Jak se dnes máte? (... a proč?)

Nobody has responded yet.

Hang tight! Responses are coming in.

MUNI | RECETOX

Úvod do problému chemického znečištění

Jakub Hofman

Seminář
9.10.2023

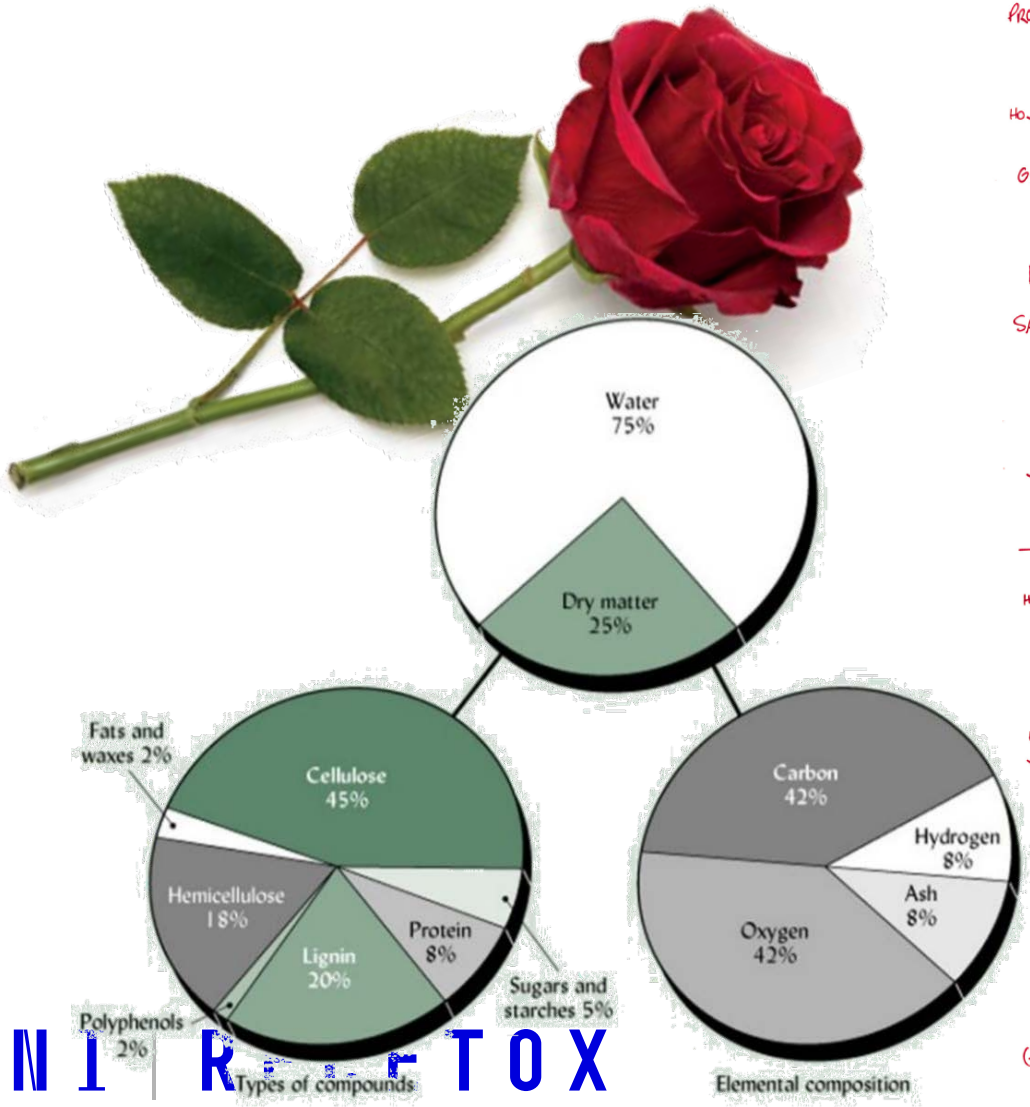
člověk → chemické látky
chemické látky → člověk

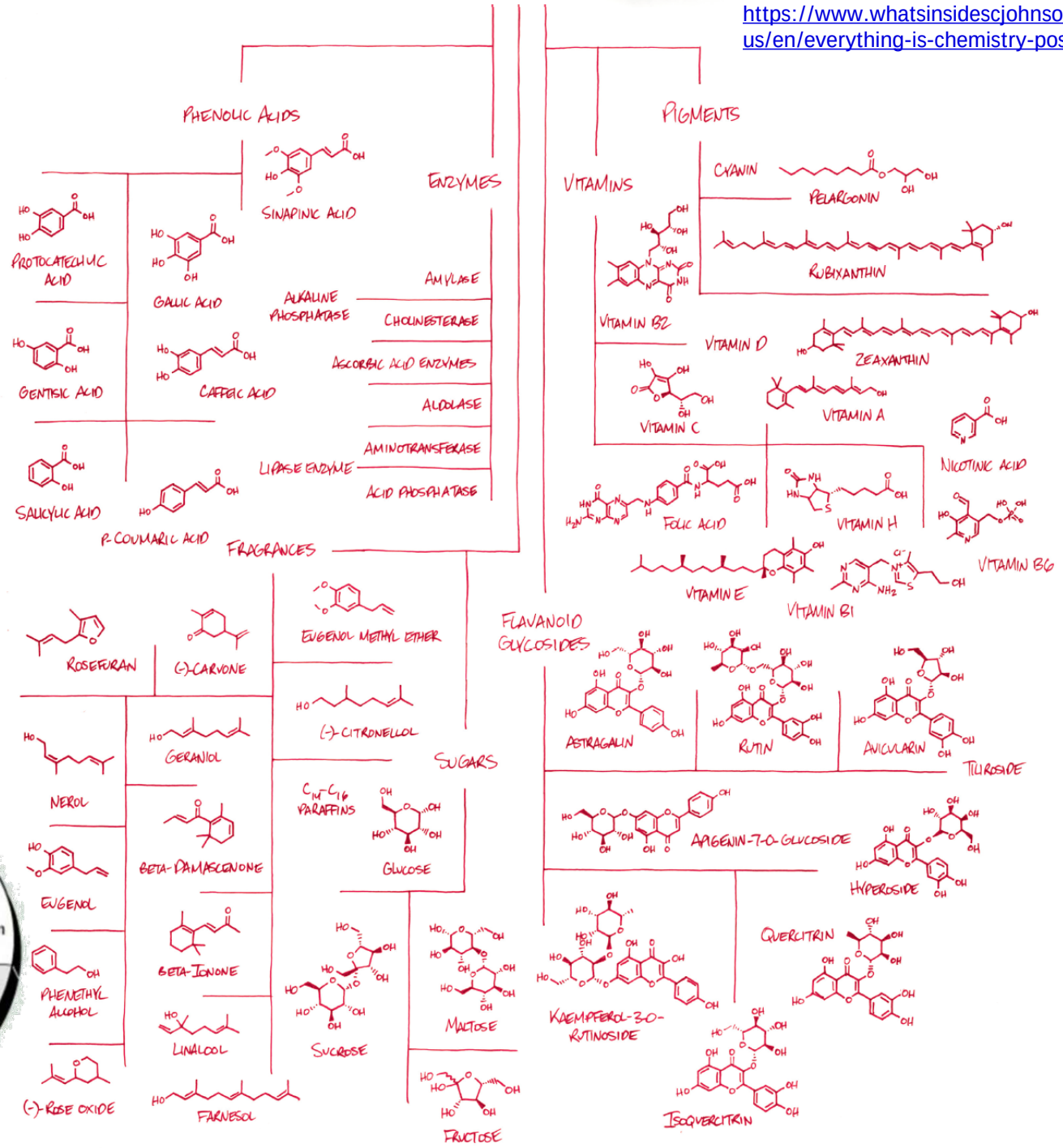
www.PollEv.com/lindan443

Je všechno kolem nás JEN chemie ?

Všechno kolem nás je chemie ... (?)

https://www.whatsinsidescjohnson.com/us/en/everything-is-chemistry-posters





Chemické látky

www.PollEv.com/lindan443

When poll is active, respond at **pollev.com/lindan443**

Kolik (řádově) chemických látek zná lidstvo?

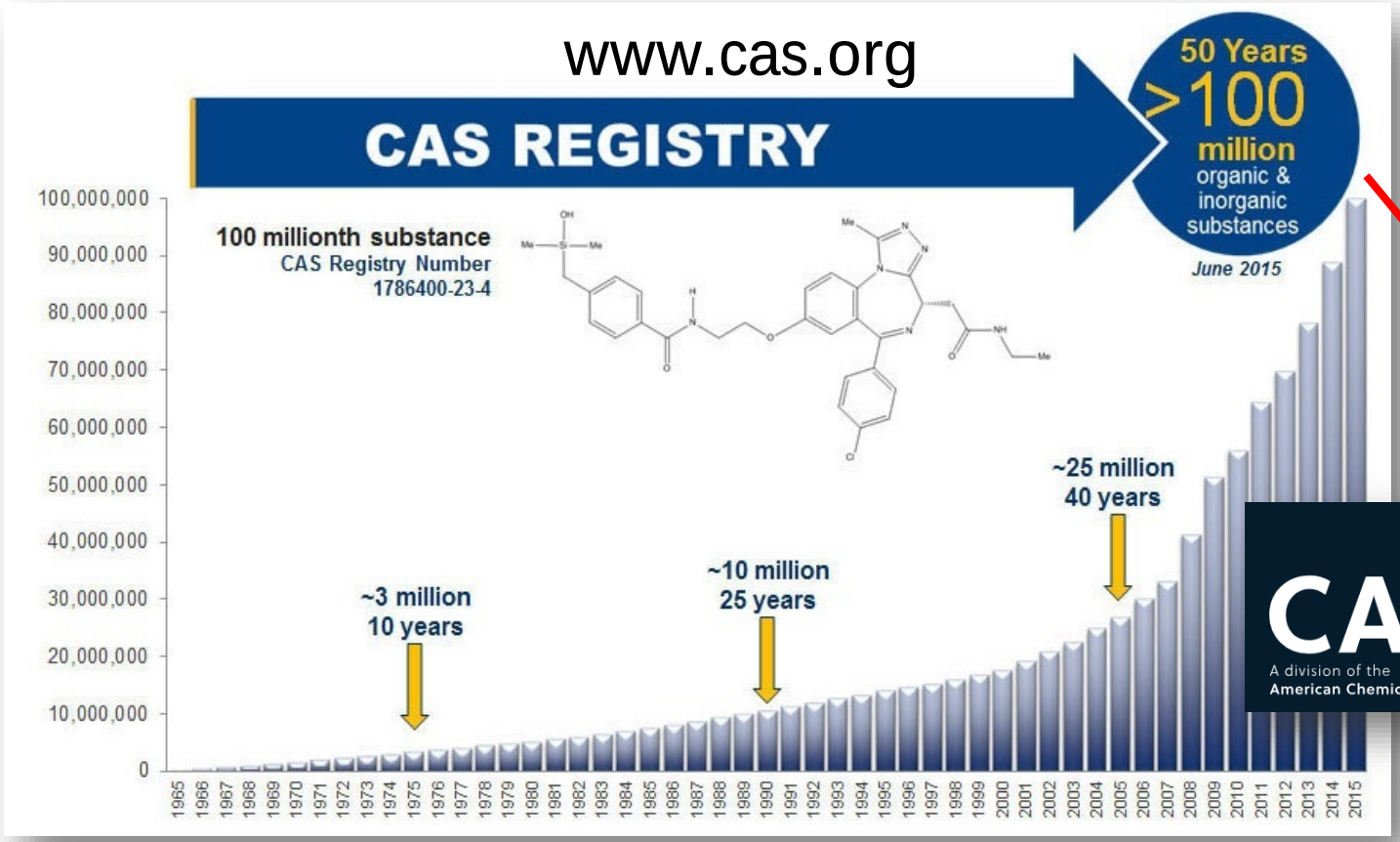
- deset tisíc
- sto tisíc
- milion
- deset milionů
- sto milionů
- ani jedna odpověď není správně

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

Chemické látky

- **svět kolem nás = chemie** (známe > 100 mil. chemických látek)

www.cas.org



CAS
A division of the
American Chemical Society

CAS DATA

The largest human-curated collection of scientific data in the world, the CAS Content Collection, underpins all of our solutions and relevant data that can be licensed for machine learning and in-house workflow integration.

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CAS Refe

Insights fro of publishe literature

The CAS refer aggregates a knowledge fr journals and published glo languages da 1800s.

Chemické látky

www.PollEv.com/lindan443

When poll is active, respond at **pollev.com/lindan443**

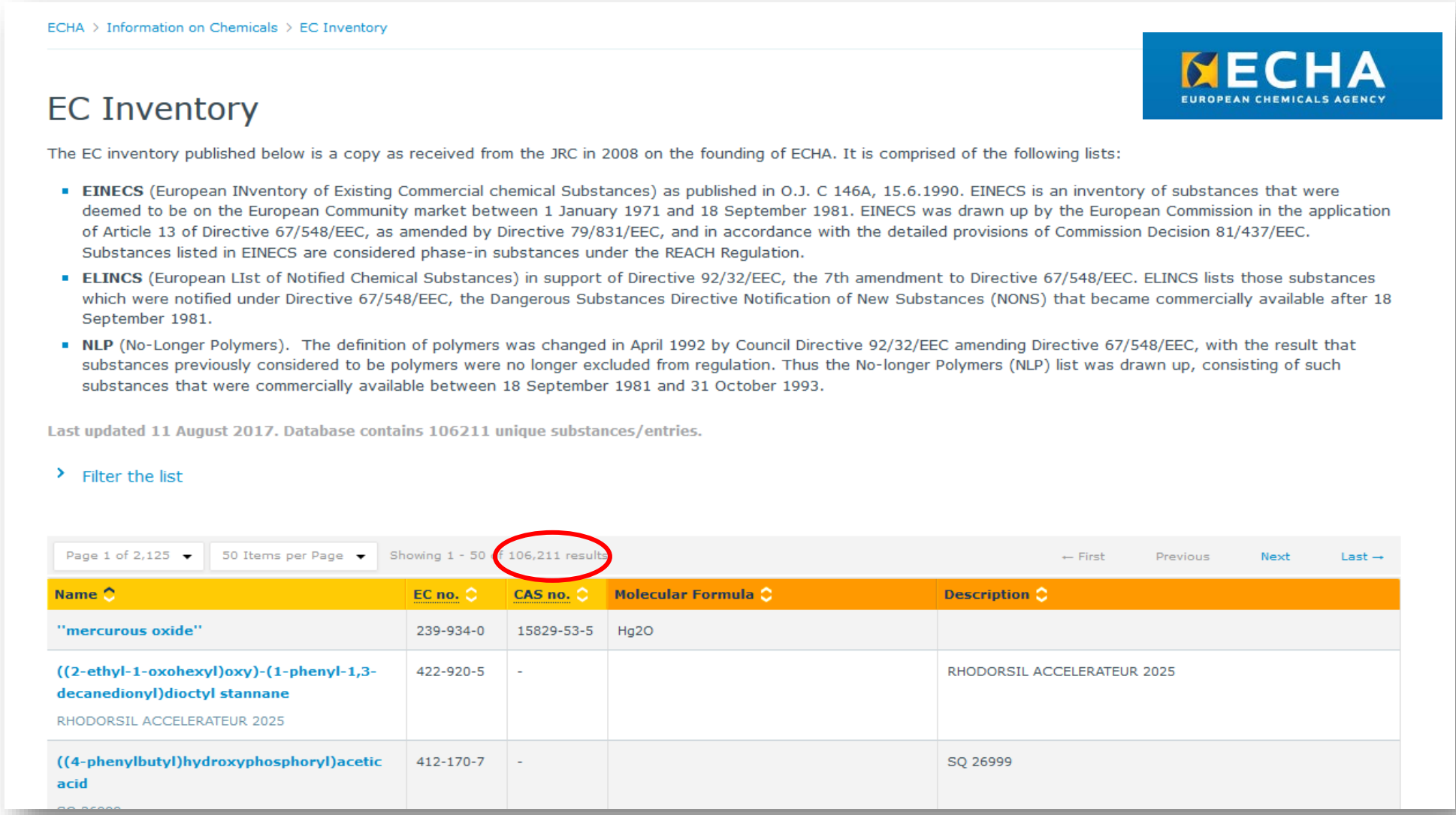
Kolik chemických látek (řádově) vyrábíme a používáme?

