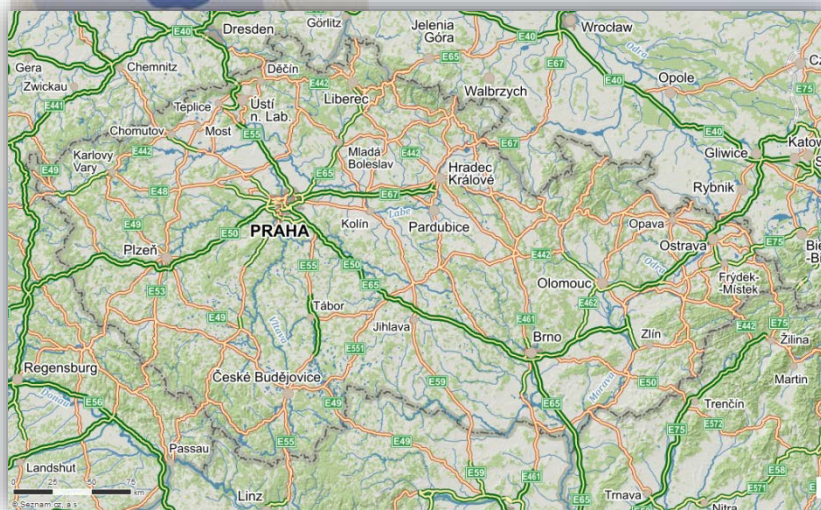
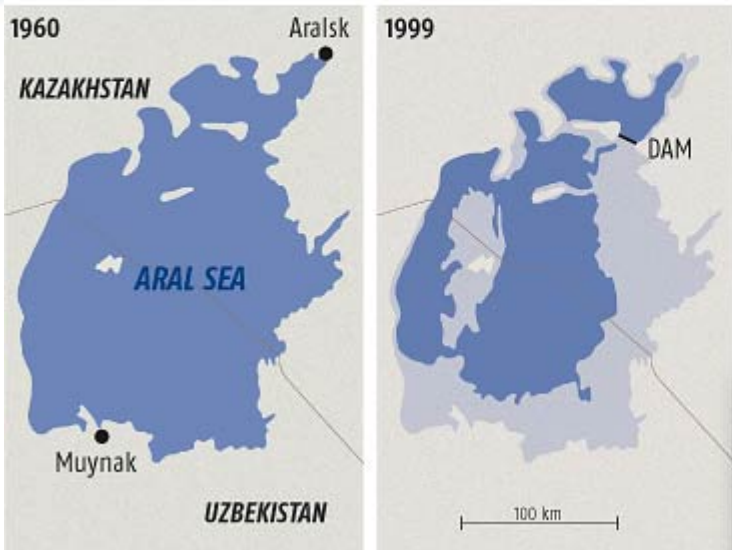
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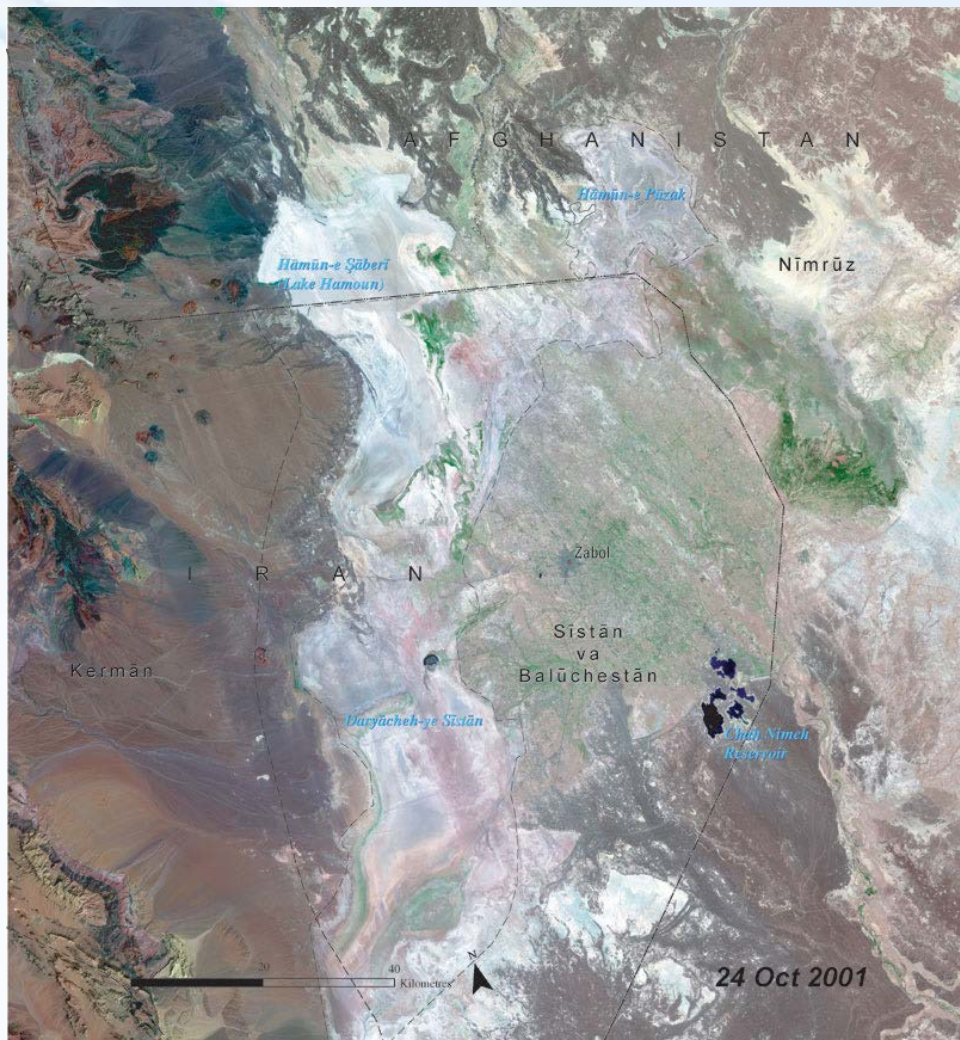
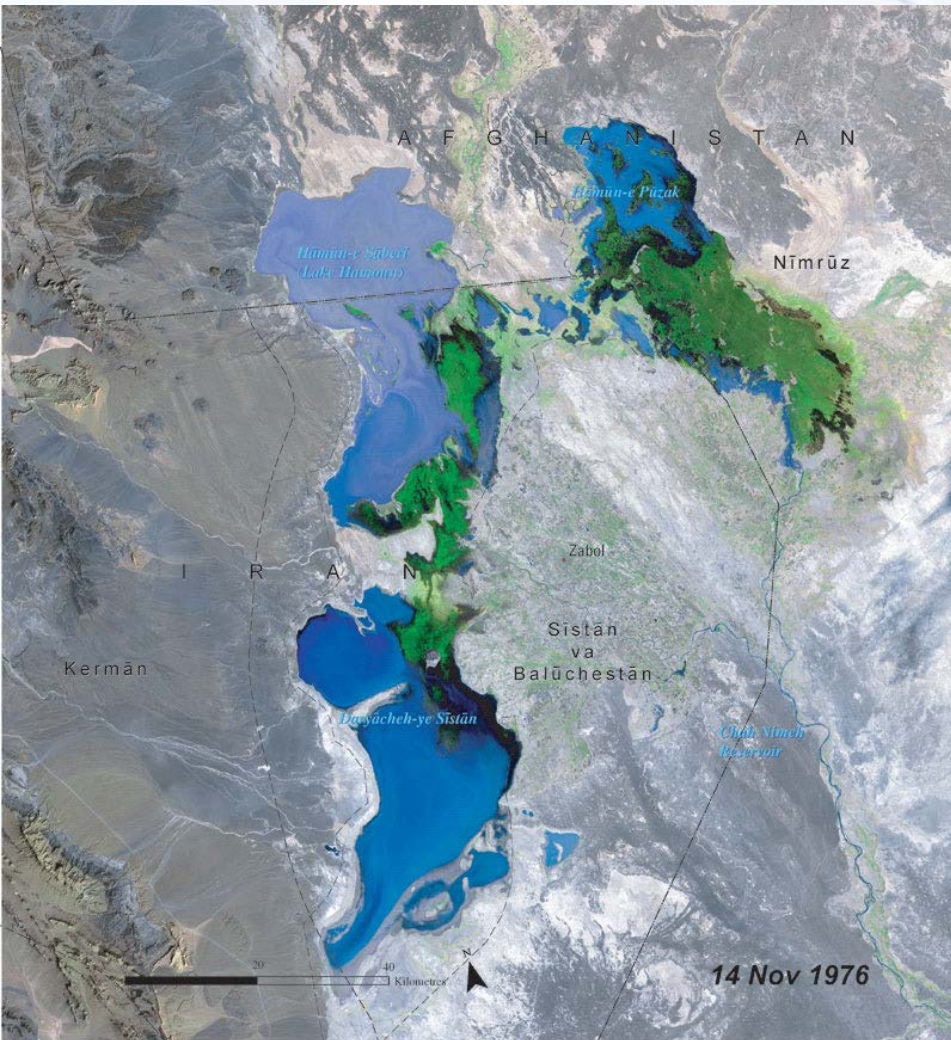
Aralské Jezero

THE SHRINKING SEA

The changed shape of the Aral Sea since 1960



Lake Hamoun – Irán, Afghánistán

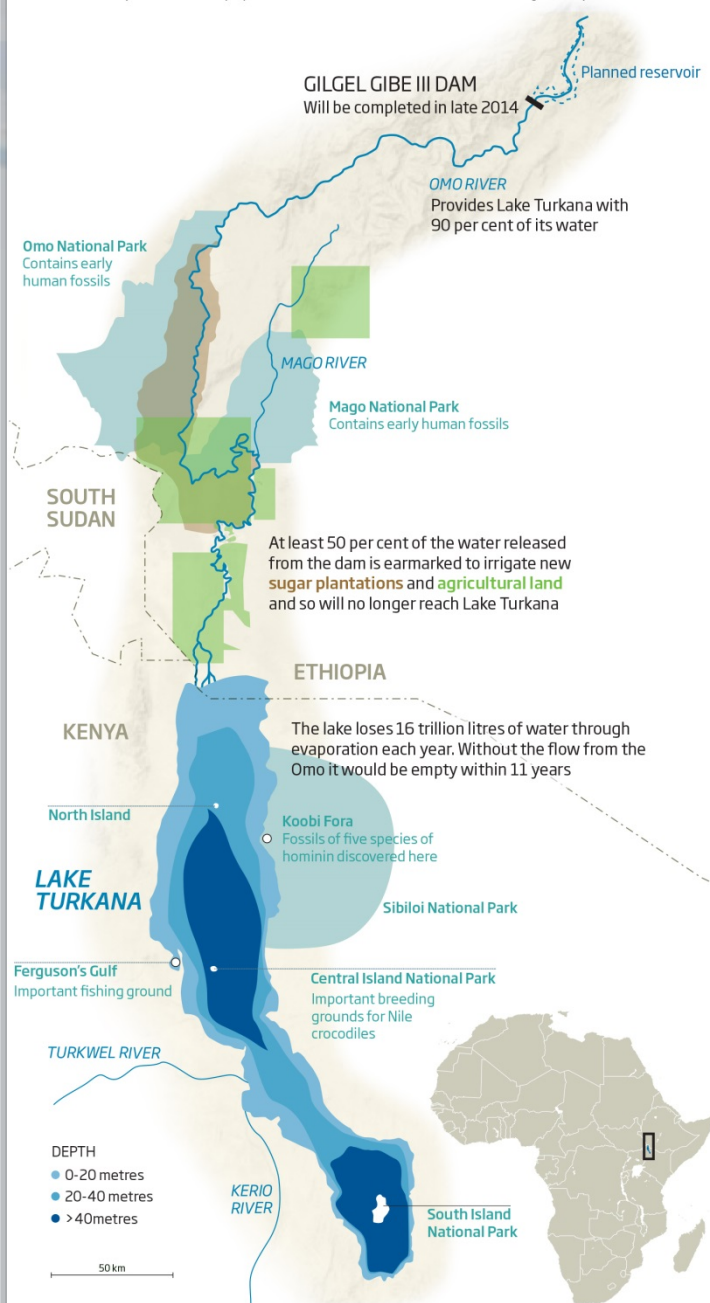




Lake Turkana Keňa ???

blahobyt
x
přírodní dědictví

Harnessing the Omo's waters
Today Lake Turkana in Kenya has a surface area of 6400 square kilometres and is the world's largest desert lake. It is replenished mostly by water from the river Omo, which flows through Ethiopia



Přehrady

- **význam** - ochrana před povodněmi a suchem ... ?