- sto
- tisíc
- deset tisíc
- sto tisíc
- milion
- ani jedna odpověď není správně

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

Chemické látky

- lidstvo v rámci svých aktivit vyrábí a používá > 100 000 látek



ECHA > Information on Chemicals > EC Inventory

EC Inventory

The EC inventory published below is a copy as received from the JRC in 2008 on the founding of ECHA. It is comprised of the following lists:

- **EINECS** (European INventory of Existing Commercial chemical Substances) as published in O.J. C 146A, 15.6.1990. EINECS is an inventory of substances that were deemed to be on the European Community market between 1 January 1971 and 18 September 1981. EINECS was drawn up by the European Commission in the application of Article 13 of Directive 67/548/EEC, as amended by Directive 79/831/EEC, and in accordance with the detailed provisions of Commission Decision 81/437/EEC. Substances listed in EINECS are considered phase-in substances under the REACH Regulation.
- **ELINCS** (European LIst of Notified Chemical Substances) in support of Directive 92/32/EEC, the 7th amendment to Directive 67/548/EEC. ELINCS lists those substances which were notified under Directive 67/548/EEC, the Dangerous Substances Directive Notification of New Substances (NONS) that became commercially available after 18 September 1981.
- **NLP** (No-Longer Polymers). The definition of polymers was changed in April 1992 by Council Directive 92/32/EEC amending Directive 67/548/EEC, with the result that substances previously considered to be polymers were no longer excluded from regulation. Thus the No-longer Polymers (NLP) list was drawn up, consisting of such substances that were commercially available between 18 September 1981 and 31 October 1993.

Last updated 11 August 2017. Database contains 106211 unique substances/entries.

Filter the list

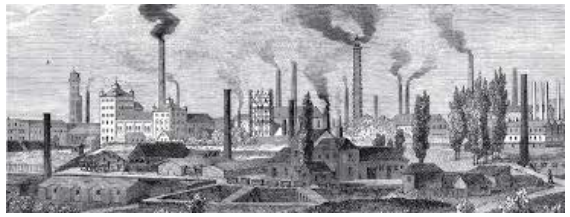
Page 1 of 2,125 | 50 Items per Page | Showing 1 - 50 of 106,211 results | ← First | Previous | Next | Last →

Name	EC no.	CAS no.	Molecular Formula	Description
''mercurous oxide''	239-934-0	15829-53-5	Hg2O	
((2-ethyl-1-oxohexyl)oxy)-(1-phenyl-1,3-decanedionyl)dioctyl stannane RHODORSIL ACCELERATEUR 2025	422-920-5	-		RHODORSIL ACCELERATEUR 2025
((4-phenylbutyl)hydroxyphosphoryl)acetic acid	412-170-7	-		SQ 26999

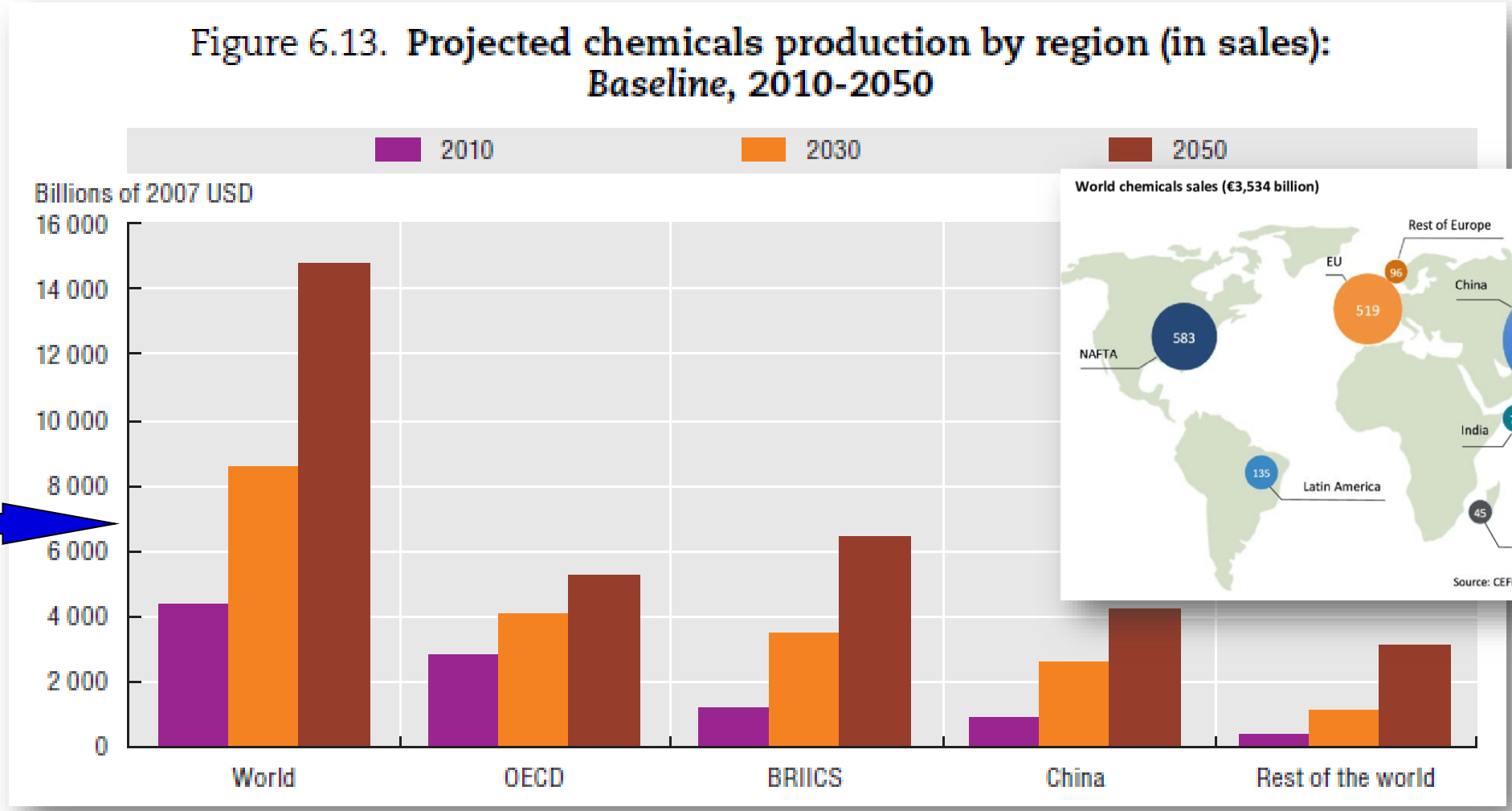
https://echa.europa.eu/cs/information-on-chemicals/ec-inventory

Člověk vždy používal ChL, produkoval odpad a čelil následkům

- skládky odpadů známé již ze starověku
- olověná potrubí v římském impériu
- **průmyslová revoluce** - drastický nárůst produkce ChL a produkce odpadu
- polovina 18. století – znečištění ovzduší, londýnský smog, nemoci
- začátek 19. století – zpracování nafty, produkce organických chemikálií, umělá hnojiva, olovo do benzínu, kovy v elektronice
- polovina 19. století – boom pesticidů - **green revolution**
- od 60. let – zlepšení nakládání s odpady, legislativa
- od 70. a 80. let environmentální legislativa, regulace ChL
- produkce ChL a odpadu stále roste s růstem populace a GDP



Produkce chemických látek roste



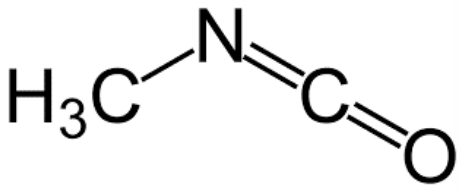
současnost

OECD (2012)

Bhopal

https://www.csfd.cz/film/253347-bhopal-modlitba-za-dest

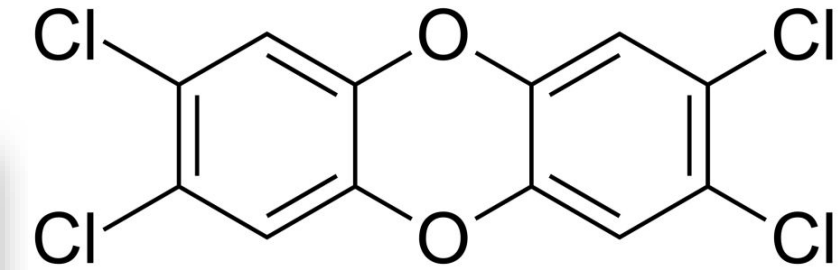
- továrna společnosti Union Carbide, výroba pesticidů pro Indii
- 2-3.12.1984 havárie zásobníku methylisokyanátu
- mrak vysoce toxického plynu těžšího než vzduch – MIC, CO, NOx, HCN, MMA, CO_2, $COCl_2$ ... (~ 42 tun)
- > 8000 úmrtí během týdne
- 100-200 tisíc osob s trvalými zdravotními následky



Eckerman (2005)

Seveso

- 10.7.1976 únik chemikálií z továrny na výrobu pesticidů
- cca 6 tun chemikálií s cca 1 kg 2,3,7,8-TCDD (LD50 0,6 µg/kg !!)
- zamoření oblasti cca 18 km^2
- 37.000 lidí s následky otravy



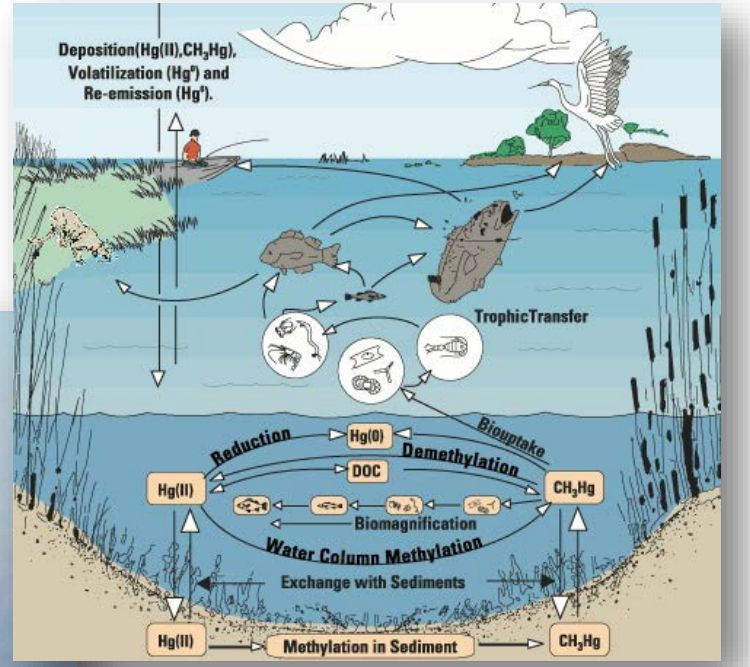
Eskenazi et al. (2018)

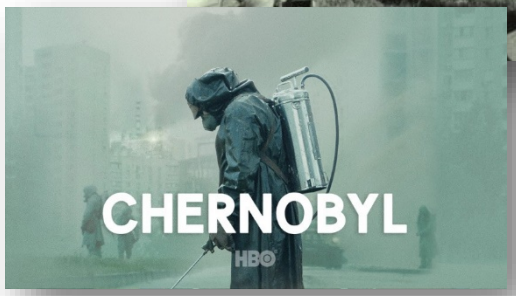
Další chemické katastrofy

- Minamata 1950’s
- Love Canal 1950’s
- Agent Orange 1961-71
- Chernobyl 1986
- Exxon Valdez 1989
- Gulf war 1991
- Deepwater Horizon 2010
- Fukushima 2011

- desítky dalších ...

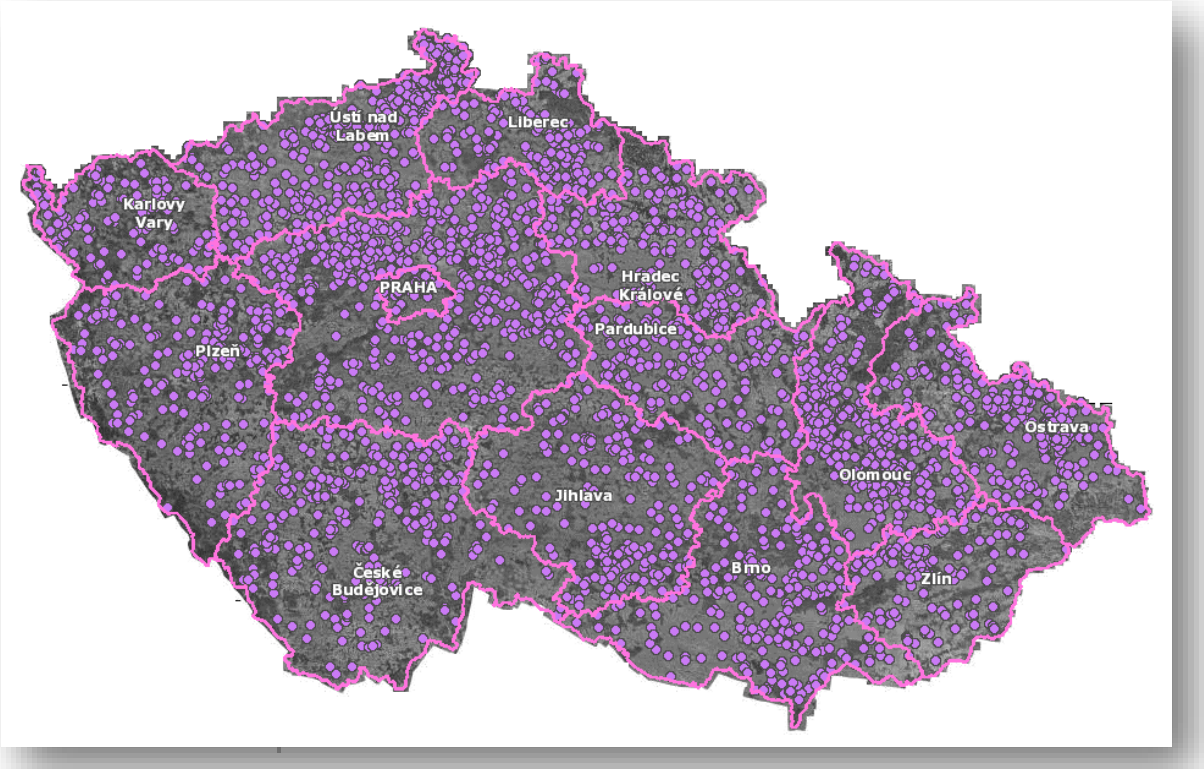
https://en.wikipedia.org/wiki/List_of_industrial_disasters

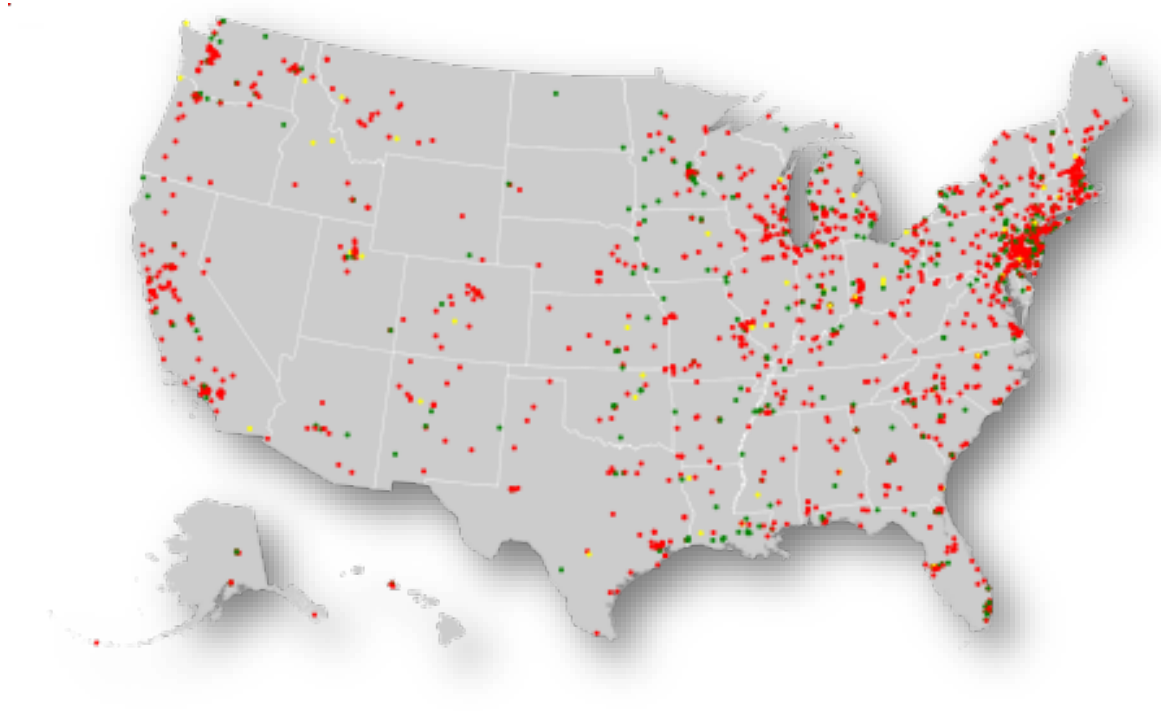




nejen katastrofy ... kontaminovaná místa

- v EU až 3,5 mil kontaminovaných míst, 0,5 mil vážně
- v ČR kolem 10 tisíc kontaminovaných míst http://www.sekm.cz/
- USA – superfund sites
- ...





nejen katastrofy ... kontaminovaná místa

Blacksmith Institute (2006)

https://www.thoughtco.com/worst-polluted-places-on-earth-1204101
https://www.livescience.com/30353-most-polluted-places-earth.html
https://www.scientificamerican.com/slideshow/10-most-polluted-places-in-the-world/

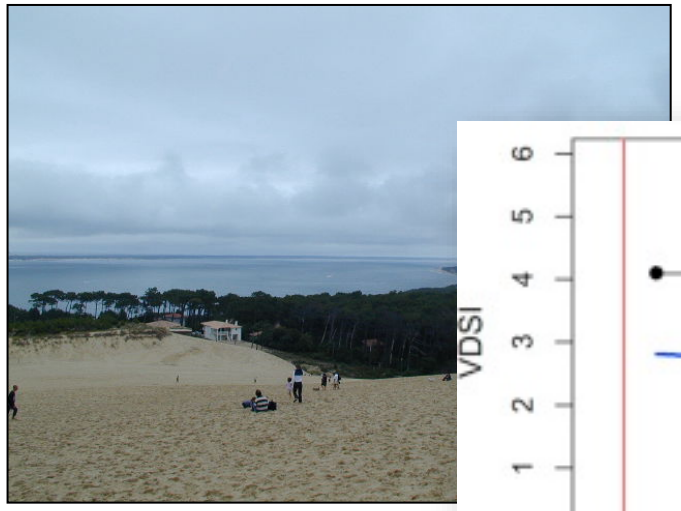
... žel management při chemických katastrofách někdy připomíná tuto parodii ...

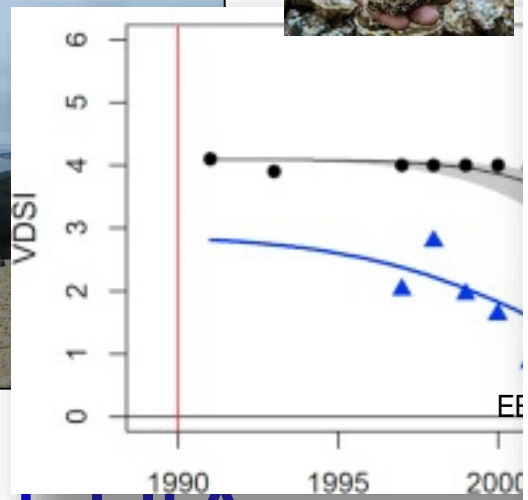
https://www.youtube.com/watch?v=2AAa0gd7CIM

nejen katastrofy ...

Tributylcín

- biocid, široké využití, ná
- uvolnění do mořských e
- bioakumulace, metaboli
- vliv na hormonální systé



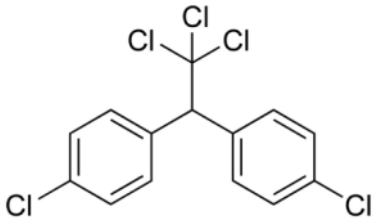


Early 1970s	Rapid increase in the use of TBT antifouling paints on vessels of all sizes and first reports of imposex in marine snails (Blaber, 1970; Smith, 1971)
1976–81	Repeated failure of larval settlement leads to near collapse of oyster fishery, Arcachon Bay, France
1982	France introduces legislation prohibiting the use of TBT paints on small vessels
1985	First controls introduced in United Kingdom limiting concentrations of TBT in paints
1986	Bryan *et al.* (1986) report widespread imposex in dogwhelks on southern coast of United Kingdom, linked to TBT
January 1987	United Kingdom announces further restrictions on TBT content of applied antifouling paint
May 1987	United Kingdom introduces ban on retail sale of TBT paint for use on vessels < 25 m and on fish cages
June 1987	PARCOM Recommendation 87/1 calls for similar ban over entire convention area (Northeast Atlantic)
1988	United States introduces restrictions. Waldock *et al.* (1988) highlight significance of inputs from shipyards
1989	Restrictions introduced in Canada, Australia and New Zealand
1991	Harmonised ban on retail sale of TBT paint introduced at European Union level
1994	Early reports of imposex in whelks from offshore areas of North Sea linked to shipping activity
1995	Ministerial declaration of fourth North Sea conference (Esbjerg) commits to working for global phase-out of TBT paint within IMO
1997	Concept of global phase out of organotin containing paints agreed at MEPC's 40th session
1998	Draft mandatory regulations aimed at such a phase-out adopted. OSPAR (Convention for the Protection of the Marine Environment of the Northeast Atlantic) prioritises organotins for action to cease all releases. Cessation of all releases of organotins to marine environment, under OSPAR's hazardous substances strategy in 2020
November 1999	Deadlines for phase-out adopted under IMO Assembly Resolution A.895(21)
2001	Text of International Convention on the Control of Harmful Anti-fouling Systems to be finalised. In 2003 worldwide prohibition on new application of organotin antifoulants to all vessels and in 2008 the existing organotin antifouling coatings will be replaced on all vessels worldwide

nejen katastrofy ...

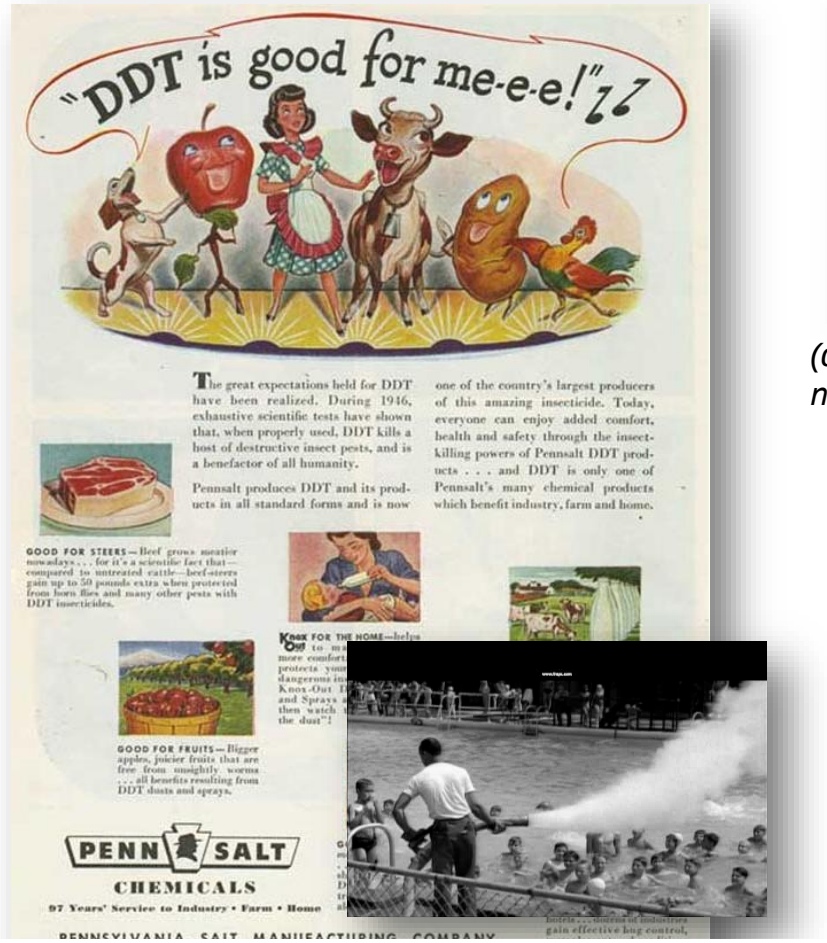
DDT

1874

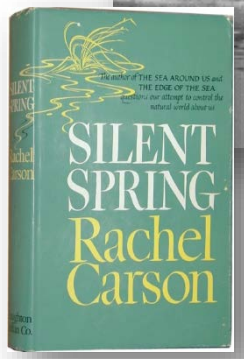


1939

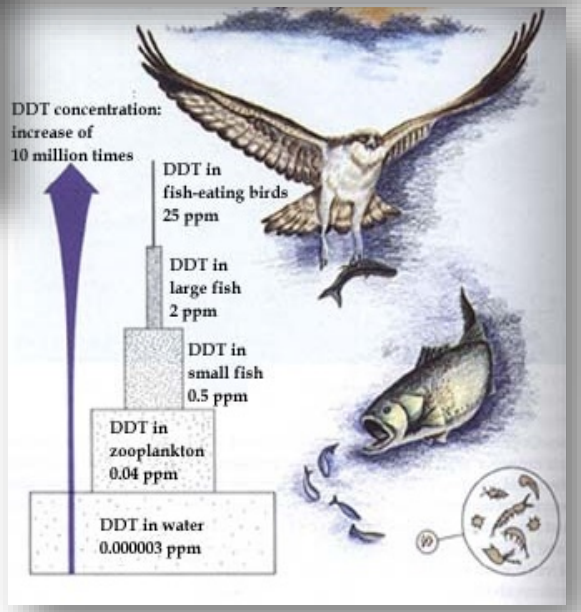
Paul Hermann Muller



1962

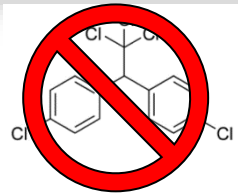


(dostupné např. zde či zde)



1970

1972



výskyt malárie

500 milionů životů

Příběhy - “Late Lessons from Early Warnings”

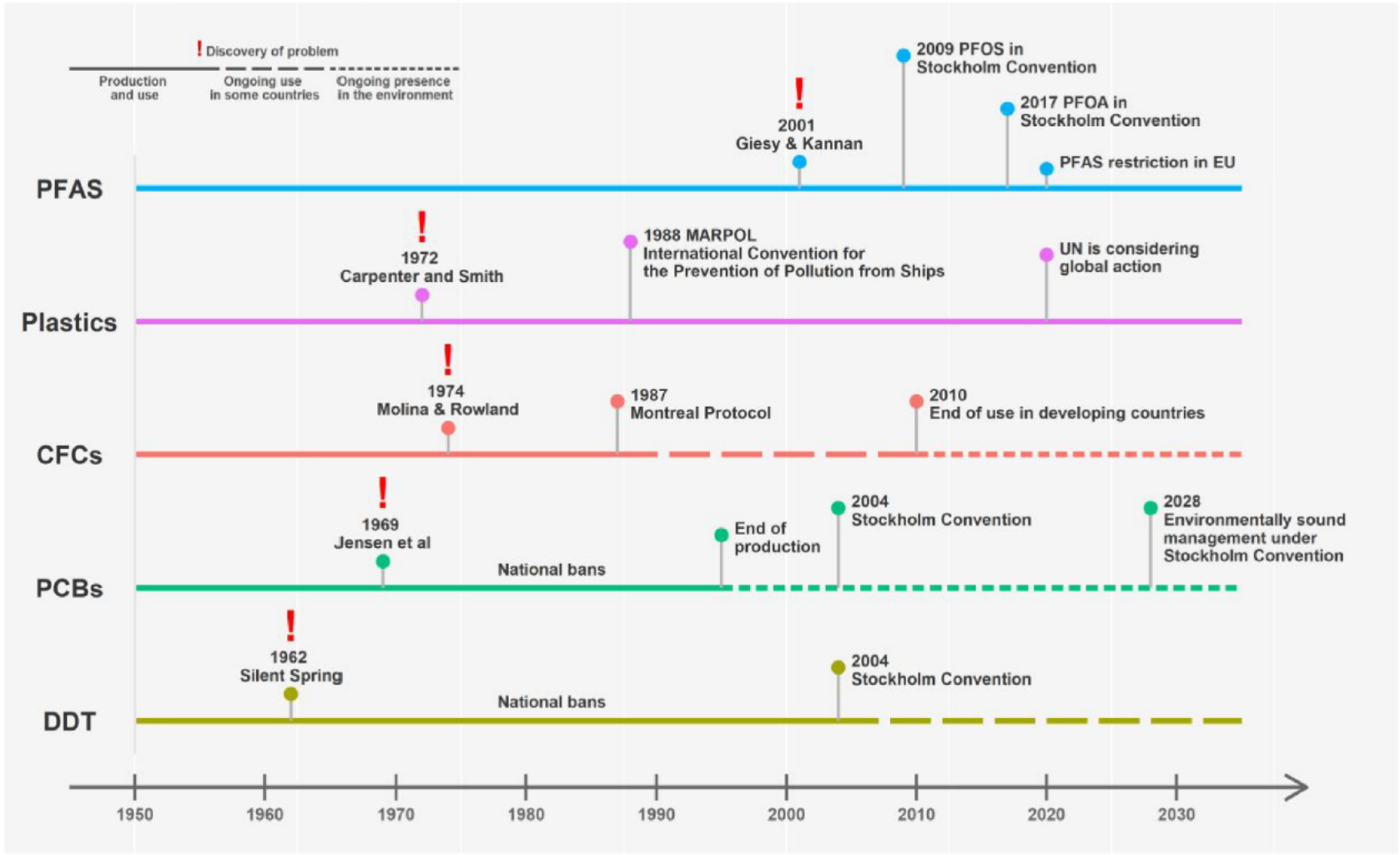
- olovo v benzínu, MTBE v benzínu
- rtuť a minamata
- azbest ve stavebnictví
- tributylcín
- PCBs v průmyslu
- freony a ozonová vrstva
- antibiotika a mikrobiální resistence
- hormony a „jako“-hormony (BPA)
- kauza dietylstilbestrol
- kouření a rakovina
- pesticidy (DDT, neonikotinoidy,)
- ...