Přehrady

- **význam** - ochrana před povodněmi a suchem ... ?
- Výstavba velkých vodních děl je v posledních letech kriticky vnímána po celém civilizovaném světě. Koncept, že podobná díla nás ochrání před povodněmi a suchem, už neplatí“
- díky přehradám paradoxně **trpí více lidí nedostatkem vody** (hlavně pod přehradou), než kolik lidí vodu získá (23 % glob. populace x 20 %)



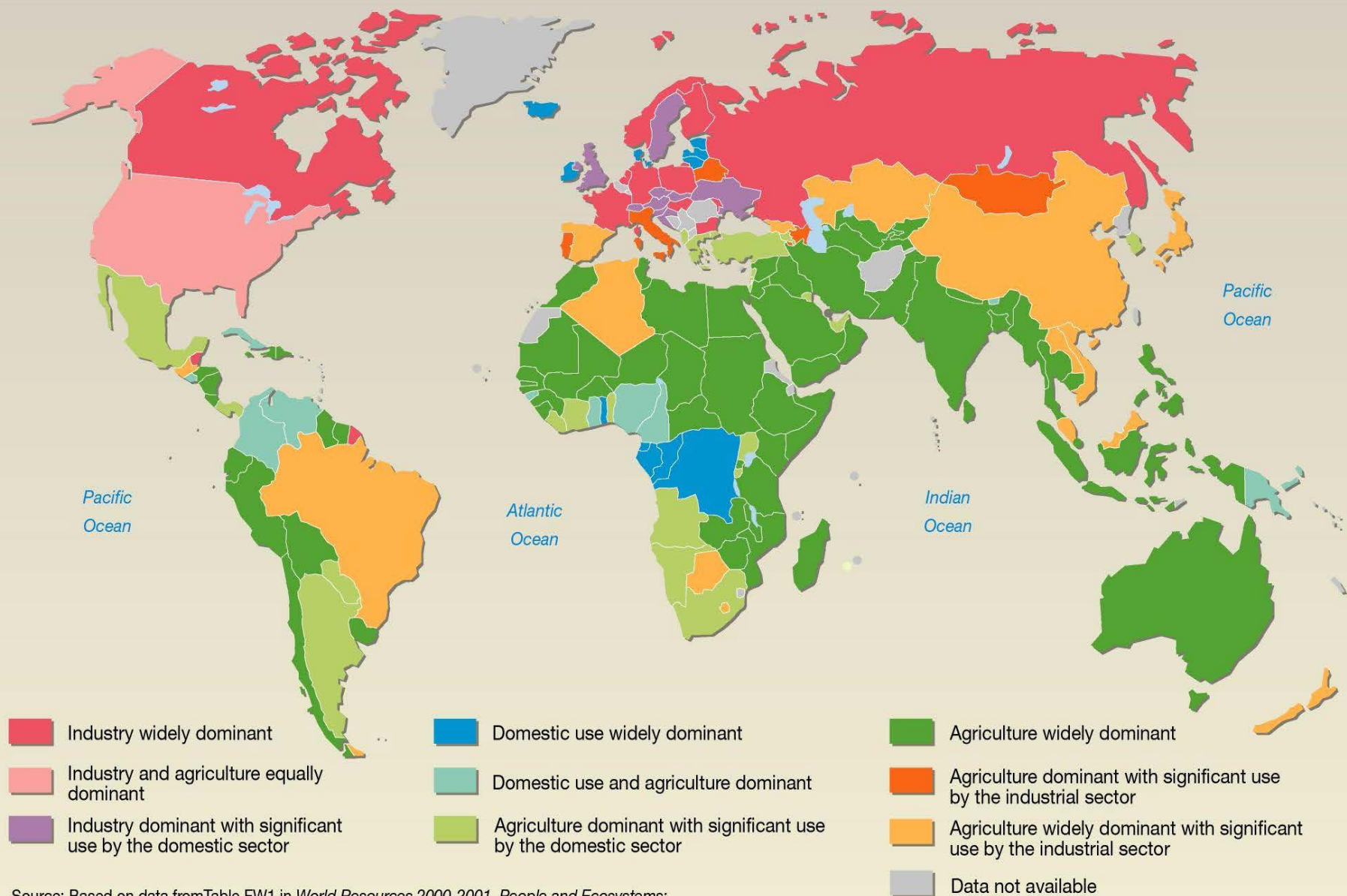
DAILY NEWS 15 June 2017

Billion-dollar dams are making water shortages, not solving them



Who are the winners and losers?
Michael Reinhard/Corbis/Getty

Odvětví spotřeby vody



Source: Based on data from Table FW1 in *World Resources 2000-2001, People and Ecosystems: The Fraying Web of Life*, World Resources Institute (WRI), Washington DC, 2000.

Oblasti a příčiny nedostatku vody

Areas around the globe suffering from depleted water resources

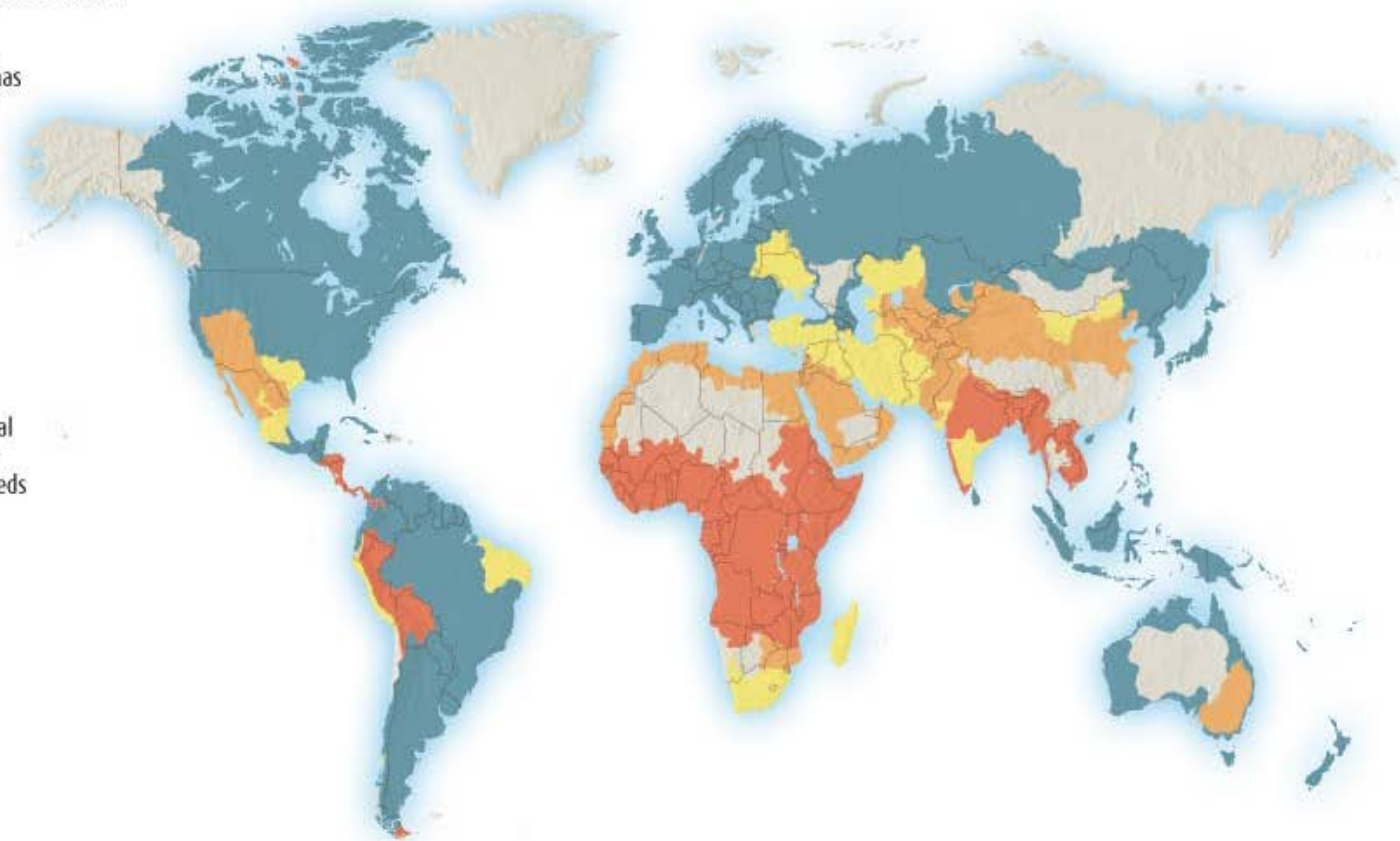
Physical water scarcity
Water resource development is approaching or has exceeded sustainable limits. More than 75% of river flow is extracted for agriculture

Approaching physical water scarcity
More than 60% of river flow is extracted. These areas will experience physical water scarcity in the near future

Economic water scarcity
Limited access to water even though natural local supplies are available to meet human demands. Less than 25% of water extracted for human needs

Little or no water scarcity
Abundant water resources relative to use, with less than 25% of water extracted for human purposes