2013

2002

https://www.eea.europa.eu/publications/late-lessons-2
https://www.eea.europa.eu/publications/environmental_issue_report_2001_22

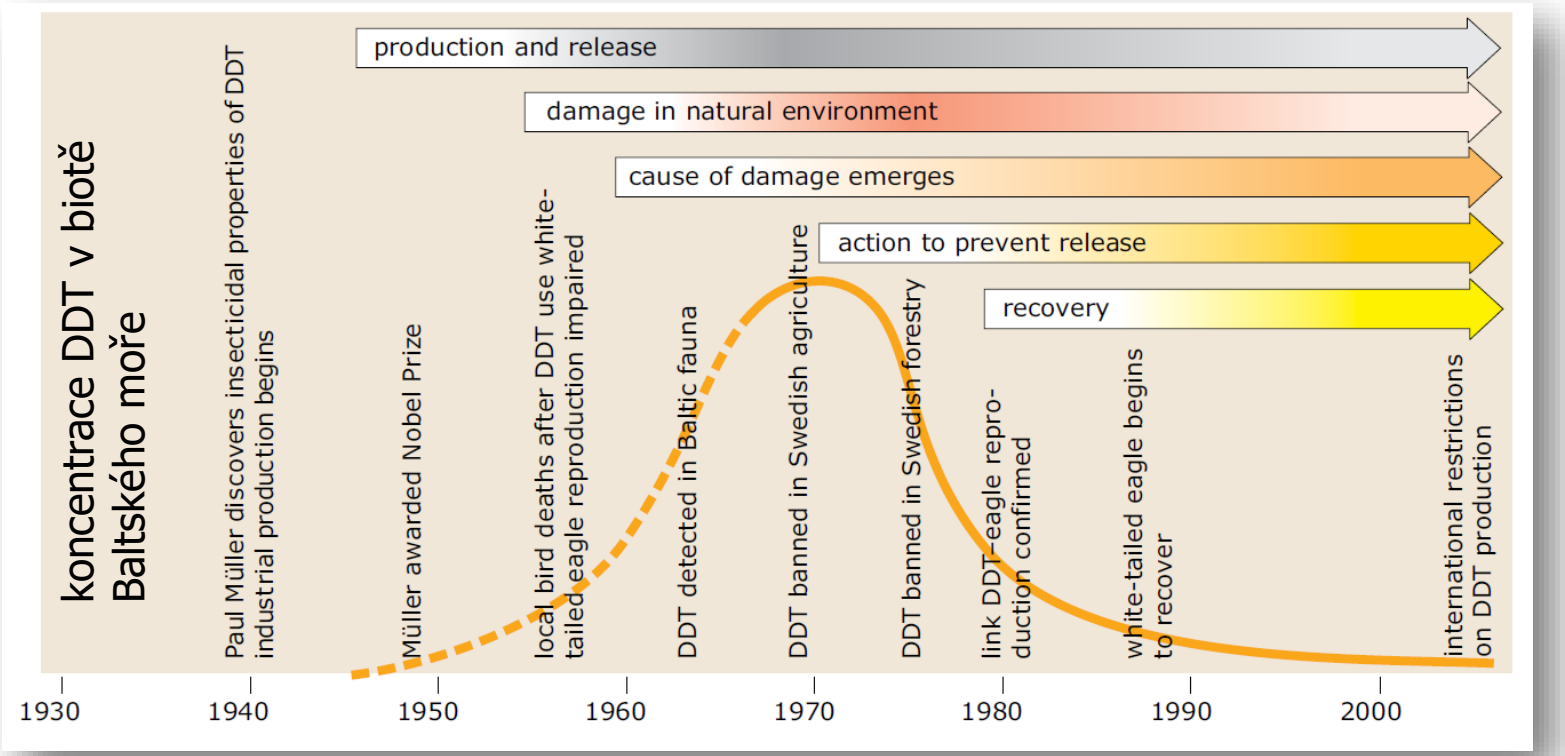
Zpoždění legislativy za problémy ŽP



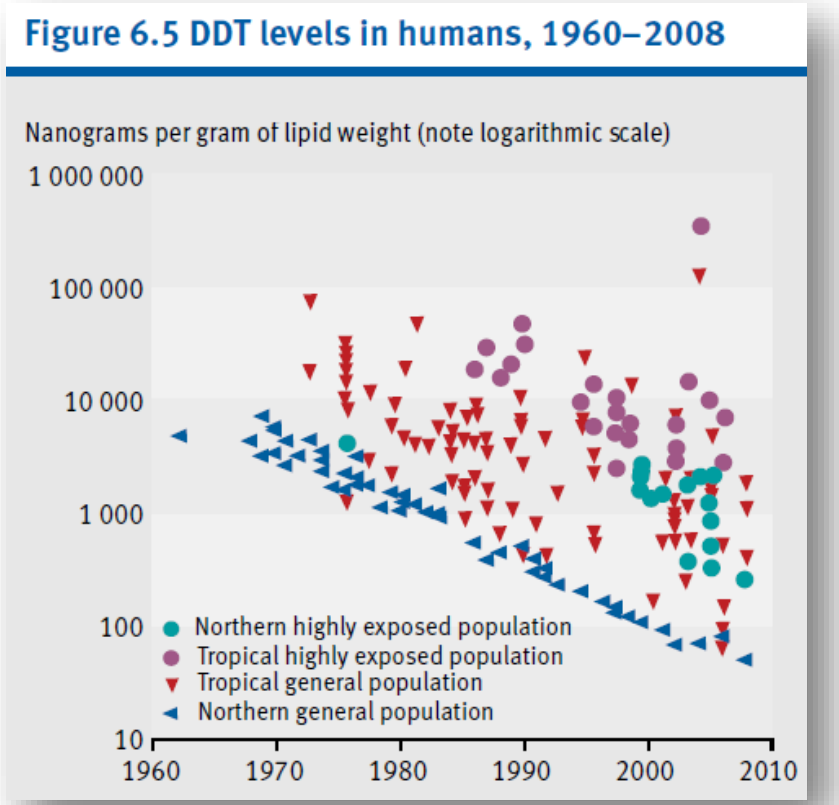
Scheringer et al. (2022): Stories of Global Chemical Pollution: Will We Ever Understand Environmental Persistence? Environmental Science & Technology 56, 17498–17501.

Figure 1. Time lines of selected global chemical pollution cases. Abbreviations: PFAS, per- and polyfluoroalkyl substances; CFCs, chlorofluorocarbons; PCBs, polychlorinated biphenyls. In some cases, the production and use started at lower levels before 1950, but production and use of all substances increased strongly from 1950 on. All chemicals remain in the environment for long periods of time after national or international bans. References not cited in the text: Carson, R. *Silent Spring*; 1962. Carpenter, E. J.; Smith, K. L. *Science* **1972**, *175*, 1240–1241.

Ne všechny příběhy končí špatně ...

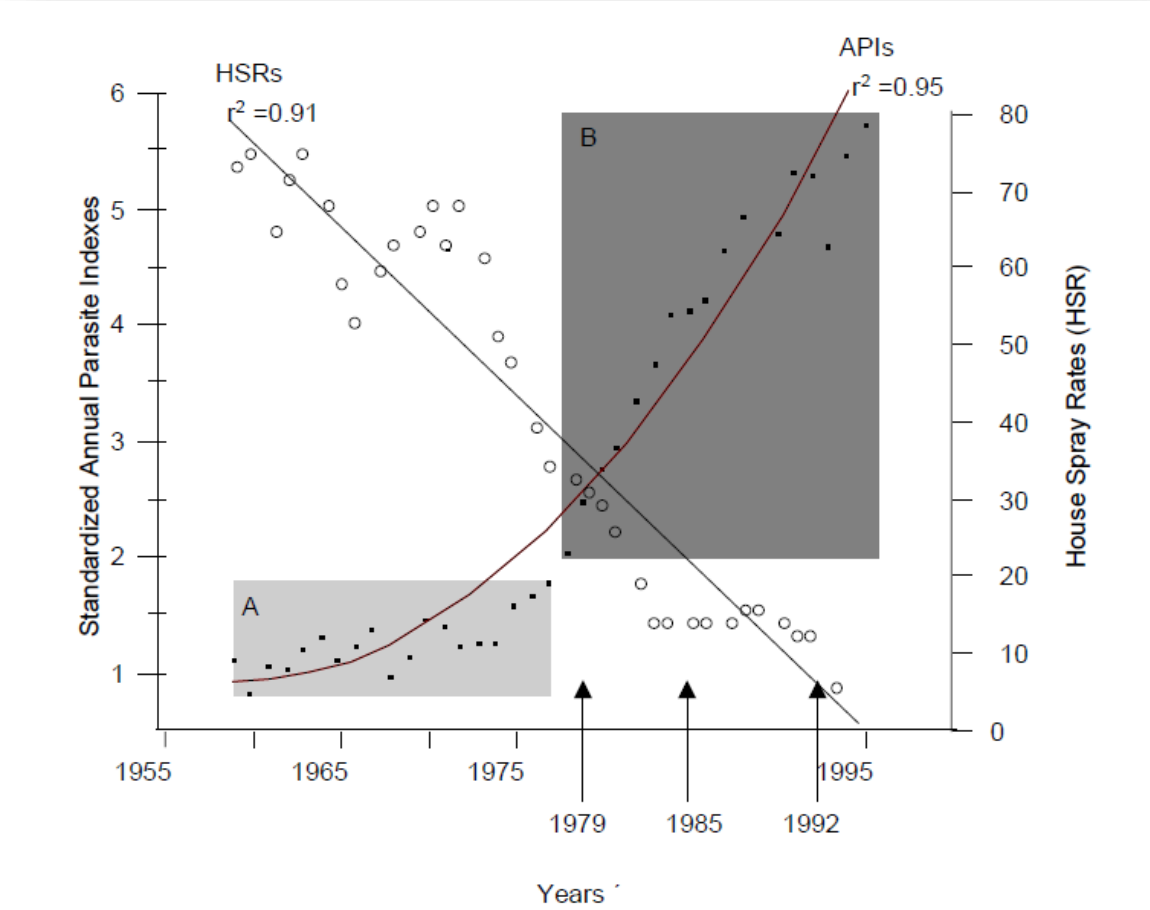


EEA (2013)

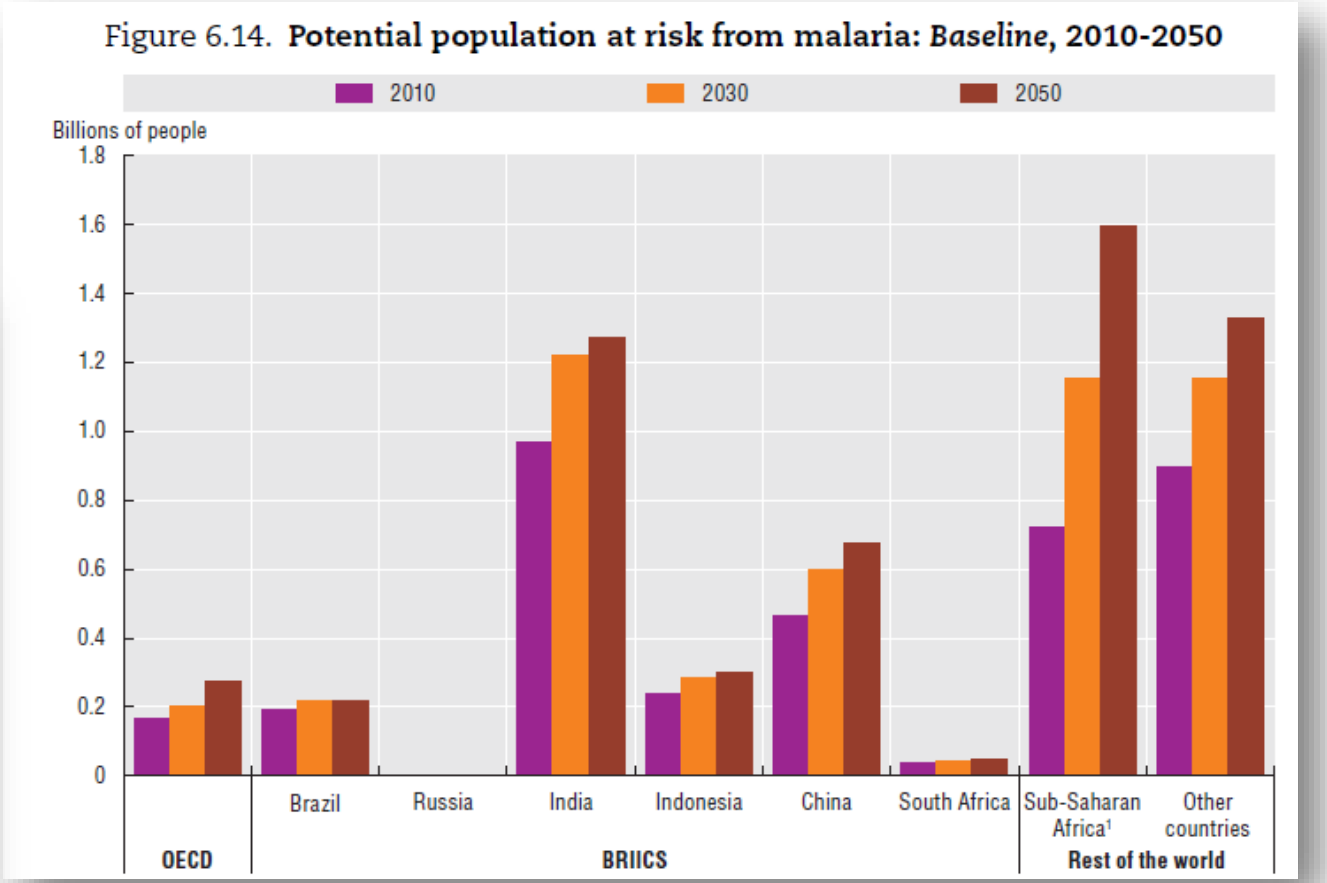


UNEP (2012)

i když ... 2., 3. ... dějství



Roberts (1997)



OECD (2012)

climate change → malaria → DDT (?)

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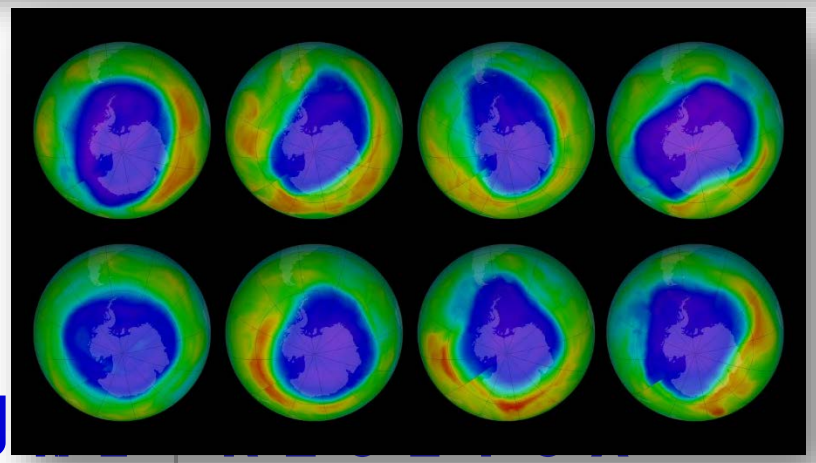
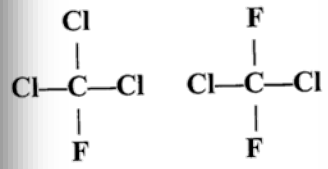
Ne všechny příběhy končí špatně, i když ...

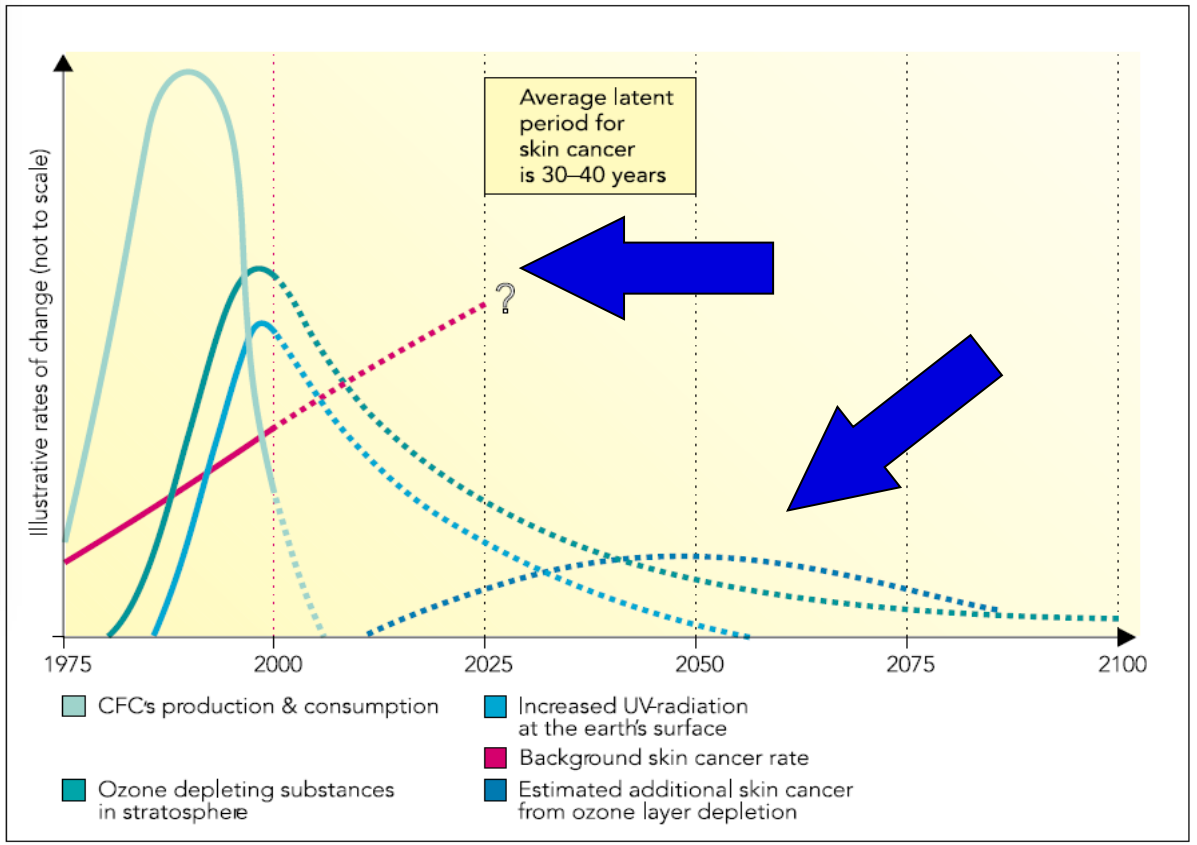
... setrvačnost, dohra ...

1907	Laboratory experiments by Weigert on the decomposition of ozone photosensitised by chlorine
1934	*Ditto* by Norrish and Neville
1973	Global survey of CFCs by Lovelock *et al.* showing their distribution in the atmosphere worldwide
1974	Molina and Rowland publish their theoretical arguments that CFCs would be destroying the ozone layer
1977	United States bans CFCs in aerosols based on 'reasonable expectation' of damage, followed by Canada, Norway and Sweden.
1977	Research-oriented 'world plan of action on the ozone layer' agreed, overseen by UNEP
1980	European decision restricting use of CFCs in aerosols, but rising use in refrigerators, etc. marginalises this restriction
1985	UNEP Vienna Convention for the protection of the ozone layer agrees research, monitoring, information exchange and restrictions if and when justified
1985	Farman, Gardiner and Shanklin publish results showing hole in ozone layer over Antartica
1987	Montreal Protocol on protection of the ozone layer is signed, with phasing out of ozone depleting substances for both developed and developing countries within different timescales
1990s	Increasing finance to developing countries to help them reduce their dependence on ozone depleting substances
1997	Amendments to the Montreal Protocol in order to restore levels of chlorine by 2050–60
1999	Beijing Declaration calling for efforts to stop illegal trade in ozone depleting substances



EEA (2001)

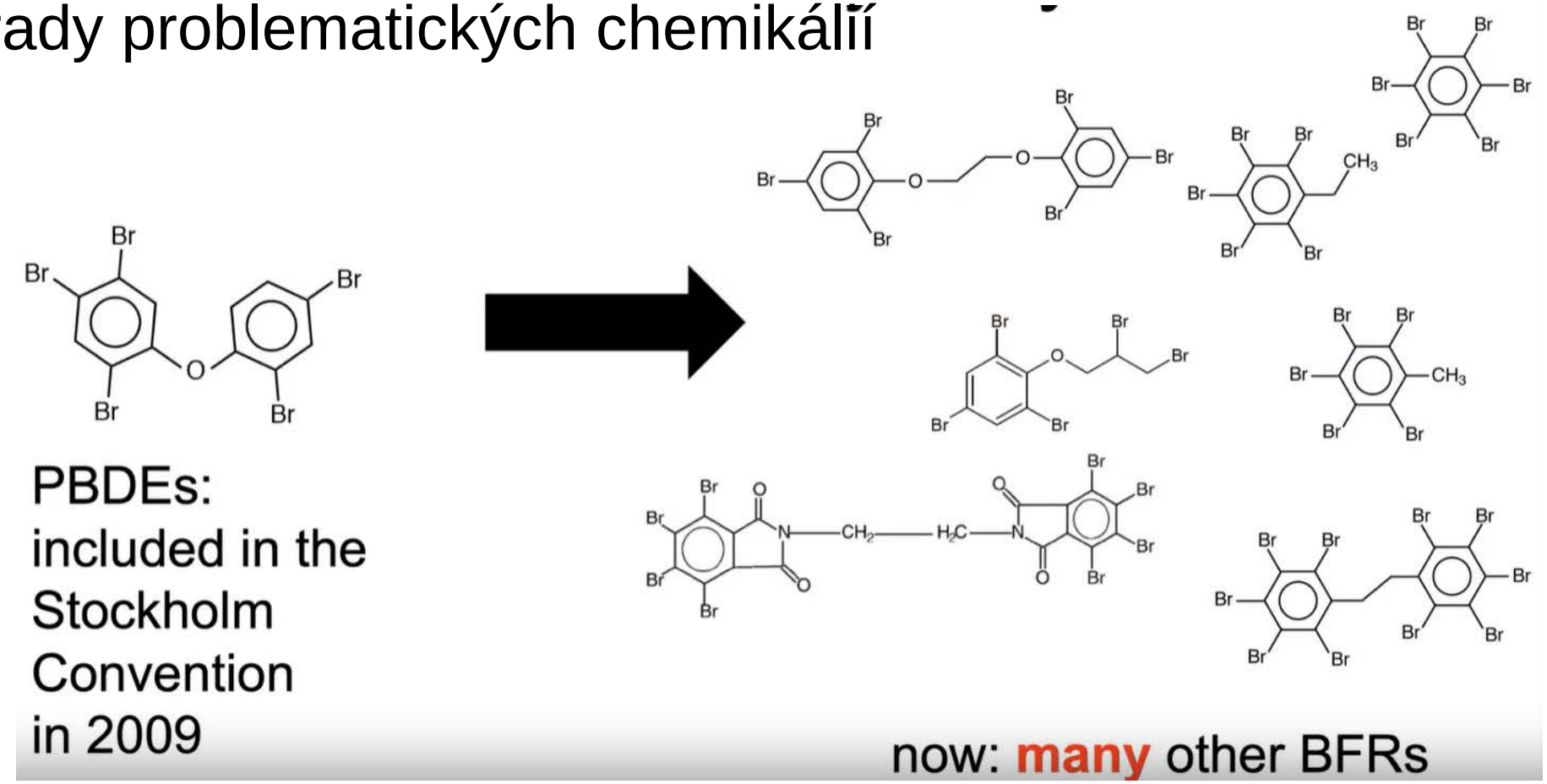




This graph illustrates the approximate time lags between CFC production, the resulting depletion of the stratospheric ozone layer and subsequent extra penetration of UV radiation and the impact this will eventually have on increasing the background rate of skin cancer, given the 30-40 year average latent period for such cancers. Reality is far more complex than this schematic illustration. For example, there are other ozone-depleting chemicals (HCFCs, HFCs and methyl bromide); the ozone hole varies with latitude, time of the year and meteorological conditions; the increased UV radiation varies between different wavelengths and with latitude and cloud cover; and the skin cancer excess comes on top of a rising background rate of skin cancer, with differential effects on the different types of skin cancer, such as malignant melanoma and non-malignant skin cancers. Human behaviour is also a determining effect in skin cancer. Health effects also include cataracts and immune response suppression. However, the figure illustrates the main relationships and time lags between CFC production and skin cancer, and the 'success' in stopping CFC production and averting much more skin cancer from ozone depletion than what is now expected. (Slaper, *et al.*, 1996).

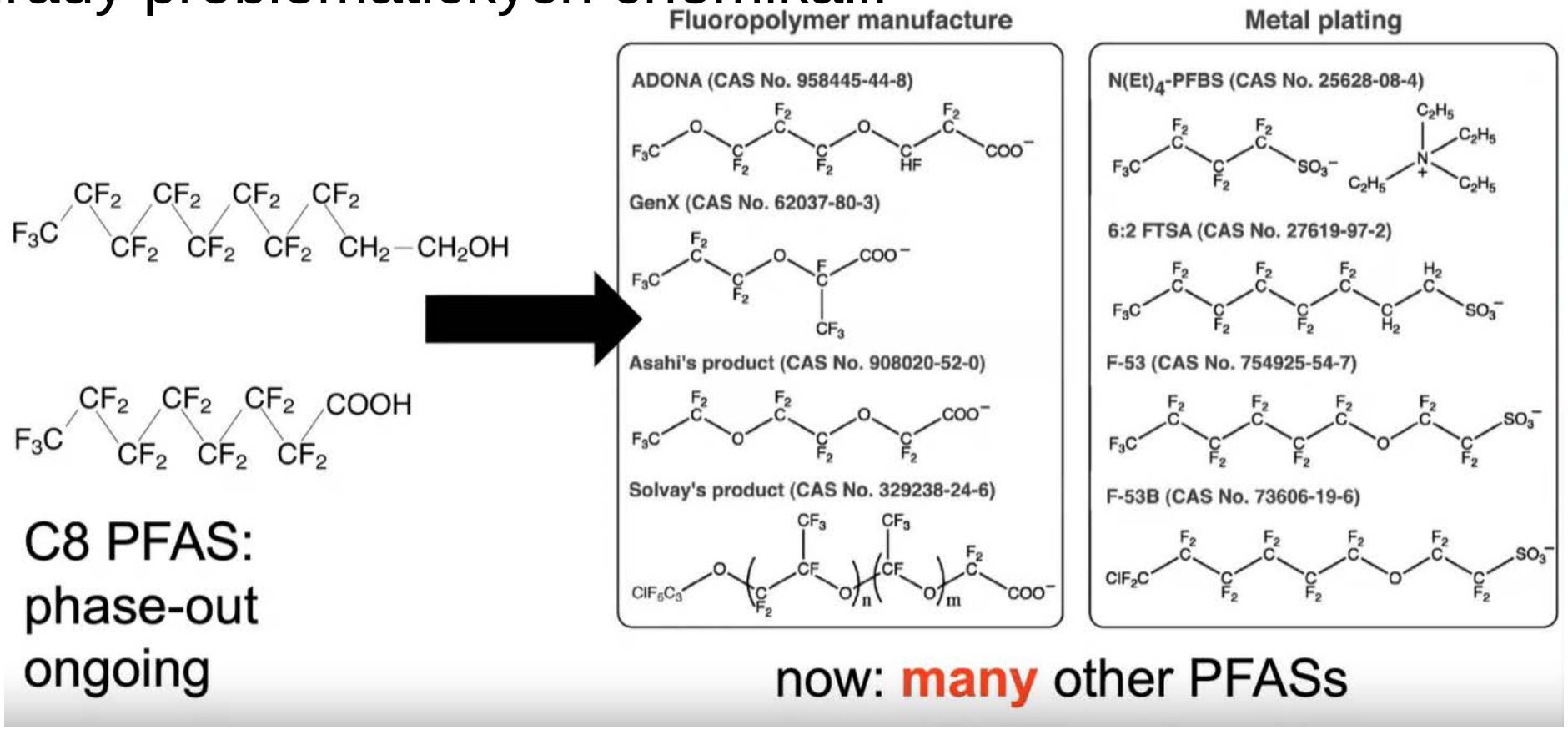
Zákaz problematické chemikálie, hurá ...
... anebo ? ... (strategie chemického průmyslu)

- náhrady problematických chemikálií



Zákaz problematické chemikálie, hurá ...
... anebo ? ... (strategie chemického průmyslu)

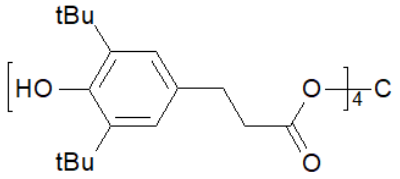
- náhrady problematických chemikálií



Zákaz problematické chemikálie, hurá ... ... anebo ? ... (strategie chemického průmyslu)