Not estimated

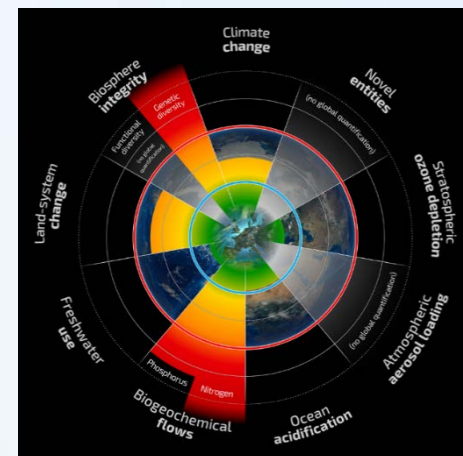


SOURCE: INTERNATIONAL WATER MANAGEMENT INSTITUTE



VIII. Změna využívání krajiny

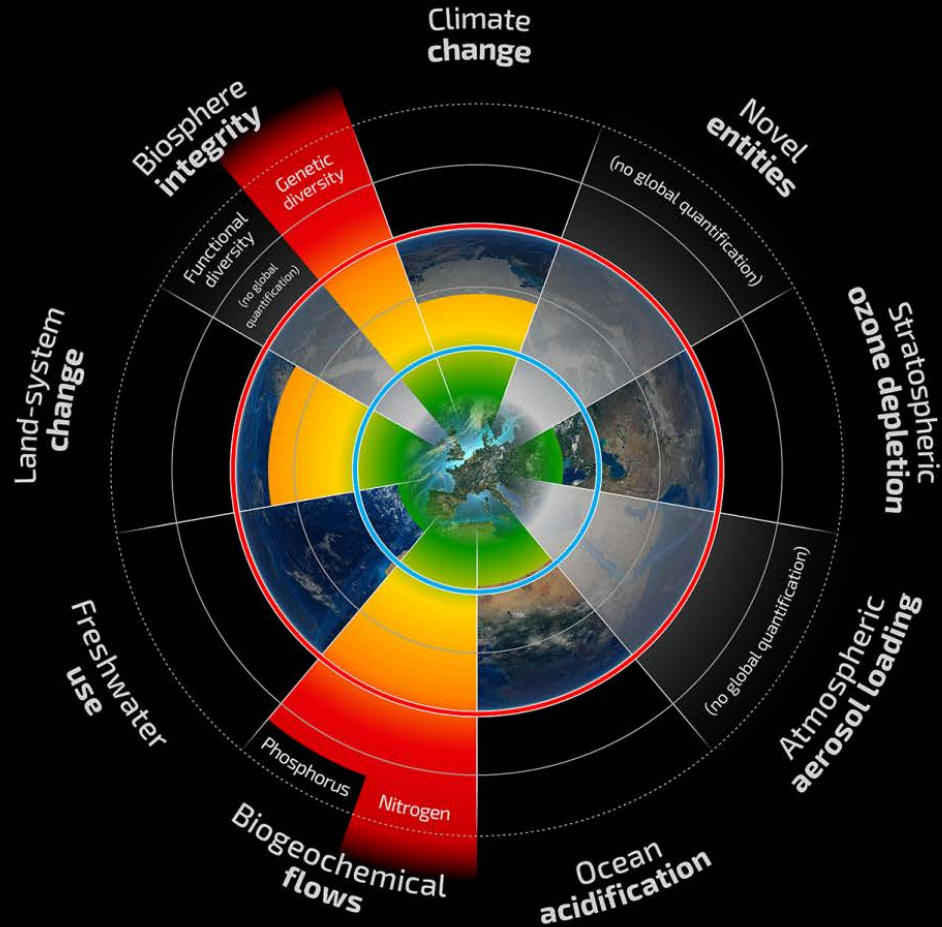
Earth-system process	Control variable(s)	Planetary boundary (zone of uncertainty)	Current value of control variable
Land-system change (R2009: same)	<i>Global:</i> Area of forested land as % of original forest cover	<i>Global:</i> 75% (75–54%) Values are a weighted average of the three individual biome boundaries and their uncertainty zones	62%
	<i>Biome:</i> Area of forested land as % of potential forest	<i>Biome:</i> Tropical: 85% (85–60%) Temperate: 50% (50–30%) Boreal: 85% (85–60%)	



Překročení hranic?

Planetary Boundaries

A safe operating space for humanity



- Beyond zone of uncertainty (high risk)
- In zone of uncertainty (increasing risk)
- Below boundary (safe)
- Boundary not yet quantified



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Změna využívání krajiny

- poháněno expanzí zemědělství a jeho intenzifikace
- posledních 50 let byly lesní a další ekosystémy měněny na zemědělskou půdu rychlostí 0,8% ročně
- hlavní síla řídící ztrátu **ekosystémových funkcí a služeb** (např. produkce potravin a cyklus vody), ztrátu biodiverzity a podkopává lidský blahobyt a dlouhodobou udržitelnost



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- **maximální únosná míra přeměny ekosystémů na zeměd. půdu je přibližně 15 % nezaledněné plochy souše – v současnosti je to 12 %**
- při překročení únosné míry využívání v určitém regionu může dojít k náhlé změně charakteru krajiny
- **např. nadkritická přeměna Amazonských pralesů na zemědělské plochy či pastviny může „skokově“ změnit celý charakter povodí na polosuchou savanu**



Změn

- poh
- posl
- zem
- hlav
- (nap
- a po
- max
- půd
- souč
- při překročení únosné míry využívání v určitém regionu může dojít k náhlé změně charakteru krajiny
- např. nadkritická přeměna Amazonských pralesů na zemědělské plochy či pastviny může „skokově“ změnit celý charakter povodí na polosuchou savanu

Parts of Amazon close to tipping point

- › 13:52 05 March 2009 by [Catherine Brahic](#)
- › For similar stories, visit the [Endangered Species Topic Guide](#)

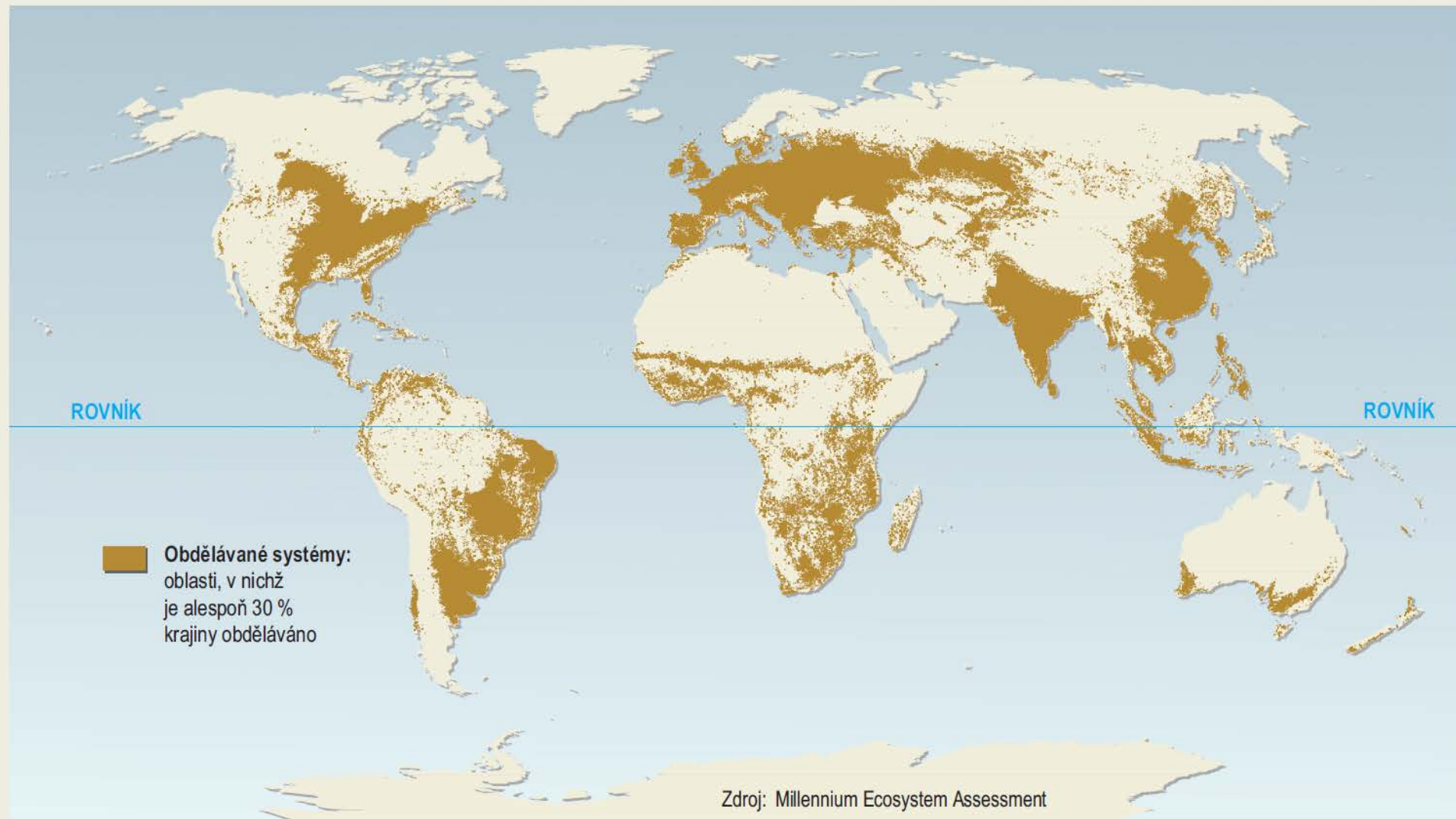
The Mato Grosso, the most scarred region of the Amazon rainforest, is teetering on a deforestation "tipping point", and may soon be on a one-way route to becoming a dry and relatively barren savannah.

[Mônica Carneiro Alves Senna](#) and colleagues at the Federal University of Viçosa, Brazil, used computer models to simulate how the Amazon would recover from various amounts of deforestation. Their simulations ranged from a complete wipe-out of the entire forest to a situation where just one fifth of the forest would be removed.



Graf 1: ROZLOHA OBHOSPODAŘOVANÝCH SYSTÉMŮ V ROCE 2000

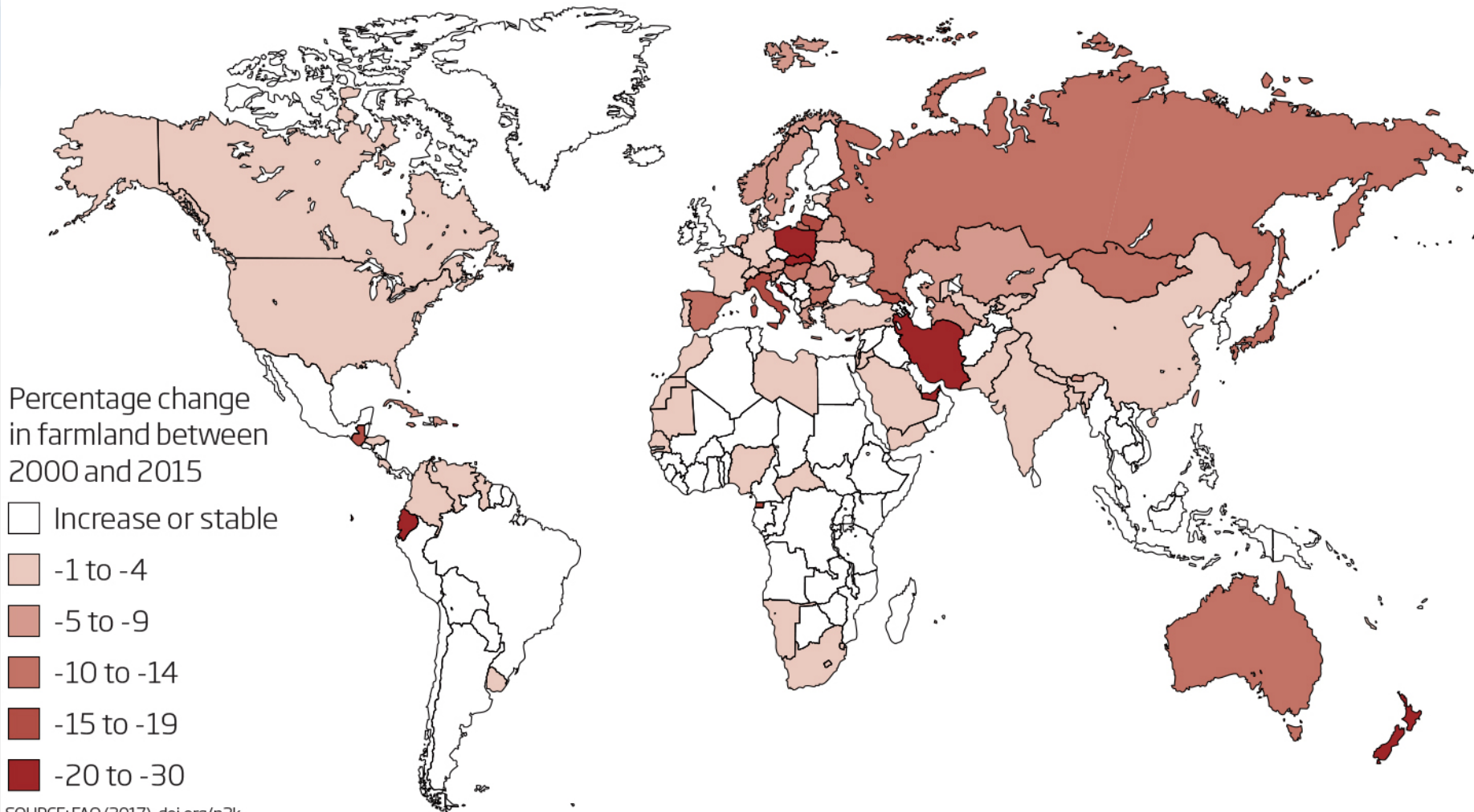
Obhospodařované systémy pokrývají 24 % suchozemského povrchu.