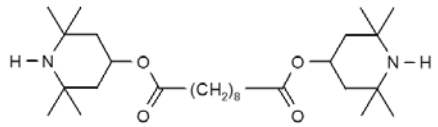
- náhrady problematických chemikálií

stabilizátory plastů

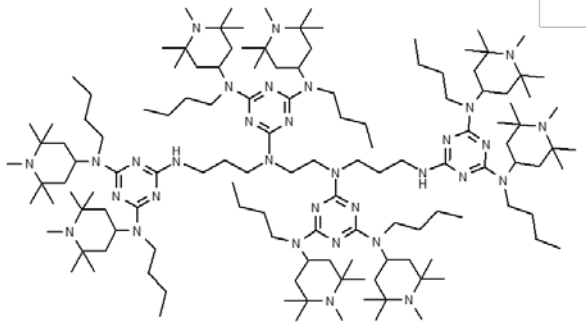


Tetrakis[methylene(3,5-di-tert-butyl-4-hydroxy-hydrocinnamate)] methane

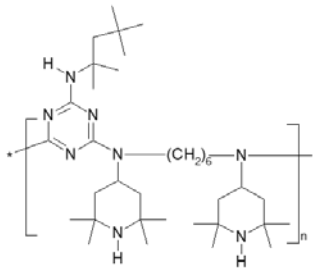
IRGANOX 1010



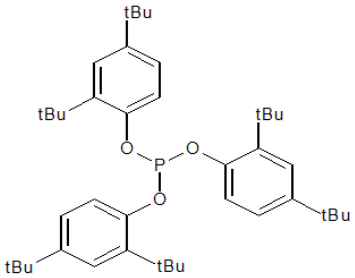
TINUVIN 770
Mol. wt. 481



CHIMASSORB 119
Mol. wt. 2286

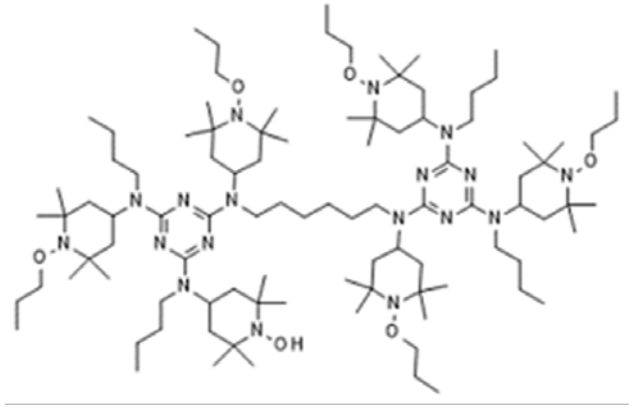


CHIMASSORB 944
Mol. wt. > 2500

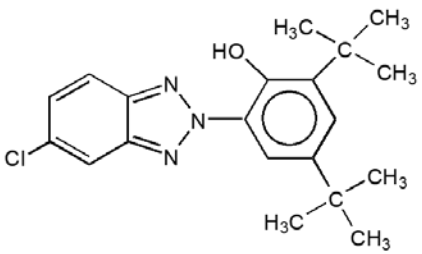


Tris(2,4-di-tert-butylphenyl) phosphite

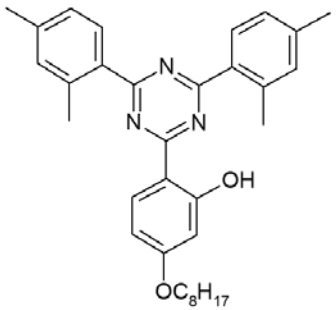
IRGAFOS 168



TINUVIN NOR 356
Mol.wt. 1700

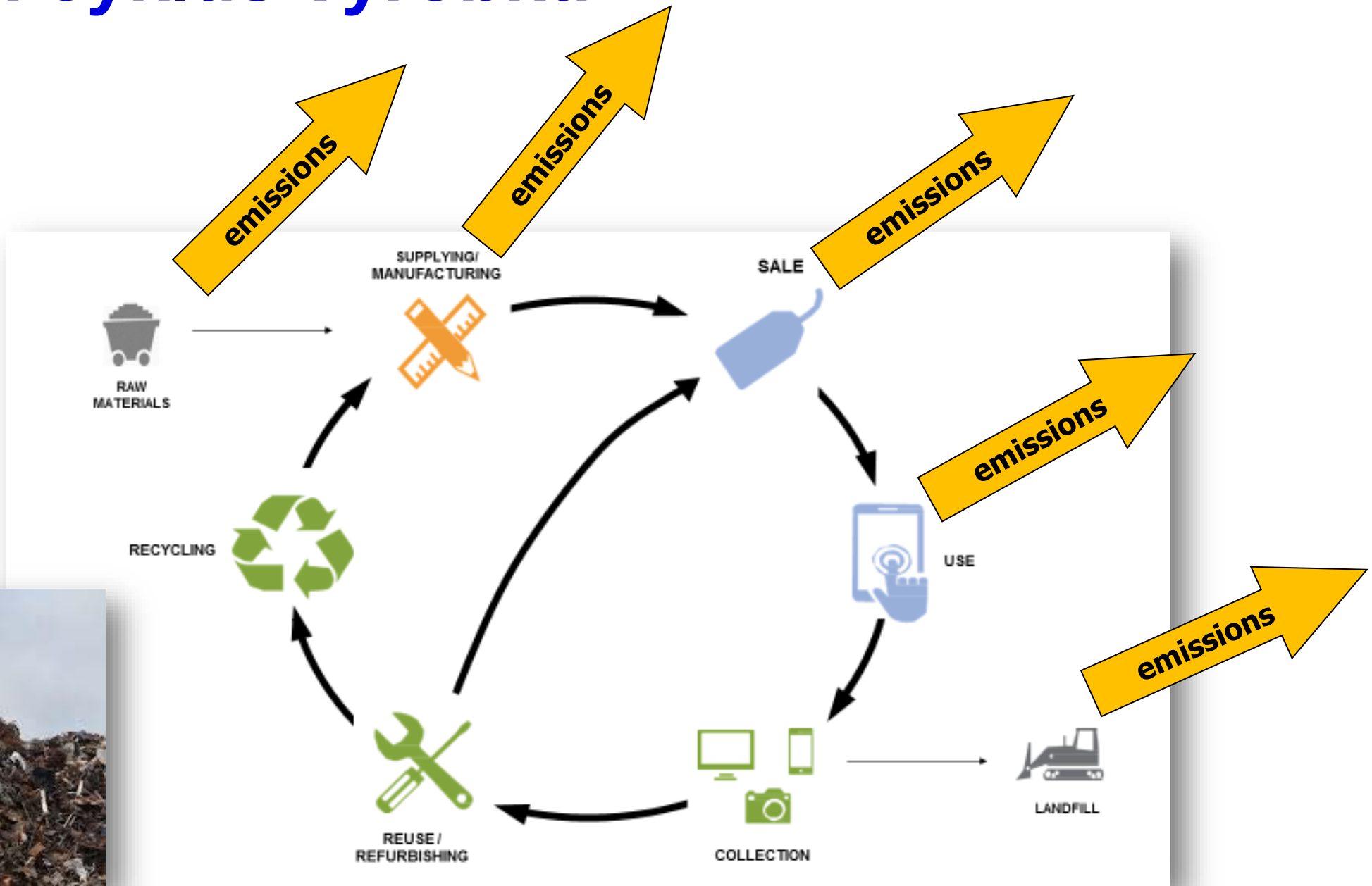


TINUVIN 327
Mol.wt. 358
Abs. Max. 310, 351 nm

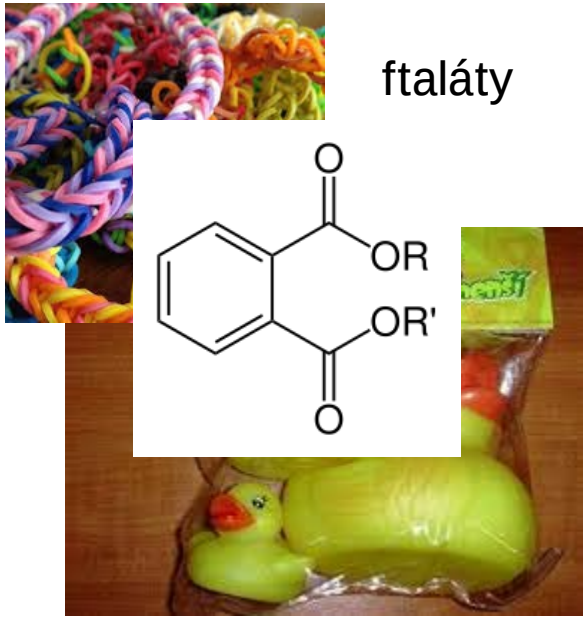


CYASORB UV 1164
Mol.wt. 509
Abs. Max 290, 342 nm

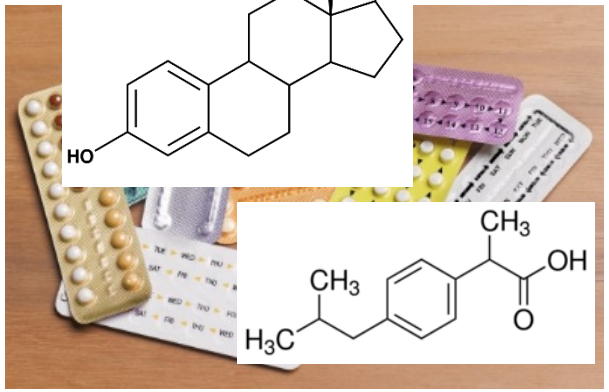
Životní cyklus výrobku



Pomalé uvolňování chemikálií do ŽP

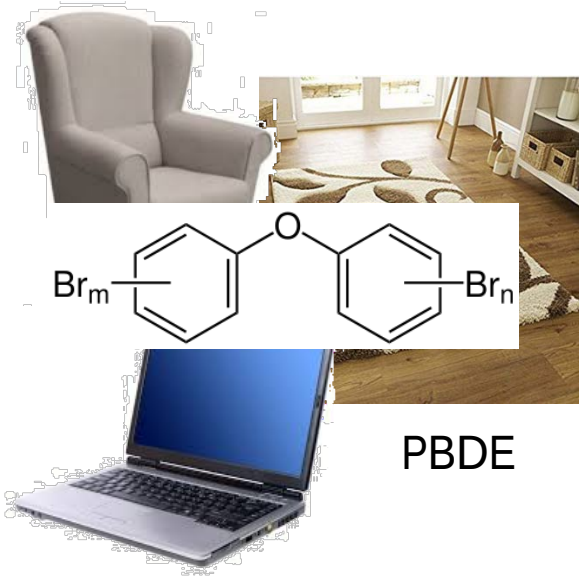


ftaláty



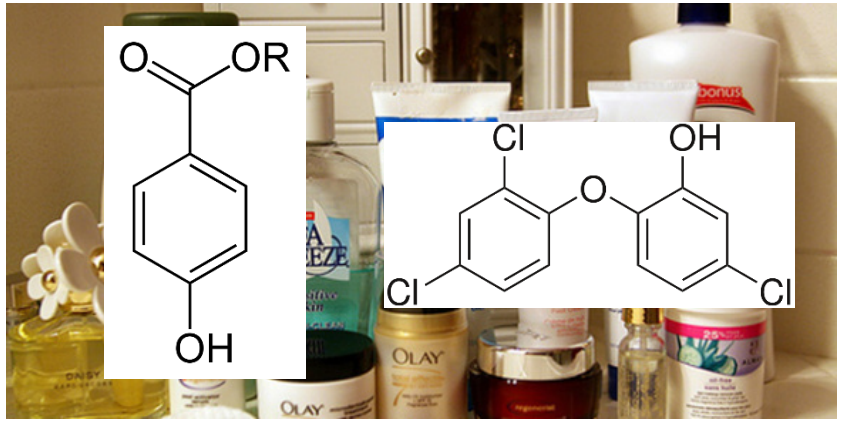
estradiol

ibuprofen



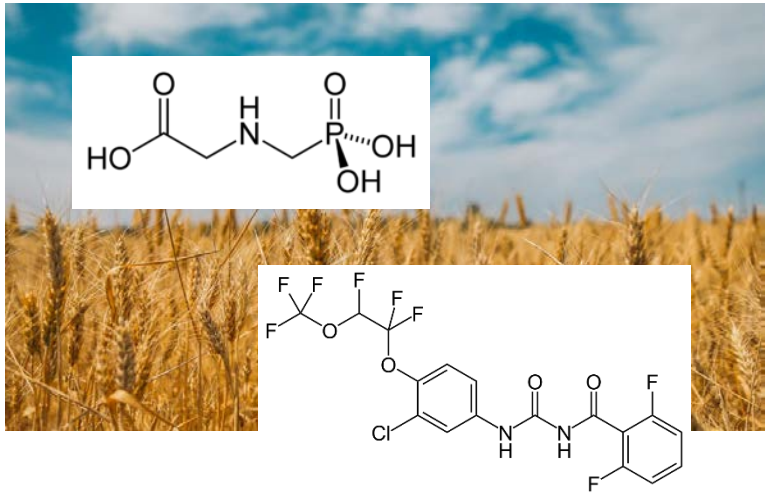
PBDE

paraben



triclosan

glyfosát



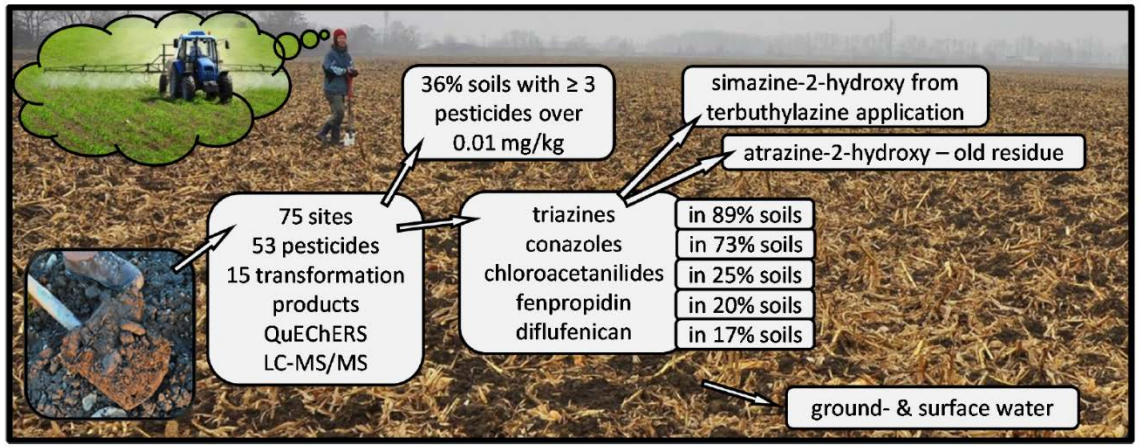
novaluron

MUNI | RECETOX

Směsi – koktejly polutantů

Výsledky průzkumu půd 2015

- 81% půd s alespoň jedním pesticidem nad 0.01 mg/kg
- 36% půd s ≥ 3 pesticidy nad 0.01 mg/kg



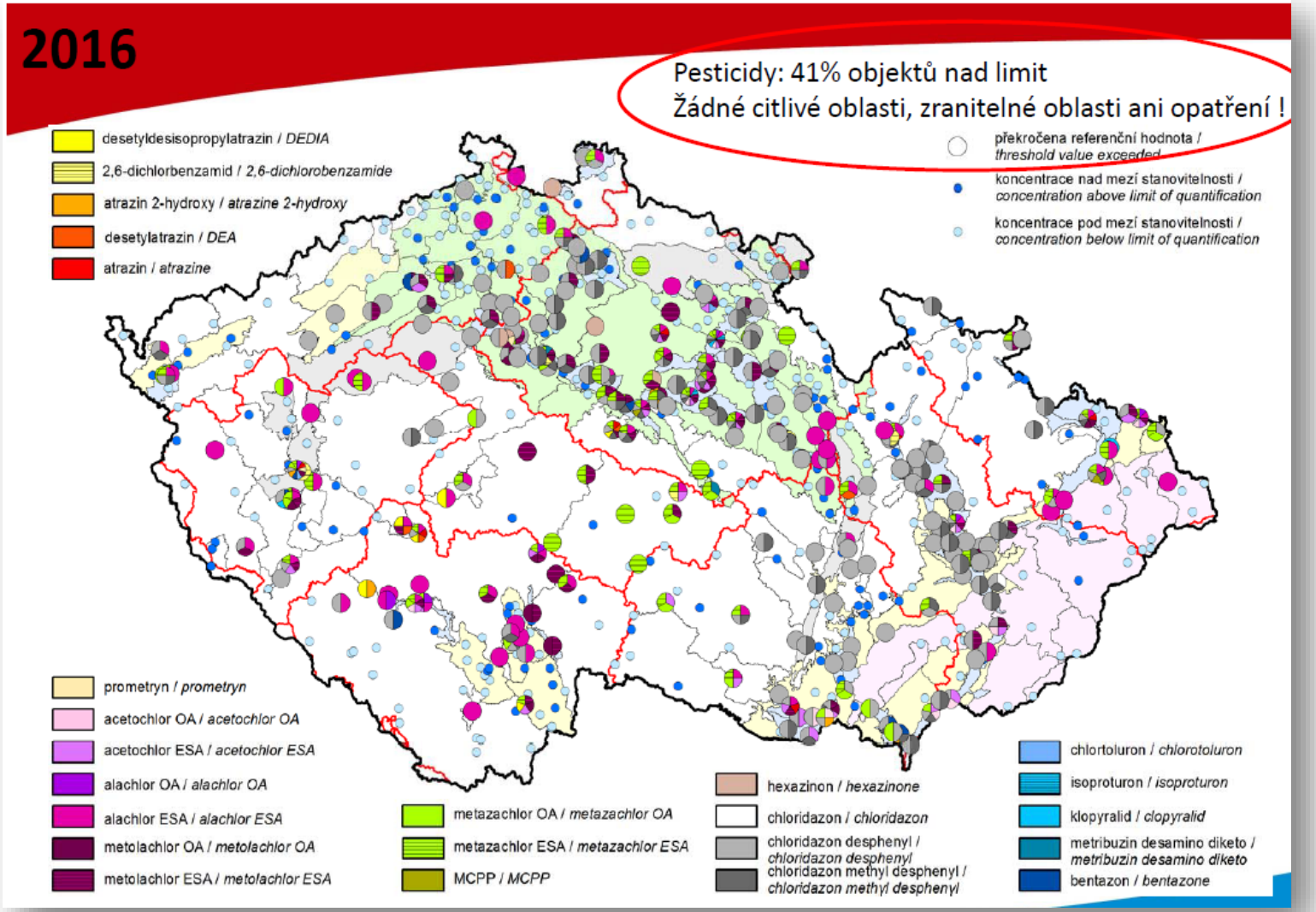
https://www.stream.cz/adost/10028599-zamorena-puda-alarmujici-vysledky-testu-pudy-v-cesku

Směsi – koktejly polutantů

Výsledky monitoringu vod ČR 2014-2016

- 43% objektů
  nad limit 0.1 µg/L
  pro jednotlivý pesticid

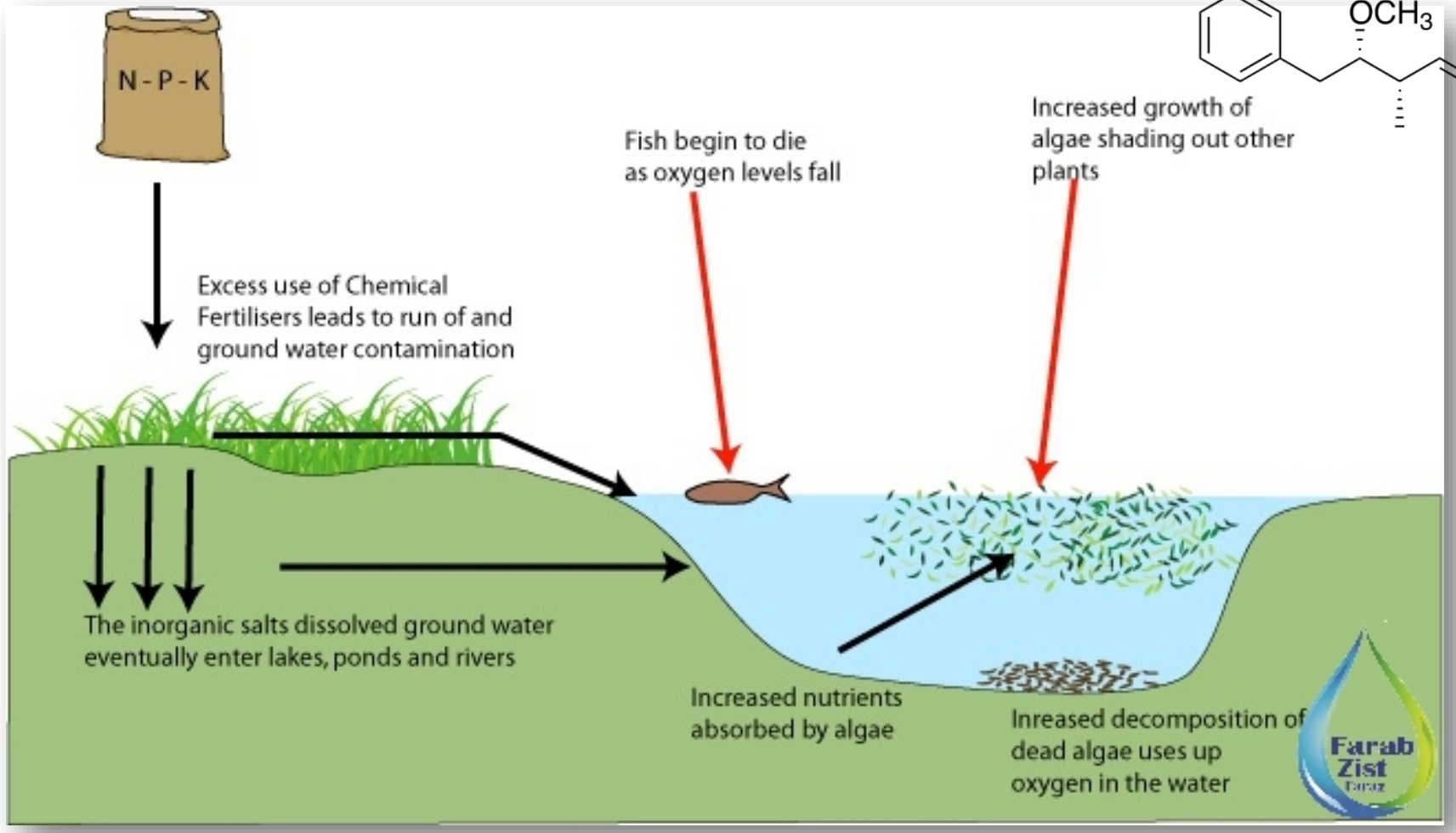
- 31% objektů
  nad limit
  pro sumu pesticidů

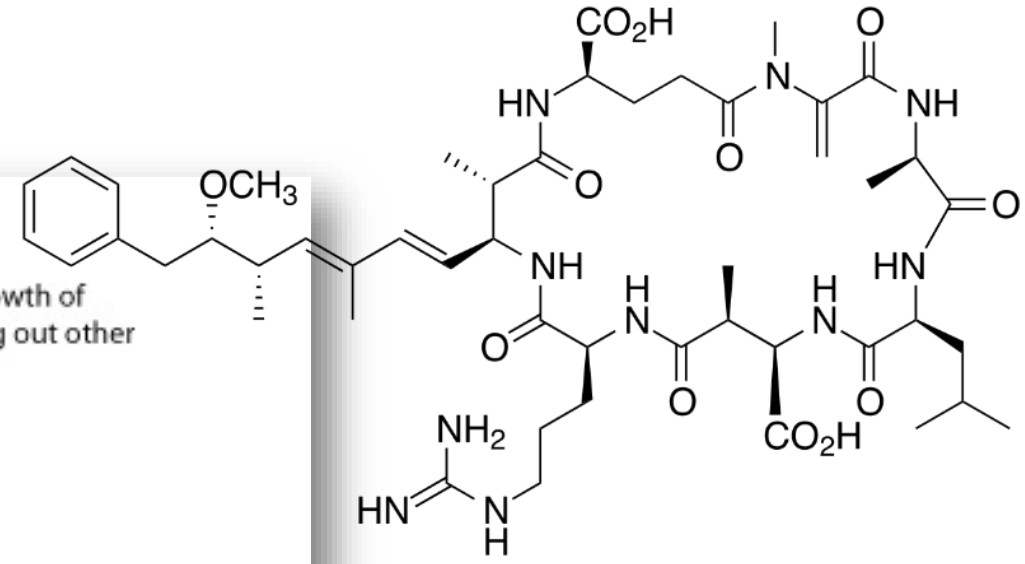


Proč asi uhynula tato ryba?

www.PollEv.com/lindan443

Proč uhynula tato ryba?





eutrofizace
saprobita

toxiny

Globální chemické znečištění

www.PollEv.com/lindan443

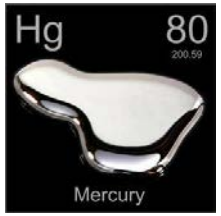
Jaké skupiny látek znečišťujících ŽP vás napadají?

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

Globální chemické znečištění

Pesticidy

Odpady



Průmyslové chemikálie

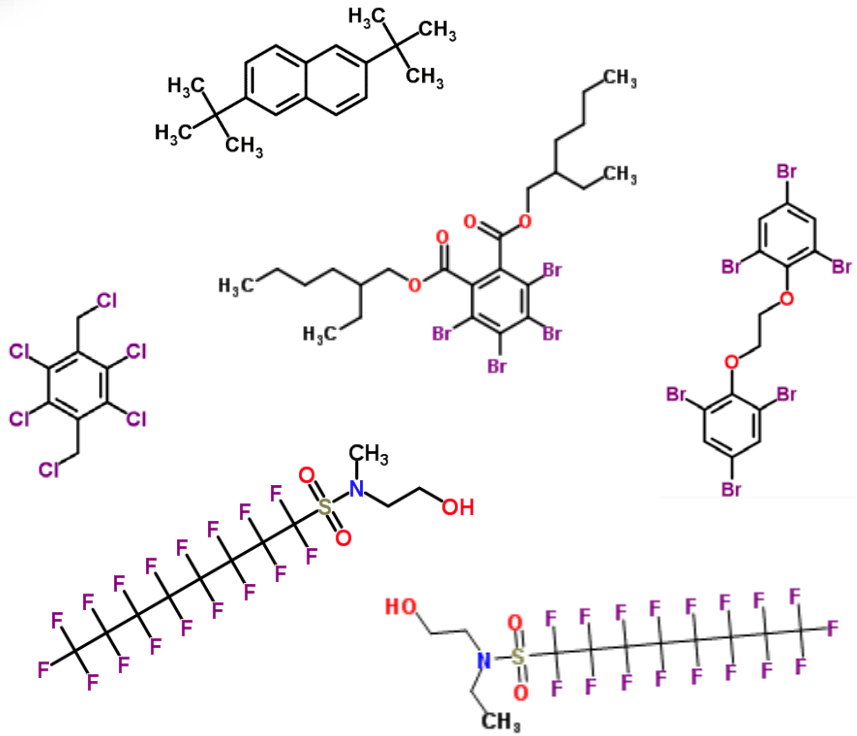
Léky

Plasty

Vedlejší produkty činností

Produkty denní spotřeby

atd .....

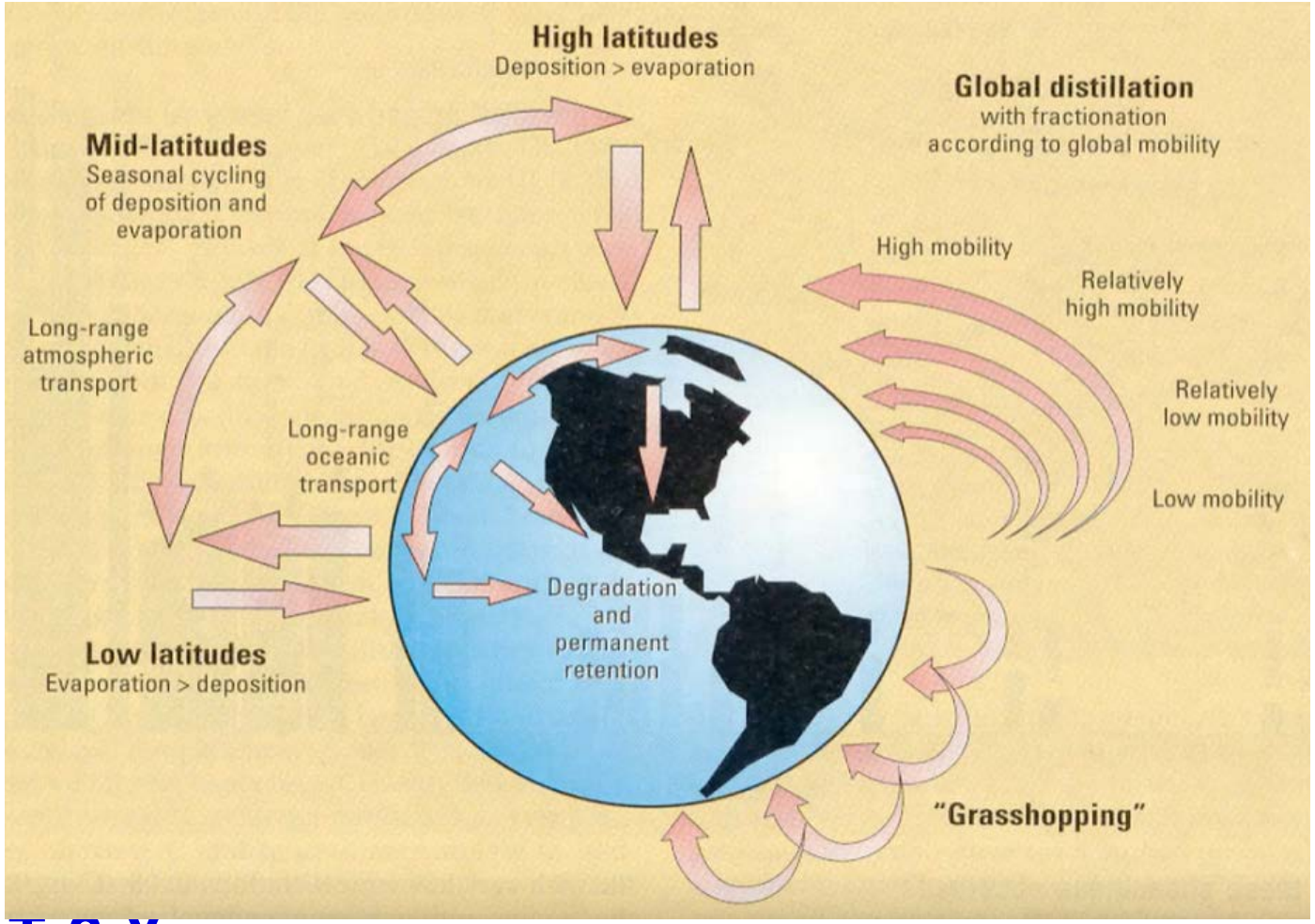


Skupiny znečišťujících látek

- anorganické plyny
- kovy
- průmyslové kyseliny
- radionuklidy
- nutrienty (živiny, anorganická hnojiva)
- organické (degradabilní, komunální, fekální) znečištění
- komunální chemie – PCPs, detergenty, mýdla, změkčovadla ...
- nehalogenovaná rozpouštědla (alkoholy, etery, BTEX ...)
- halogenované alifatické uhlovodíky (freony ...)
- látky průmyslu gumy a plastů (ftaláty, polybromované difenylethery, PFAS ...)
- persistentní organické látky (POPs), halogenované [produkty průmyslu (PCBs, PBBs) a vedlejší produkty (PCDD/Fs, PBDD/Fs)]
- pesticidy [insekticidy – nehalogenované vs. halogenované (patří mezi POPs), herbicidy]
- farmaka, léčiva
- produkty denní spotřeby (PCPs)
- PAHs – polycyklické aromatické uhlovodíky
- ...