Blýskání na lepší časy?

Shrinking farmland

For the first time, more land is being left to return to nature than is being cleared for agriculture

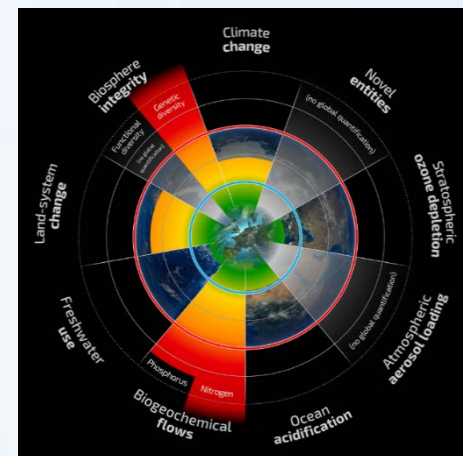


SOURCE: FAO (2017), doi.org/n2k

IX. Chemické znečištění

Earth-system process	Control variable(s)	Planetary boundary (zone of uncertainty)	Current value of control variable
Introduction of novel entities (R2009: Chemical pollution)	No control variable currently defined	No boundary currently identified, but see boundary for stratospheric ozone for an example of a boundary related to a novel entity (CFCs)	

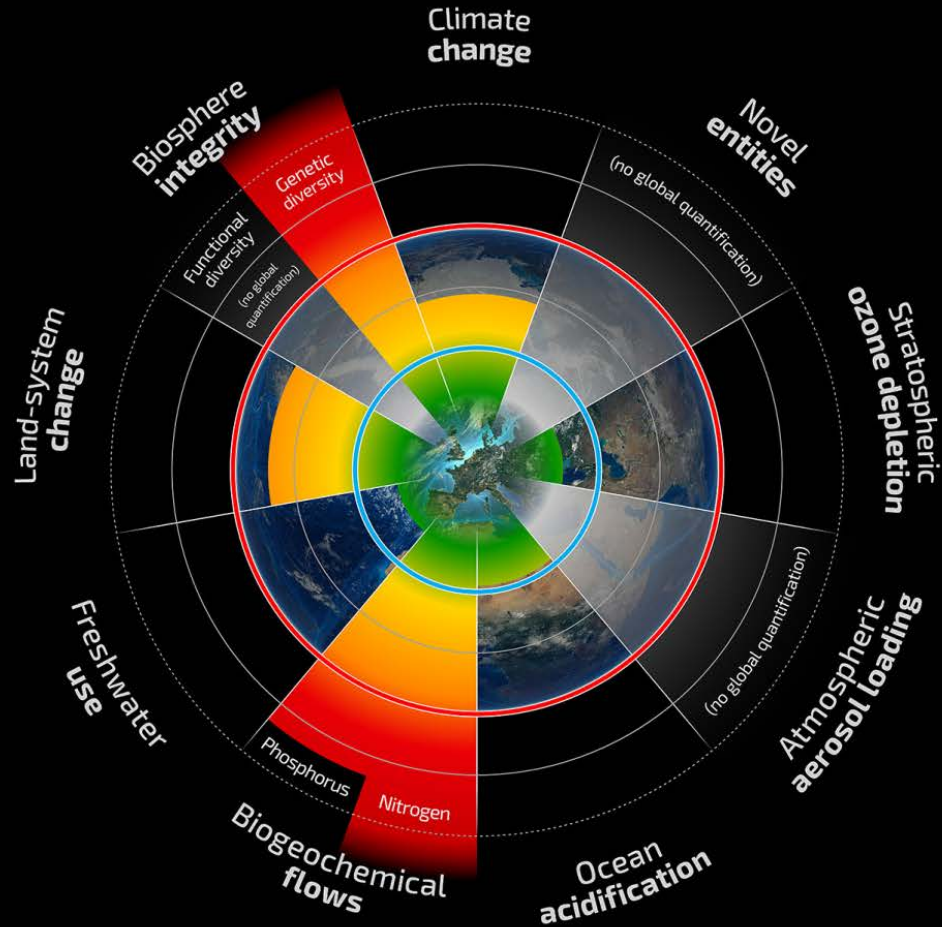
Boundary: Not yet identified



Překročení hranic?

Planetary Boundaries

A safe operating space for humanity



- Beyond zone of uncertainty (high risk)
- In zone of uncertainty (increasing risk)
- Below boundary (safe)
- Boundary not yet quantified



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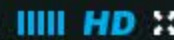


MIDWAY

Message From the Gyre



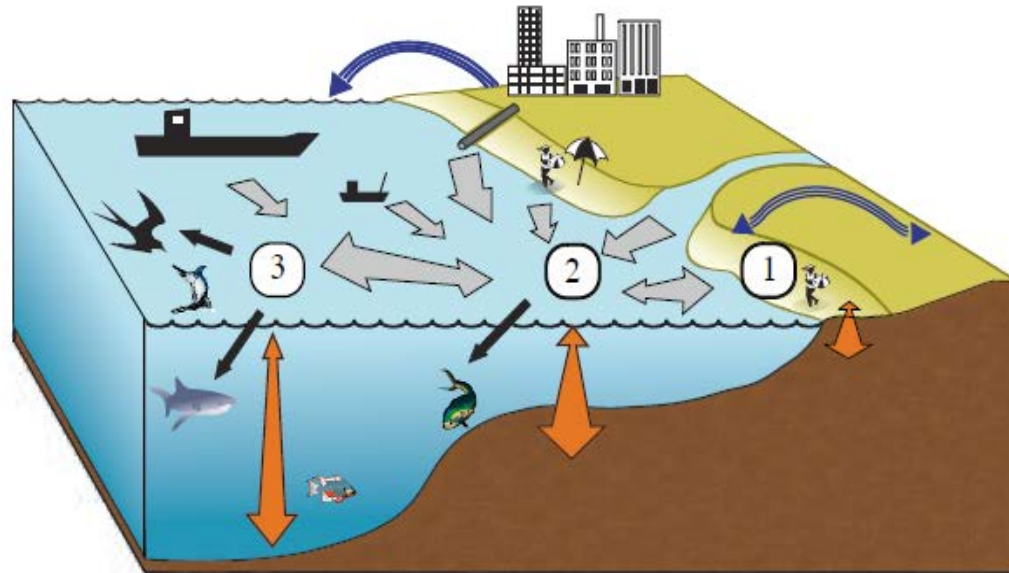
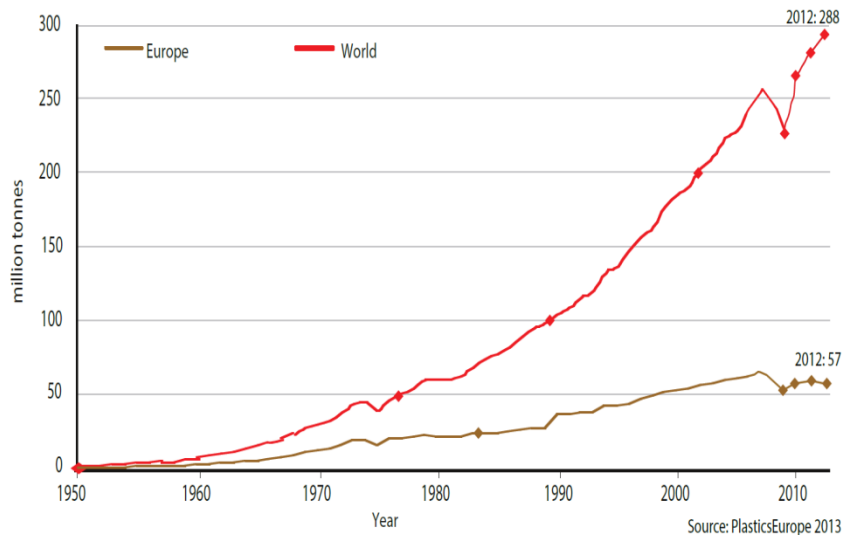
03:54



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v prostředí

Plastikové kousky v ŽP

Growth in plastics production 1950-2012



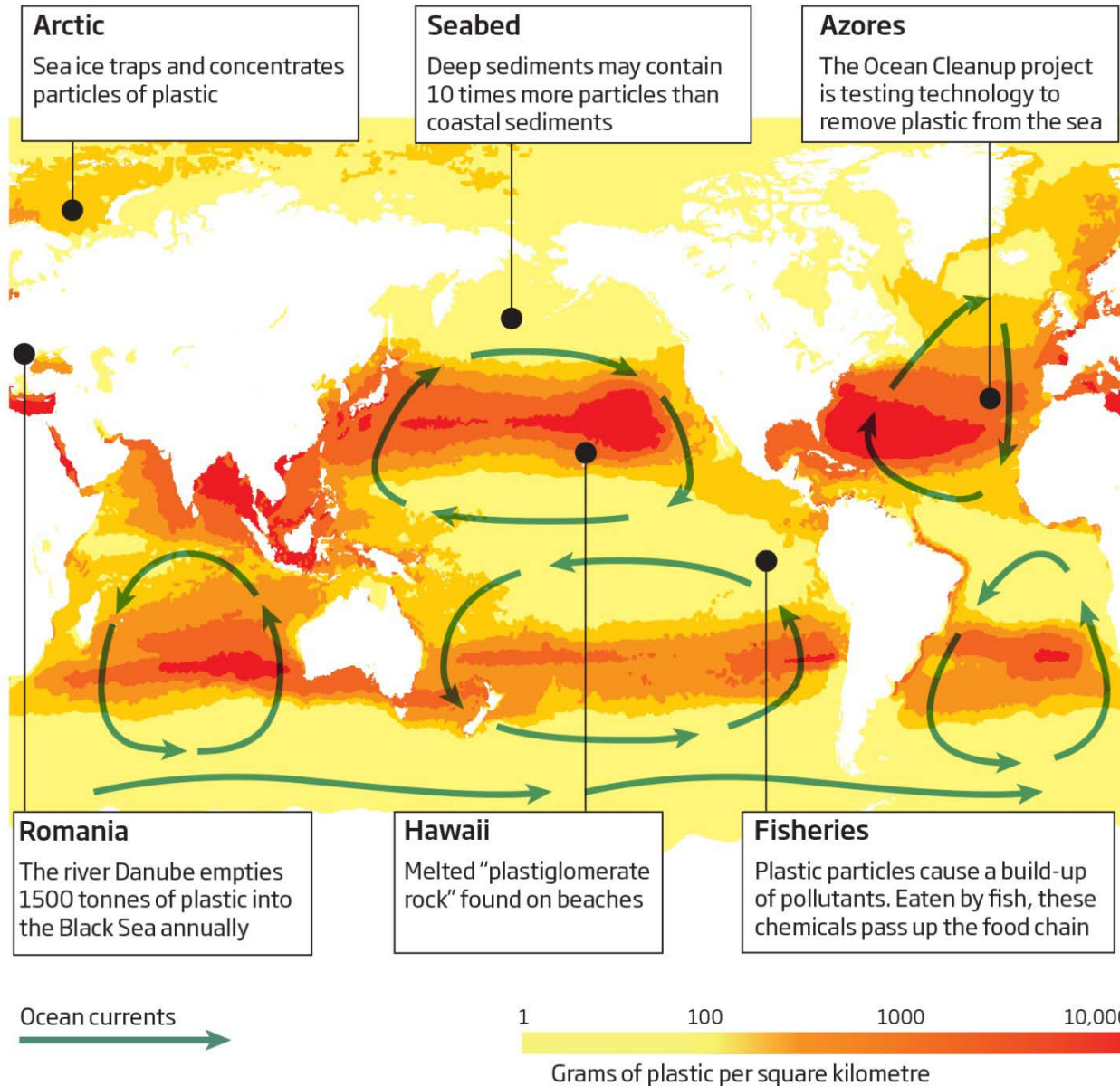
- PET, PA and polyacryl fibres are not included





Global garbage dump

Much of the ocean's plastic waste is found near heavily populated coastlines, but farther out, it is concentrated in five "gyres" in the Atlantic, Pacific and Indian oceans. Where most of it ends up is unclear



Místo zmizelého boeingu našli nový "kontinent". Tvoří jej tuny plastového odpadu

Je to křídlo, nebo kus sedačky? Otazník vznášející se nad zmizením malajsijského boeingu obrací zájem veřejnosti k dalším otázkám - tentokrát ekologickým. Pátrání potvrzuje předpoklad, že oceán z hromadícího se odpadu začíná formovat "nový kontinent".

Čtěte více o: [Pacifik](#) | [oceán](#) | [ekologie](#)

ČTK

ČLÁNEK

DISKUSE (115)

Je to už téměř měsíc, co záchranáři několika států pátrají po zmizelém letu MH370, bohužel neúspěšně. Hledání pohřešovaného malajsijského letadla zatím vedlo jen k objevení velké spousty trosek a různých plovoucích předmětů. Bohužel o žádném z nich nebylo možné s jistotou říct, že patří k hledanému Boeingu 777 společnosti Malaysia Airlines.

Značné množství odpadků pohupujících se na hladině oceánu dělá ze sisyfovského hledání zmizelého letadla ještě komplikovanější úkol. Ve vodách plují zbytky



Obrovskou masu odpadků v Tichém oceánu přináší mořský proud ze všech břehů.

foto: Reuters

Positively Radiant® Face Moisturizer with Jennifer Aniston | 2014 AVEENO® Commercial



▶ ⏮ 🔊 0:03 / 0:30



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v prostředí

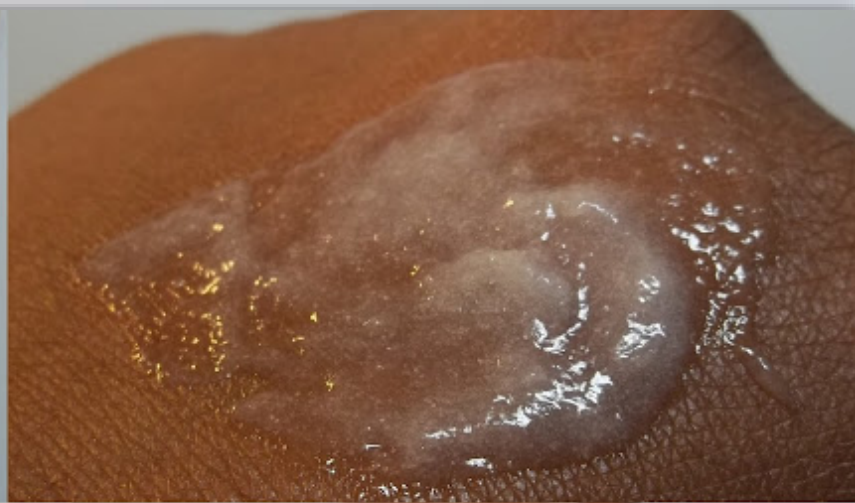
Aveeno
ACTIVE NATURALS®
positively
ageless®

resurfacing
scrub

with vitamin C

exfoliates to
smooth for
a more even tone

ACTIVE NATURALS®
NATURAL SHIITAKE
COMPLEX



oil-free - noncomedogenic- allergy tested- ophthalmologist tested

Reveal your natural beauty and youthful energy every day. **POSITIVELY AGELESS®** Resurfacing Scrub helps to reveal younger looking, natural beautiful skin everyday. Formulated with **ACTIVE NATURALS® Natural Shiitake Complex** and fortified with Vitamin C, this gentle exfoliating scrub with retexturizing microbeads removes impurities while polishing away dead skin cells for smoother, more even tone.

Directions: Moisten face and squeeze scrub into hand. Massage gently in circular motion over face. Rinse thoroughly and pat dry before applying your moisturizer.

Ingredients: Water, Glycerin, Ammonium Lauryl Sulfate, Polyethylene, Glyceryl Stearate, Lauryl Glucoside, Acrylates/C10-30 Alkyl Acrylate Crosspolymer, Caprylyl Glycol, Fragrance, Cetearyl Oliviate, Sodium Hydroxide, Chlorphenesin, Sorbitan Oliviate, Citric Acid, Tetrasodium EDTA, Caprylhydroxamic Acid, Butylene Glycol, Algae Extract, Artemisia Abrotanum Flower/Leaf/Stem Extract, Hydrolyzed Caesalpinia Spinosa Gum, Ganoderma Lucidum



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v prostředí

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Centrum pro výzkum
toxických látek
v prostředí

MICROBEADS FACE TO FISH

**A TUBE OF FACEWASH
CAN CONTAIN OVER
330,000 MICROBEADS**

This means billions of plastic
microbeads are flowing into
our global waterways.



**1,147 PERSONAL
CLEANSING PRODUCTS
CONTAIN MICROBEADS**

1,147 personal cleansing
products in the US and around
the world contain micro-plastic
particle abrasives (MICROBEADS),
employed as exfoliant.

MICROBEADS ARE DESIGNED TO WASH DOWN THE DRAIN

1

WASTE TREATMENT

Many sewage
treatment facilities do
not capture
synthetic,
floating particles
the size of
microbeads that
are only about a
.5 mm in diameter.

2

SEWAGE OVERFLOW

During heavy rains,
some treatment
facilities let sewage
overflow go
directly into our
waterways.

3

SLUDGE & FERTILIZER RUNOFF

Sewage sludge
used as fertilizer,
beads seep into
soil, get into
rivers/aquifers.

663 SPECIES OF MARINE WILDLIFE ARE AFFECTED BY PLASTIC POLLUTION

Over 663 species of
marine wildlife are
affected by plastic
pollution through
ingestion or
entanglement.
Micro-plastics
particles attract other
pollutants in the
environment
including PCBs,
flame-retardants, and
other industrial
chemicals.

43,000 5 Gyres found an
PLASTIC average of 43,000
PARTICLES plastic particles
/km2 in Lake Erie.

**A SINGLE PLASTIC PARTICLE
CAN ABSORB UP TO
1,000,000
TIMES MORE TOXIC CHEMICALS
THAN THE WATER AROUND IT.**



Aveeno
ACTIVE NATURALS®

positively
ageless®

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Centrum pro výzkum
toxických látek
v prostředí

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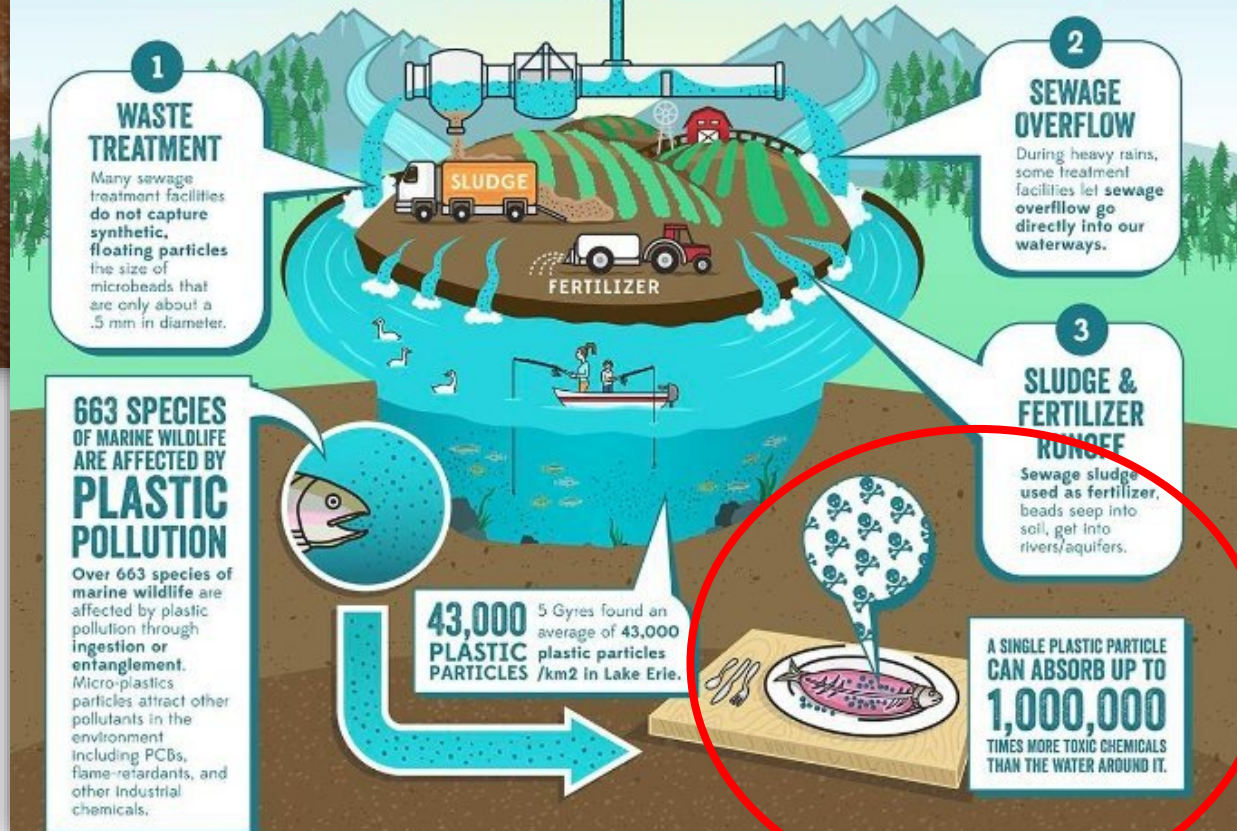
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Národní centrum
pro toxické látky



Regionální centrum
Stockholmské úmluvy



INFRASTRUKTURA



RECETOX: Laboratoře
stopové analýzy



genasis



Centrum pro výzkum toxických látek v prostředí

Centrum je samostatným ústavem Přírodovědecké fakulty Masarykovy univerzity, který realizuje výzkum, vývoj, výuku a expertní činnost v oblasti znečištění prostředí toxickými látkami. Předmětem zájmu jsou především perzistentní organické polutanty (POPs), polární organické látky, toxické kovy a jejich specíe, přírodní toxiny (cyanotoxiny).

Vědecká činnost Centra je realizována ve dvanácti pracovních skupinách sdružených do čtyř vědeckých programů:

- [Environmentální chemie a modelování](#)
- [Organická fotochemie a supramolekulární chemie](#)
- [Proteinové inženýrství](#)
- [Ekotoxikologie](#)

Vědecké programy jsou podporovány nejmodernější výzkumnou infrastrukturou částečně centralizovanou do samostatných jednotek ("core facilities"):

- [Laboratoře stopové analýzy](#)
- [Informační systém GENASIS](#)
- [Databáze ELSPAC](#)

Vzdělávání

Kromě výzkumu Centrum rovněž poskytuje [vysokoškolské vzdělání ve třech různých oborech](#) PŘF MU - chemie životního prostředí, ekotoxikologie a matematická biologie - a organizuje další specializované vzdělávací aktivity a kurzy.

Společná pracoviště

- [Národní centrum pro perzistentní organické polutanty](#) (společné pracoviště MŽP a MU)
- [Regionální centrum Stockholmské úmluvy pro budování kapacit a přenos technologií pro region střední a východní Evropy](#)
- [Centrum pro cyanobakterie a jejich toxiny](#) (společné pracoviště s BÚ AVČR, v.vi.)



Aktuality



- [Ph.D. pozice a témata doktorských prací na RECETOX](#)
- [Volná pracovní pozice - porodní asistent\(ka\)](#)
- [Volná pracovní pozice - ekonom projektů](#)
- [Přečtěte si letní číslo RECETOX News!](#)
- [Pásmo přednášek na Sýpce](#)
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- [Pozvánka na Brněnské dny pro zdraví 2018](#)
- [Speciální Den otevřených dveří - přijďte se podívat na RECETOX](#)
- [NOC VĚDCŮ 2018 - aneb 100 let české vědy a 35 let RECETOXu](#)
- [Volná pracovní pozice - POSTDOC POSITION in the field of Environmental Toxicology / Environmental](#)





PLASTIC IN COSMETICS

ARE WE **POLLUTING** THE ENVIRONMENT
THROUGH OUR PERSONAL CARE?

PLASTIC INGREDIENTS THAT CONTRIBUTE TO MARINE MICROPLASTIC LITTER

FACT SHEET

1.0542 millimeters

1.002 millimeters



Centrum pro výzkum
toxických látek
v prostředí



PLASTIC IN COSMETICS

1.002 millimeters

What can be done?

- **Producer:** Taking the potential impact of product ingredients on the natural environment into account during the design phase and achieving cleaner production of PCCPs could eliminate microplastic by (and also packaging) pollution from PCCPs.
- **Consumer:** Look in your bathroom – what contains microbeads – download the Beat the microbead app and avoid buying products that contain these plastics.
- **Governments:** Promote phase out of microplastics in personal care and cosmetic products
- **Researchers:** Further research is needed to better understand the implications of nano- and micro-sized plastics in PCCPs on human and marine ecosystem health, especially through ingestion and chemical transfer through the food chain. Help us to better understand and drive mitigation activities. Consumers, policymakers, industry and businesses with knowledge provided by scientific communities and propagated by NGOs and other civil society representatives are enabled to make informed choices to protect marine ecosystems and human well-being.

1.002 millim

What are they used for?

- Plastics are used as ingredients in PCCPs for a variety of purposes such as sorbent phase for delivery of active ingredients, film formation, exfoliation, viscosity regulation and many others. 'Microbead' is one of many terms applied to plastic PCCP ingredients; they may also be called microplastics, microspheres, nanospheres, plastic particulates etc.

POLYMER	EXAMPLES OF FUNCTIONS IN PCCP FORMULATIONS
Nylon-12 (polyamide-12)	Bulking, viscosity controlling, opacifying (e.g. wrinkle creams)
Nylon-6	Bulking agent, viscosity controlling
Poly(butylene terephthalate)	Film formation, viscosity controlling
Poly(ethylene isoterephthalate)	Bulking agent
Poly(ethylene terephthalate)	Adhesive, film formation, hair fixative; viscosity controlling, aesthetic agent, (e.g. glitters in bubble bath, makeup)
Poly(methyl methacrylate)	Sorbent for delivery of active ingredients
Poly(pentaerythrityl terephthalate)	Film formation
Poly(propylene terephthalate)	Emulsion stabilizing, skin conditioning
Polyethylene	Abrasive, film forming, viscosity controlling, binder for powders
Polypropylene	Bulking agent, viscosity increasing agent
Polystyrene	Film formation
Polytetrafluoroethylene (Teflon)	Bulking agent, slip modifier, binding agent, skin conditioner
Polyurethane	Film formation (e.g. facial masks, sunscreen, mascara)
Polyacrylate	Viscosity controlling
Acrylates copolymer	Binder, hair fixative, film formation, suspending agent
Allyl stearate/vinyl acetate copolymers	Film formation, hair fixative
Ethylene/propylene/styrene copolymer	Viscosity controlling
Ethylene/methylacrylate copolymer	Film formation
Ethylene/acrylate copolymer	Film formation in waterproof sunscreen, gellant (e.g. lipstick, stick products, hand creams)
Butylene/ethylene/styrene copolymer	Viscosity controlling
Styrene acrylates copolymer	Aesthetic, coloured microspheres (e.g. makeup)
Trimethylsiloxysilicate (silicone resin)	Film formation (e.g. colour cosmetics, skin care, sun care)



Product information

Scrubs / Peelings

Brand/Concern	Producer	Product name
ADA-Cosmetics	ADA Cosmetics International GmbH	Pure Herbs Body Peeling
Avène	Pierre Fabre Dermo Cosmetique	Mildes reinigendes Peeling
Avène	Pierre Fabre Dermo Cosmetique	Cleanance Peeling-Maske
B Sand	BSand Schweiz	B Sand The Peeling
Balea	DM	Creme Peeling mit Aloe Vera
Basler Haar-Kosmetik	Basler Haar-Kosmetik GmbH & Co. KG	Basler beautycare regular peeling
Basler Haar-Kosmetik	Basler Haar-Kosmetik GmbH & Co. KG	Basler Totes Meer Salz Peeling
Basler Haar-Kosmetik	Basler Haar-Kosmetik GmbH & Co. KG	Basler beautycare clear peeling
Bebe young care	Johnson & Johnson GmbH	Quick & clean peeling & waschgel
Biomares	Biomares GmbH & Co. KG	Fresh face peeling
Clearasil	Reckitt Benckiser	Ultra Acne Clearing Scrub
Clearasil	Reckitt Benckiser	Daily Clear Facial Scrub
Clearasil	Reckitt Benckiser Inc.	Daily Clear Refreshing Reinigendes Peeling
Clearasil	Reckitt Benckiser	Clearasil Ultra Akut Peeling
Eisenberg Paris	Eisenberg Paris	Soft&clear Cremiges Waschpeeling
Eisenberg Paris	Eisenberg Paris	Exfoliating Body Gel - Körperpeeling
I Love...	I Love Cosmetics	Mango & Papaya
Iseree	Lidl Stiftung & Co. KG	Iseree Peeling Gel
Kiko	Kiko make up Milano	Cleansing scrub
Kiko	Kiko make up Milano	Anti-age peeling
L'Oréal	L'Oréal	Men Expert Pure Power Scrub 2000x Beads Anti-Blackhead
Lara Bellucci peeling	Rudolf Lenhart GmbH & Co. KG	Peeling
Louis Widmer	Louis Widmer	Peeling
Louis Widmer	Louis Widmer	Gesichtspeeling
Neutrogena	Johnson & Johnson	Spot stress control tägliches peeling
Neutrogena	Johnson & Johnson	Visibly clearofein and matt hautverbesserndes peeling
Neutrogena	Johnson & Johnson	Sanftes wasch peeling
Neutrogena	Johnson & Johnson	Pink grapefruit tägliches peeling
Nivea	Beiersdorf Global AG	Men's Deep Cleansing Face Scrub For Normal Skin
Nivea	Beiersdorf Global AG	Daily Essentials Skin Refining Scrub
Nivea	Beiersdorf Global AG	Aqua Effect Verfrissende Peeling
Nivea	Beiersdorf Global AG	Pflege Dusche Peeling Creme Peeling
Nivea	Beiersdorf Global AG	Gommage Lissant Doux



THIS WEEK

EDITORIALS

STEM CELLS Curtain comes down on scientific controversy p.426

WORLD VIEW End the unfair racket of academic jobs for the boys p.427



DECEPTION Orchid shape and smell fools amorous wasps p.429

In the name of beauty

The ugly truth is that the plastic microbeads found in many skin scrubs and other personal-care products are a serious pollutant of the marine environment. They should be phased out rapidly.

A beautiful woman comes into focus. What makes her skin glow so? Why, she says, she uses Aveeno's Positively Radiant skin-brightening daily scrub for "naturally beautiful results".

What is not clear from this advertisement is that the "gentle exfoliators" in the product promoted by Jennifer Aniston are minuscule beads of plastic. When Aniston, or those she inspires to follow her, rinse the scrub down the drain, many of the beads end up in the sea, where they will persist indefinitely. This is unnecessary, damaging and must stop.

Others agree, and the face scrub, along with hundreds of other products, including toothpastes, may not be long for this world. On 10 September, the California Legislature sent a bill (AB 888) to the state's governor, Jerry Brown, that would ban the inclusion of spheres of polyethylene, polypropylene and other plastics less than 5 millimetres across in personal-care products after 2020.

If signed into law, the bill will prevent trillions of plastic beads from being rinsed down the drain. Not all of these make it to the sea — wastewater treatment plants can sift out 90% of them — but the problems caused by the remaining millions are considerable. (Meanwhile, beads trapped in 'sludge' at the plants do not disappear. Plenty are sprayed on crops, from where they escape to rivers and lakes.)

In a paper published on 3 September, aquatic-health researcher Chelsea Rochman at the University of California, Davis, and her colleagues estimate that 8 trillion microbeads per day are emitted into

While bans and phase-outs slowly take effect, the Beat the Microbead campaign, funded by Dutch non-governmental organizations the Plastic Soup Foundation and the North Sea Foundation, has created an app for consumers who want to avoid contributing to the problem. A few clicks can confirm whether the tempting scrub in the pharmacy aisle contains the beads. This is helpful in the short term, but ultimately the onus of responsibility should not be on the consumer.

"No luminous complexion is worth the wholesale pollution of Earth's oceans."

Microbeads are not the only source of microplastic in the oceans. Tiny plastic pellets used in making plastic items spill into the sea; plastic bags and bottles break down over time. On almost any beach on Earth, the sand carries tiny, bright grains of plastic.

And macroplastics remain a serious problem. A study published last month estimated that around 90% of seabirds have plastic in their bellies (C. Wilcox *et al. Proc. Natl Acad. Sci. USA* <http://doi.org/7dv>; 2015). Some birds mistake shopping bags for jellyfish; others confuse cigarette lighters and pen caps with prey and fly home to feed them to their chicks.

The consequences of this ubiquitous plastic for marine species, marine ecosystems and human health remain areas of active research. But the public and policymakers need not wait for detailed results before taking action. Banning microbeads will not solve the plastic-pollution problem, but it is an easy start. Jennifer Aniston and the

EDITORIAL

In the

The ugly truth
products are a

A beautiful woman so? Why, she is brightening her skin. What is not clear is the 'exfoliators' in the products. The beads of plastic. When you rinse the scrub down the drain, where they will persist for years must stop.

Others agree, and many products, including those sold on 10 September, the California state's governor, Jerry Brown, polyethylene, polypropylene across in personal-care products.

If signed into law, the beads being rinsed down the drain water treatment plants. The problem caused by the remaining beads trapped in 'sludge' at the treatment crops, from where they are

In a paper published by Chelsea Rochman at the University of California, Berkeley, the leagues estimate that

No more plastic in shower gels and face scrubs: Cosmetics firms pledge to remove harmful microbeads to protect the oceans

- Cosmetics Europe has recommended its members discontinue the use of microbeads in wash-off products like face scrubs and shower gels by 2020
- The organisation represents 4,000 makers of personal care products
- Experts say the plastic gets into the oceans where it harms sea life
- It follows bans on microbeads in cosmetics by nine states in the US

By RICHARD GRAY FOR MAILONLINE

PUBLISHED: 11:48 GMT, 30 October 2015 | UPDATED: 13:07 GMT, 30 October 2015



Share



2.9k shares

20 View comments

Tiny plastic beads used in face scrubs, shower gels and toothpastes are to be phased out by the cosmetics industry in an attempt to protect ocean life.

Cosmetics Europe, which represents more than 4,000 personal care product manufacturers, has issued a recommendation to remove microbeads from cosmetics.

It follows sustained campaigning by environmental groups and research showing the tiny fragments of plastic can now be found in almost every habitat on the planet.

Scroll down for video



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Now that's a roll in the hay! Corn from latex and GRASS are thinner than human hair but still...

Twitter announces 'trust & safety' with over 40 organisations to help on trolls

Can YOU name the former US



- HOME
- PRODUCT LISTS
- LOOK FOR THE ZERO
- STRATEGY
- RESULTS

Results so far

Check out our timeline to find out what public and political actions have been done to put a halt on the use of microplastic ingredients in cosmetics.

2017

JANUARY

The New Zealand Minister for the Environment Nick Smith has announced a ban on the sale of personal care products containing microbeads from 1 July 2018.

Italian NGO Marevivo proposed a law at the Italian Parliament, demanding a complete ban concerning the use of microplastics in cosmetic products by 2019.

FEBRUARY

The minister for local government in Ireland, Simon Coveney, is set to initiate a six-week public consultation on a proposed legislative ban on specific products that contain plastic microbeads.

We launched our social media campaign #NOPLASTICSINCOSMETICS. We had an overall reach of 1,089,348 on Twitter for all the tweets we posted. On Facebook, we reached about 68,740 people altogether through our Beat the Microbead page.

MARCH

Norwegian Climate and Environment Minister, Vidar Helgesen asked the Environment Directorate for a report on a series of new measures to reduce marine litter and microplastics.

APRIL

Authorities in India have passed a resolution upon the directions from the National Green Tribunal, to ban use of microbeads in all forms of cosmetics.

AUGUST

Taiwan to ban all cosmetic products that contain microbeads from July 2018





8. ZÁŘÍ 2017 13:46 | LIDOVKY.CZ > RELAX > ZDRAVÍ

Většina kohoutkové vody je znečištěna plastovými částicemi, zjistili vědci



KOHOUTKOVÁ VODA - ILUSTRÁČNÍ FOTO. | FOTO: SHUTTERSTOCK

PRAHA Vědci ve více než deseti zemích po celém světě přišli na znečištění kohoutkové vody mikročásticemi. Při průzkumu vedeném serverem Orb Media výzkumníci narazili na stopy plastu průměrně v 83 procentech zkoumaných vzorků. Jaký dopad pro lidské zdraví může kontaminace mít, zatím není jisté.

Největší míru znečištění, 94 procent zkoumaných vzorků, odborníci našli v USA. Nejlépe je na tom Evropa, tam výzkumníci našli stopy plastu v „pouze“ 74 procentech. Průměrný počet plastových vláken v 500mililitrovém vzorku se pohyboval mezi 1,0 v Evropě a 4,8 v USA.





Oázy života

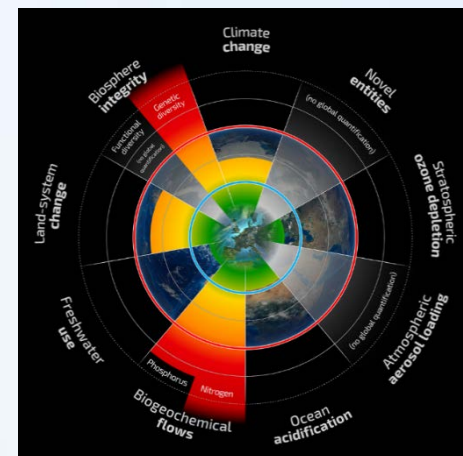
„For some microbes, plastic is the equivalent of a hotel buffet table. Any hard surface in the ocean becomes a collection plate for nutrients...“



X. Emise atmosférických aerosolů

Earth System process	Control variable	Threshold avoided or influenced by slow variable	Planetary Boundary (zone of uncertainty)	State of knowledge*
Atmospheric aerosol loading	Overall particulate concentration in the atmosphere, on a regional basis	Disruption of monsoon systems. Human-health effects. Interacts with climate change and freshwater boundaries.	To be determined	1. Ample scientific evidence. 2. Global threshold behavior unknown. 3. Unable to suggest boundary yet.

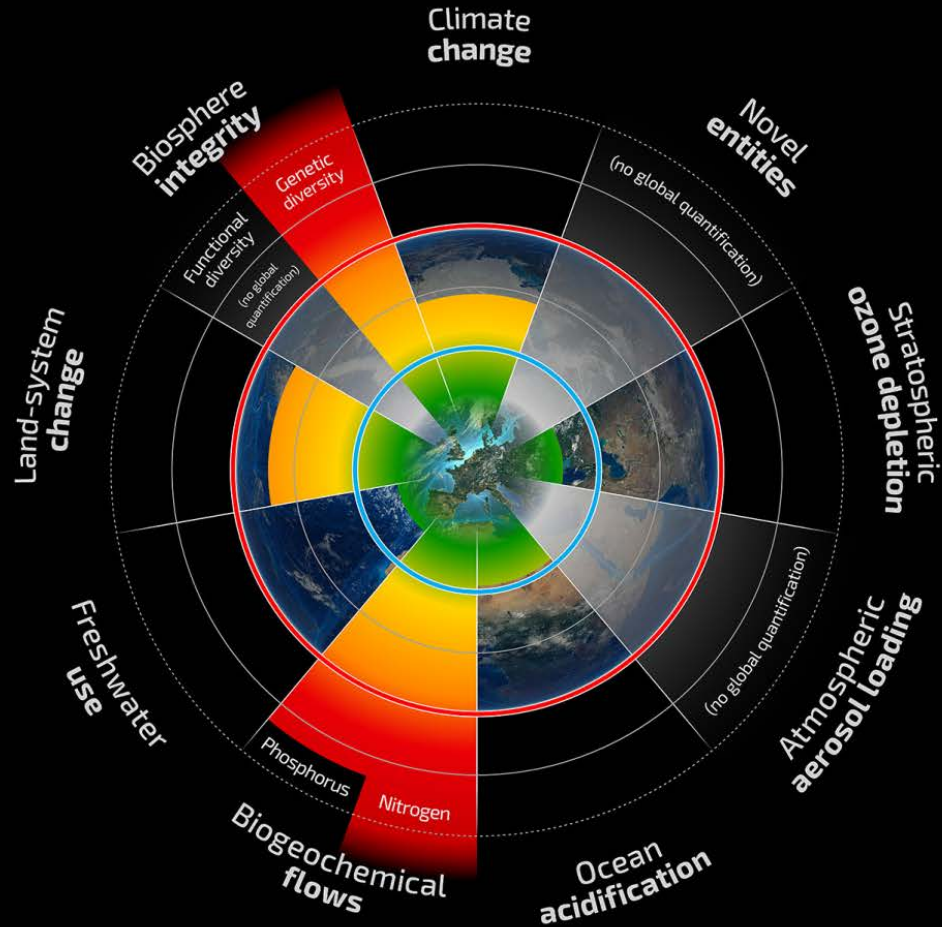
Boundary: Not yet identified



Překročení hranic?

Planetary Boundaries

A safe operating space for humanity



- Beyond zone of uncertainty (high risk)
- In zone of uncertainty (increasing risk)
- Below boundary (safe)
- Boundary not yet quantified




Centrum pro výzkum
toxických látek
v prostředí

Emise atmosférických aerosolů - důsledky

- 1) **Ovlivnění klimatického systému**
- 2) **Škodlivé účinky na lidské zdraví**

ad 1) globální koncentrace aerosolů je od prům. rev. dvojnásobná
aerosoly ovlivňují:

- radiační rovnováhu planety
zvýšeným odrazem do vesmíru
- hydrologický cyklus změnou
mechanizmu tvorby srážek
- **cirkulaci asijských monzunů**
 - aerosoly nad Indo-Ganžskou plání více zahřívají
atmosféru, zatímco dochází k ochlazování povrchu
 - dochází tak k posunu srážek do oblasti Himalájí a
změnu časového rozvržení



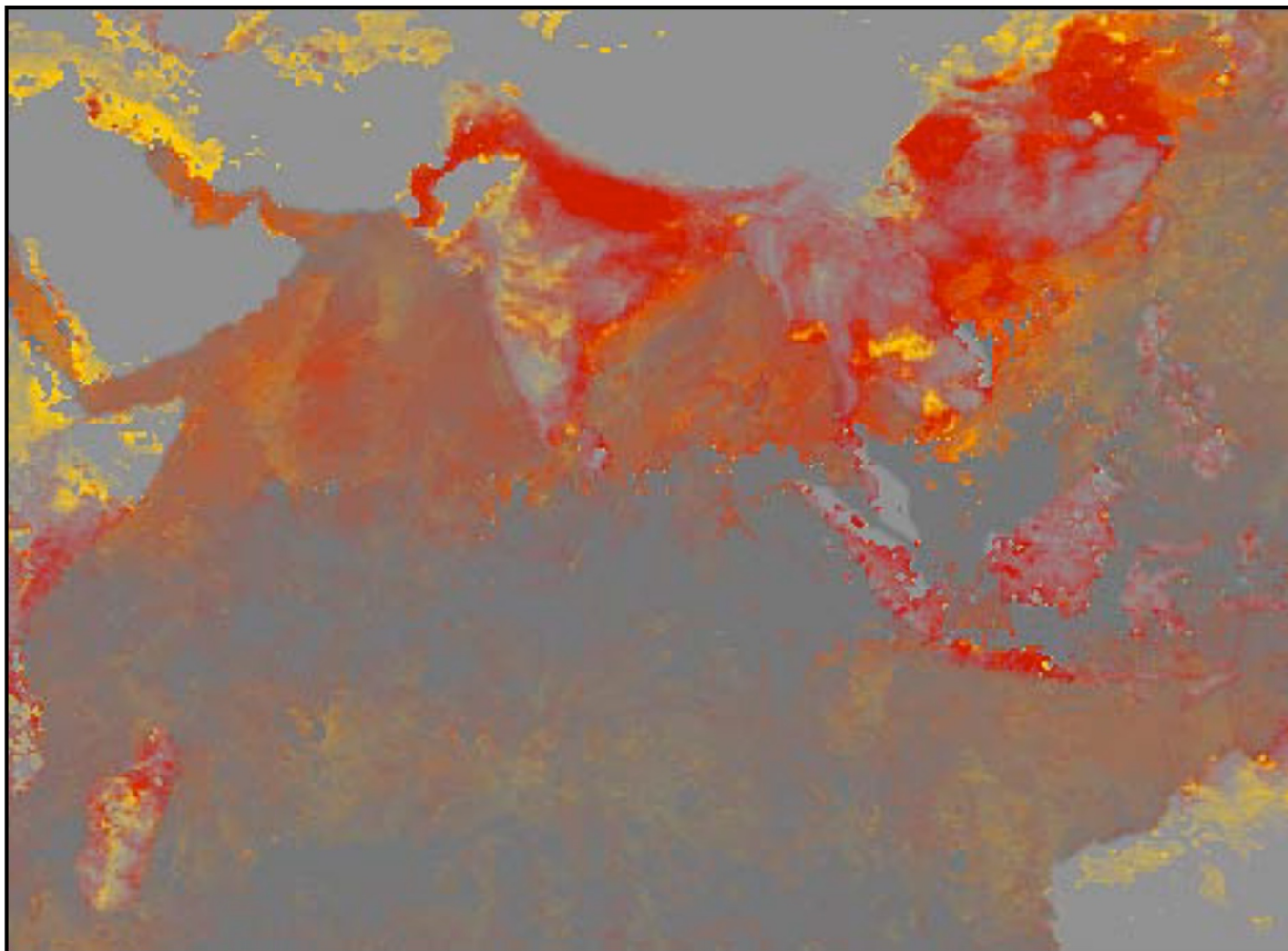
The screenshot shows the NewScientist website interface. At the top, there is a navigation bar with 'NewScientist' and 'Environment' logos. Below this is a secondary navigation bar with links for 'Home', 'News', 'In-Depth Articles', 'Blogs', 'Opinion', 'TV', 'Galleries', and 'Topic G'. A third navigation bar contains category buttons: 'SPACE', 'TECH', 'ENVIRONMENT' (highlighted in orange), 'HEALTH', 'LIFE', and 'PHYSICS&MA'. The main content area features the article title 'Air pollution is stunting India's monsoon' with a sub-header '12:16 30 September 2011 by Michael Marshall' and a link to a 'Climate Change' topic guide. The article text discusses the impact of air pollution on the Indian monsoon, mentioning that it has been drying out for half a century and that emissions are a contributing factor. It also quotes Yi Ming of Princeton University, who used climate models to assess the factors affecting the monsoon. The text concludes by explaining that the monsoon is brought by large-scale wind patterns that transport heat between the northern and southern hemispheres.

Znečištění atmosféry nad indickým oc.

8-12.12. 2004

zlatá barva – větší částice (písek, soli)

červená barva – menší částice (spalování fosilních paliv či vegetace)



Znečištění atmosféry pod Himalájemi

7.11.2007

smog nad Pákistánem a Indií



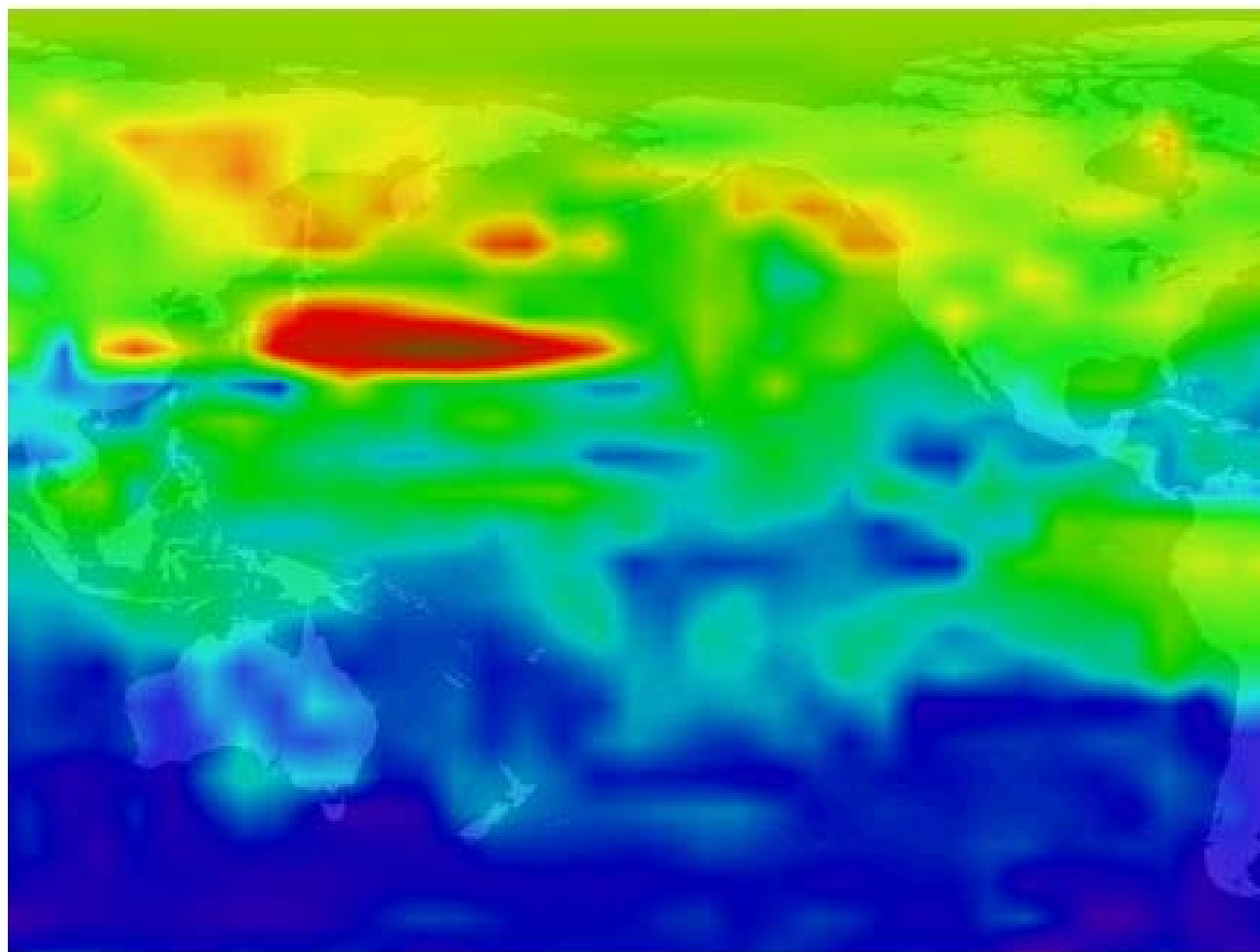
16.12.2004

smog nad tokem Gangy



Globální přenos znečištění

přenos oblaku CO z Číny do USA – květen 2000



(b) March 12, 2000

Emise atmosférických aerosolů - důsledky

1) *Ovlivnění klimatického systému*

2) *Škodlivé účinky na lidské zdraví*

ad 2) částice PM_{2,5} zodpovídají za:

- 3 % úmrtí na kardiovaskulární choroby
- 5 % tracheální, bronchiální a plicní rakoviny
- 1% úmrtí akutních respiračních onemocnění dětí

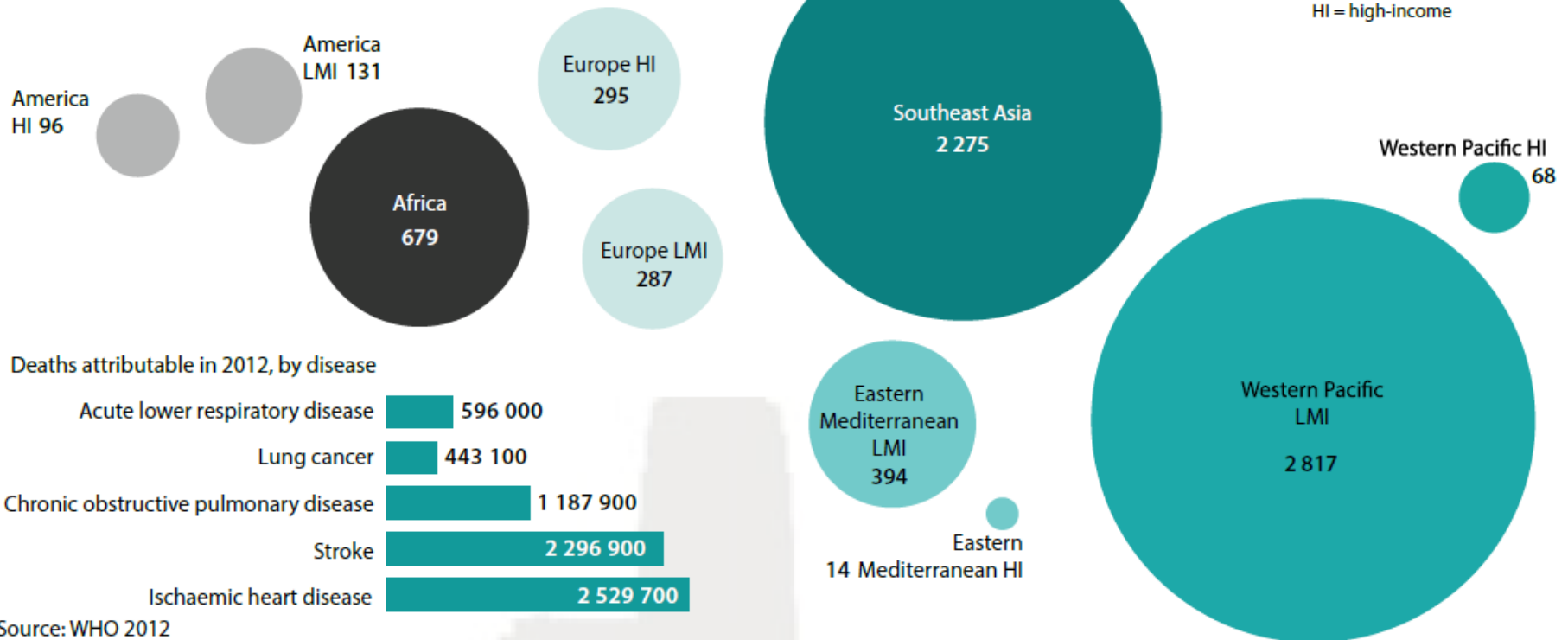
- $0,8 \cdot 10^6$ předčasných úmrtí/rok kvůli průmyslovému zneč.
- $1,6 \cdot 10^6$ předčasných úmrtí/rok kvůli vnitřnímu zakouření
- $0,3 \cdot 10^6$ předčasných úmrtí/rok prašností v povolání
 - většina případů v rozvojových Asijských zemích

UNEP Year Book 2014 emerging issues update

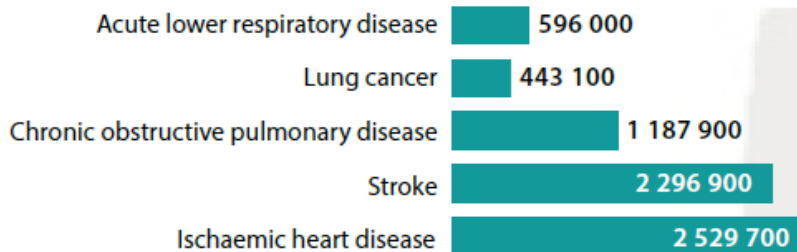
Air Pollution: World's Worst Environmental Health Risk

Choking to death

Deaths attributable to the joint effects of household and ambient air pollution in 2012, by region ('000)



Deaths attributable in 2012, by disease



Source: WHO 2012

Pollution linked to one in six deaths

By Katie Silver
Health reporter, BBC News

🕒 20 October 2017 | [Health](#) | 📄 203

[f](#) [🐦](#) [💬](#) [✉️](#) [Share](#)



Pollution has been linked to nine million deaths worldwide in 2015, a report in [The Lancet](#) has found.

Almost all of these deaths occurred in low- and middle-income countries, where pollution could account for up to a quarter of deaths. Bangladesh and Somalia were the worst affected.

Air pollution had the biggest impact, accounting for two-thirds of deaths from pollution.

Brunei and Sweden had the lowest numbers of pollution-related deaths.

Most of these deaths were caused by non-infectious diseases linked to pollution, such as heart disease, stroke and lung cancer.

Pollution linked to one in six deaths

By Katie Silver
Health reporter, BBC News

🕒 20 October 2017 | Health | 📄 203



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Pollution

is the world's largest environmental cause of disease and premature death

Pollution disproportionately kills the poor and the vulnerable.

Nearly **92 percent** of pollution-related deaths occur in **low-income and middle-income countries**. Children face the highest risks because small exposures to chemicals in utero and in early childhood can result in lifelong disease, disability, premature death, as well as reduced learning and earning potential.

In 2015, diseases caused by pollution were responsible for **9 million premature deaths**. That is **16 percent** of all global deaths.

Exposures to contaminated air, water and soil kill more people than a high-sodium diet, obesity, alcohol, road accidents, or child and maternal malnutrition. They are also responsible for three times as many deaths as AIDS, tuberculosis, and malaria combined, and for nearly 15 times as many deaths as war and all forms of violence.

Air pollution and climate change are closely linked and share common solutions. Fossil fuel combustion in higher-income countries and the burning of biomass in lower-income countries accounts for 85 percent of airborne particulate pollution.

The cost of inaction is high, while solutions yield enormous economic gains. Welfare losses due to pollution are estimated at **\$4.6 trillion per year** — **6.2 percent of global economic output**. In the United States, investment in pollution control has returned \$200 billion each year since 1980 (\$6 trillion total). The claim that pollution control stifles economic growth and that poor countries must pollute to grow is false.

Major emitters of carbon dioxide are coal-fired power plants, chemical producers, mining operations, and vehicles. Accelerating the switch to cleaner sources of energy will reduce air pollution and improve human and planetary health.

Pollution is neglected by funding agencies worldwide.

We can all help to make a difference.

- Governments** can integrate pollution challenges and control strategies into planning processes. Ask for support from development assistance agencies. Design and implement programs that reduce pollution, and save lives. End government subsidies and tax breaks for polluting industries.
- International donors, foundations, health professionals, and individuals** should prioritize funding for pollution planning, interventions, and research.
- People affected by pollution** can review data related to toxic exposures in their neighborhood and connect with help by visiting www.pollution.org

Infographic © 2017 Mount Sinai Health System

Jak se k této situaci postavit?



It looks like an oxymoron, but Earth optimism is worth a try

Decades of environmental doom-mongering have fallen on deaf ears. Maybe a new environmental campaign with a message of hope is just what we need





FEATURE 11 October 2017

Is positive thinking the way to save the planet?

Move over doom and gloom, there is a new environmental movement in town. Earth optimists say focusing on small successes is the way forward



Jak se k této situaci postavit?