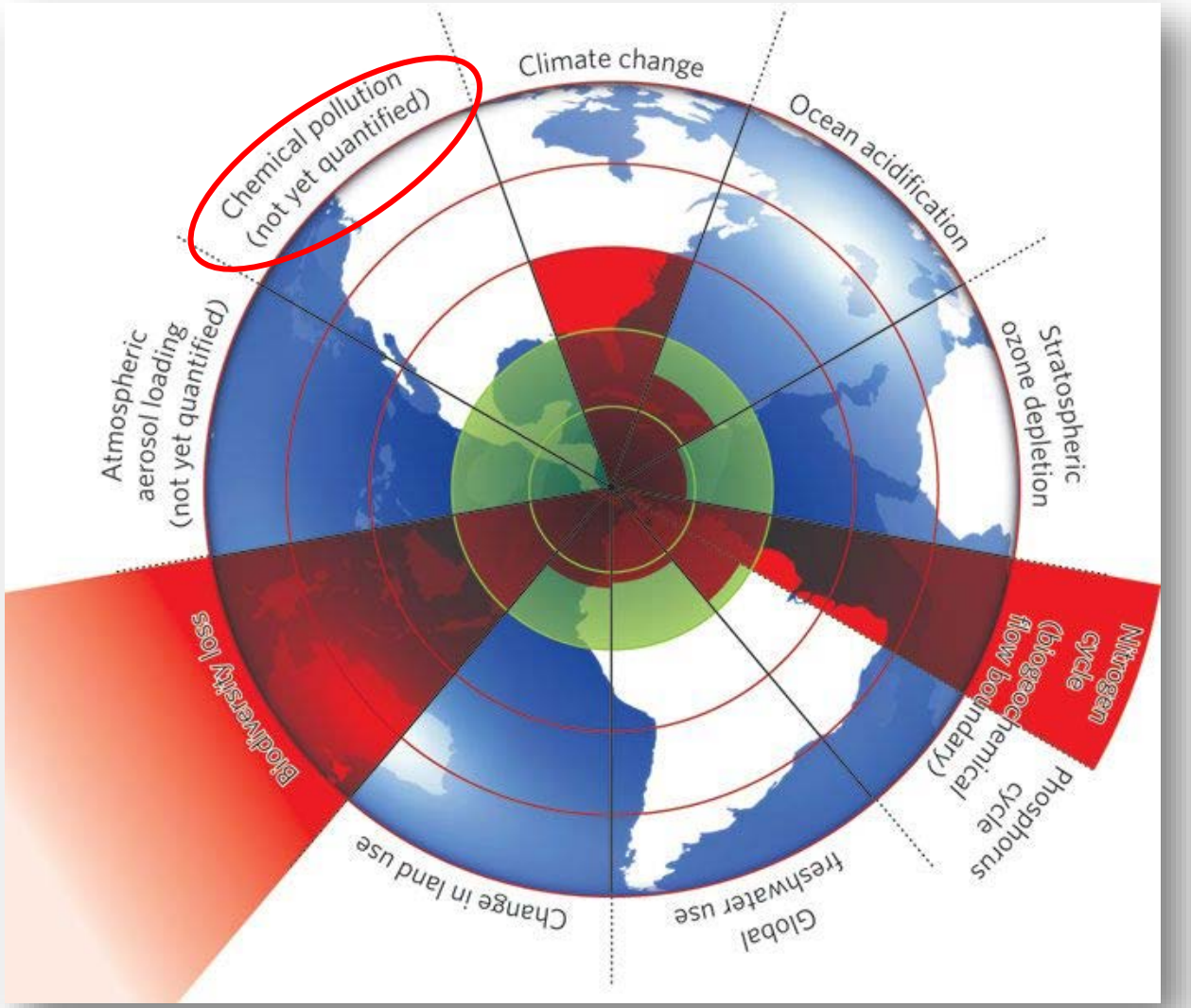
Globální chemické znečištění

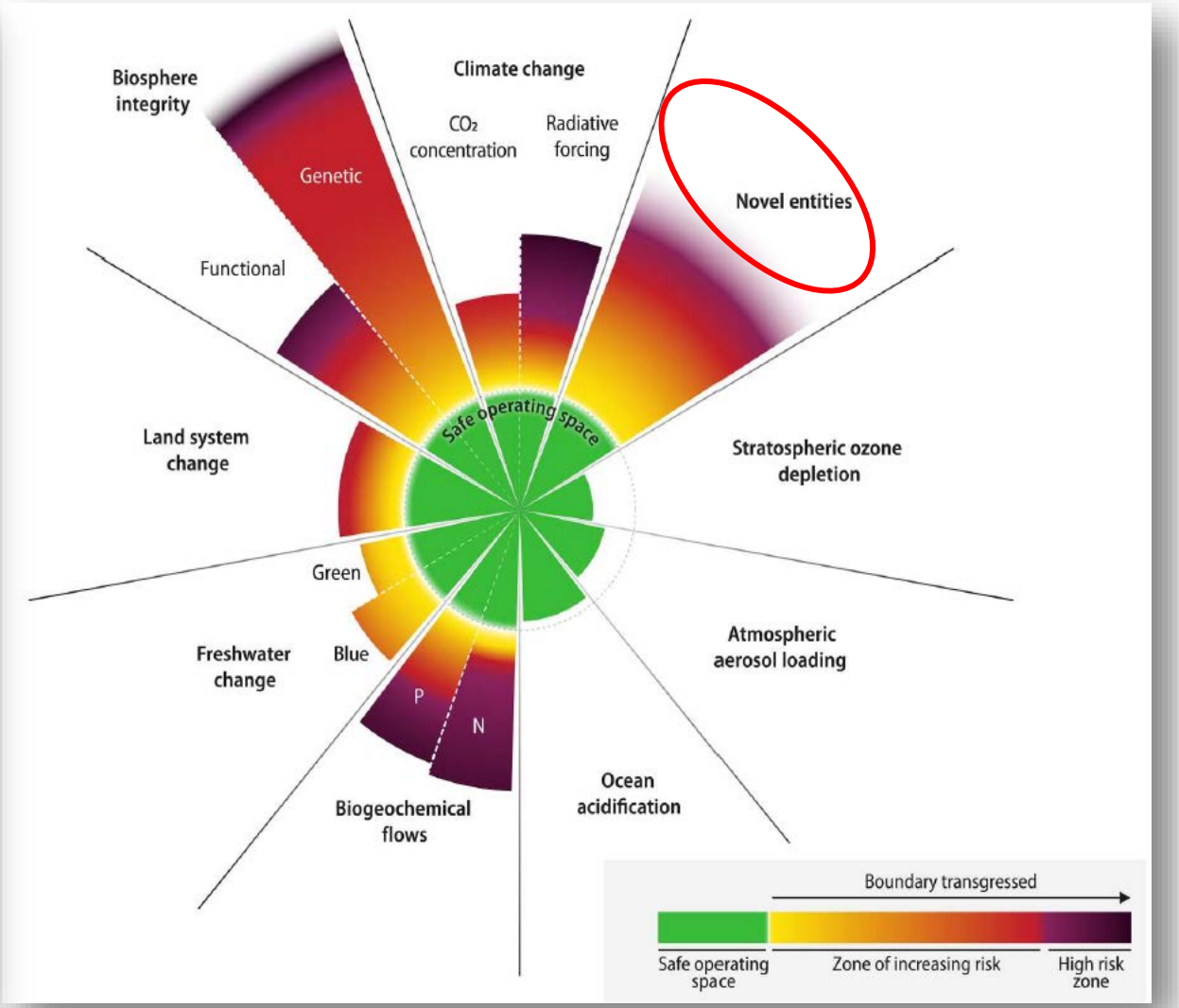
- zejména perzistentní chemikálie



F. Wania, D. Mackay, Environ. Sci. Technol. 30 (1996), 390A–396A

Globální chemické znečištění - dopady





Rockström et al. (2009)

Richardson *et al.*, *Sci. Adv.* **9**, eadh2458 (2023)

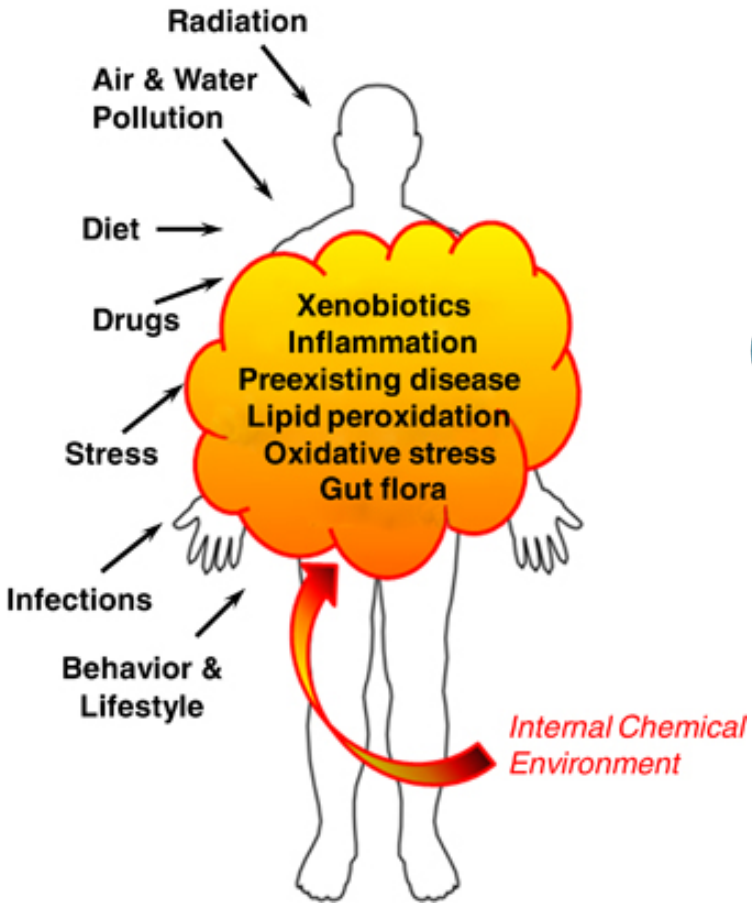
Globální chemické znečištění - dopady

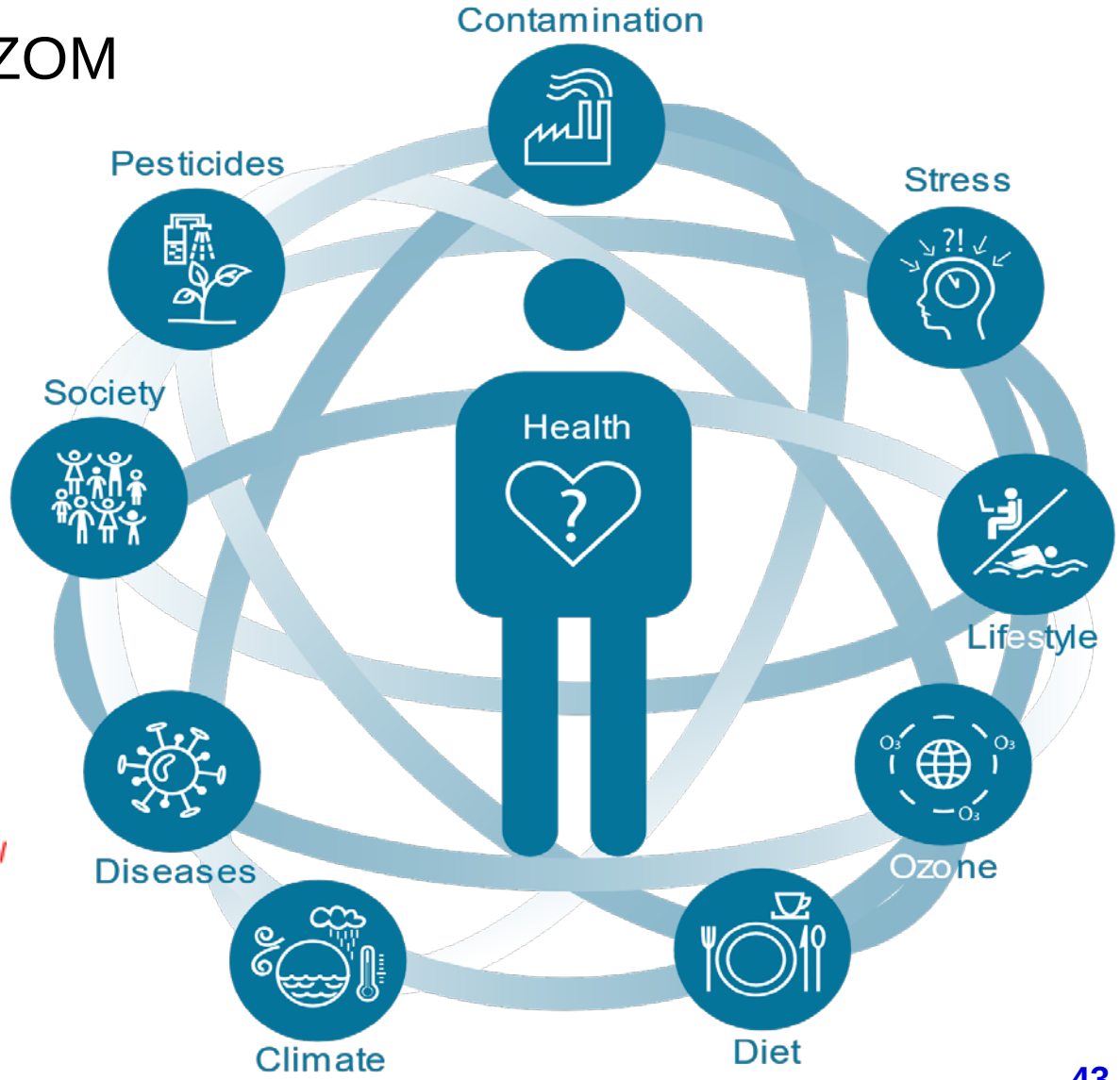
Které SDG souvisí s chemickým znečištěním PŘÍMO

Které SDG souvisí s chemickým znečištěním NEPŘÍMO

Expozom

SMĚSI + spolupůsobení faktorů = EXPOZOM



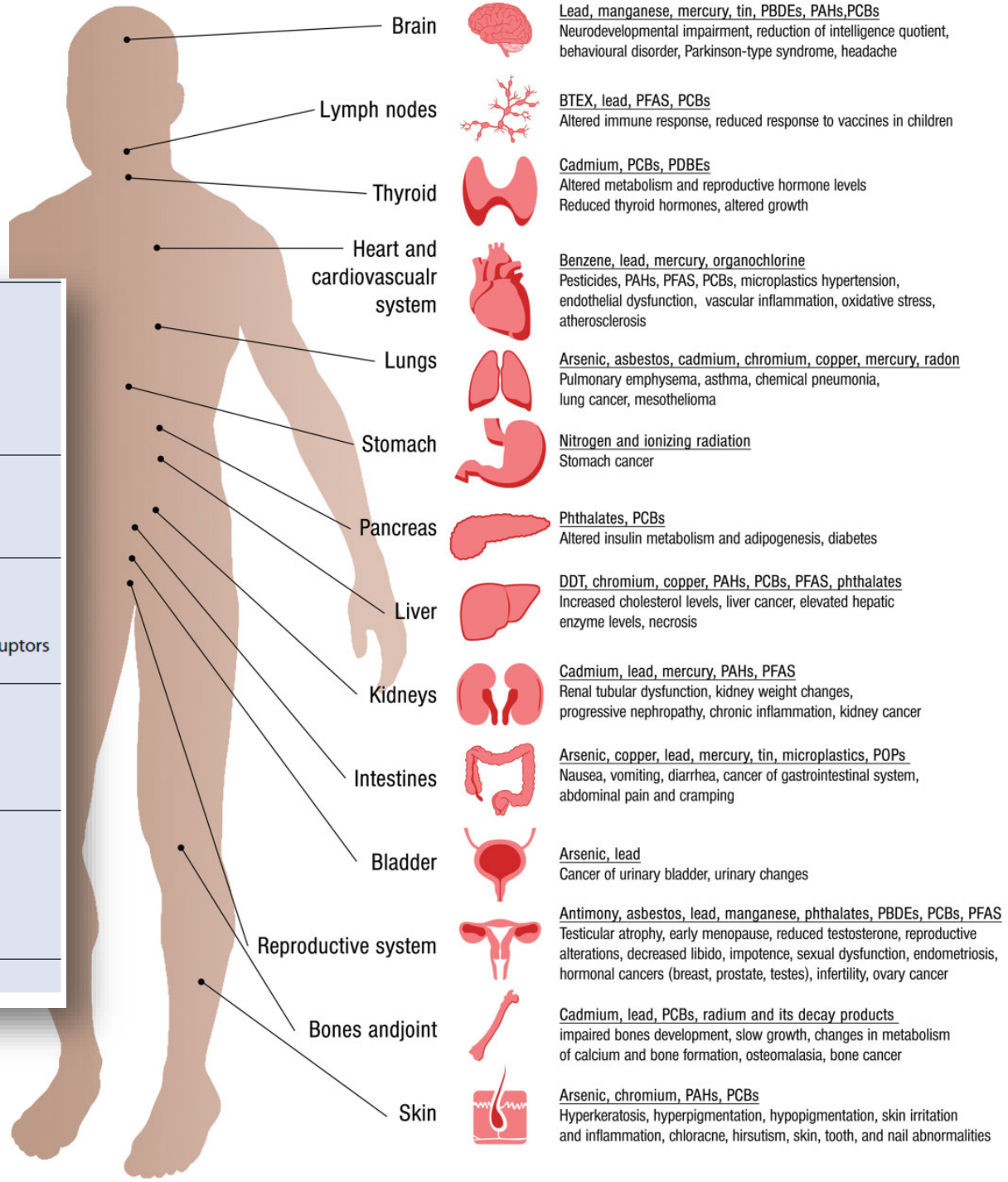


Dopady chemického znečištění na člověka

Table 1: Some major health impacts associated with environmental exposures to chemicals and other environmental stressors. *Source: Adapted from EEA (2005)*

Health impact	Associations with some environmental exposures
Infectious diseases	Water, air and food contamination Climate change-related changes in the lifecycle of pathogens
Cancer	Air pollution Some pesticides Asbestos Natural toxins (aflatoxins) Polycyclic aromatic hydrocarbons Some metals, e.g. arsenic, cadmium, chromium Benzene Dioxins
Cardiovascular diseases	Air pollution Carbon monoxide Lead
Respiratory diseases, including asthma	Sulphur dioxide Nitrogen dioxide Inhalable particles Ground-level ozone Fungal spores Dust mites Pollen
Skin diseases	UV radiation Some metals, e.g. nickel Pentachlorophenol Dioxins
Reproductive dysfunctions	Polychlorinated biphenyls (PCBs) DDT Cadmium Phthalates and other endocrine disruptors Pharmaceuticals
Developmental (foetal and childhood) disorders	Lead Mercury Cadmium Some pesticides Endocrine disruptors
Nervous system disorders	Lead PCBs Methylmercury Manganese Some solvents Organophosphates
Immune response	Some pesticides

UNEP (2013)

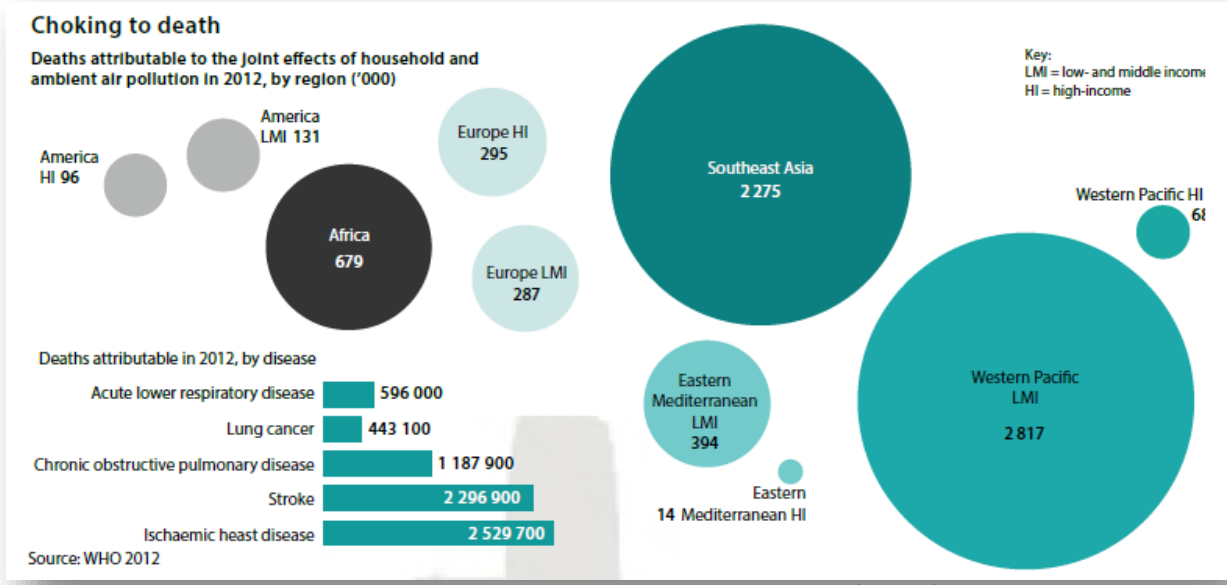


https://www.fao.org/3/cb4894en/online/src/html/chapter-04-3.html

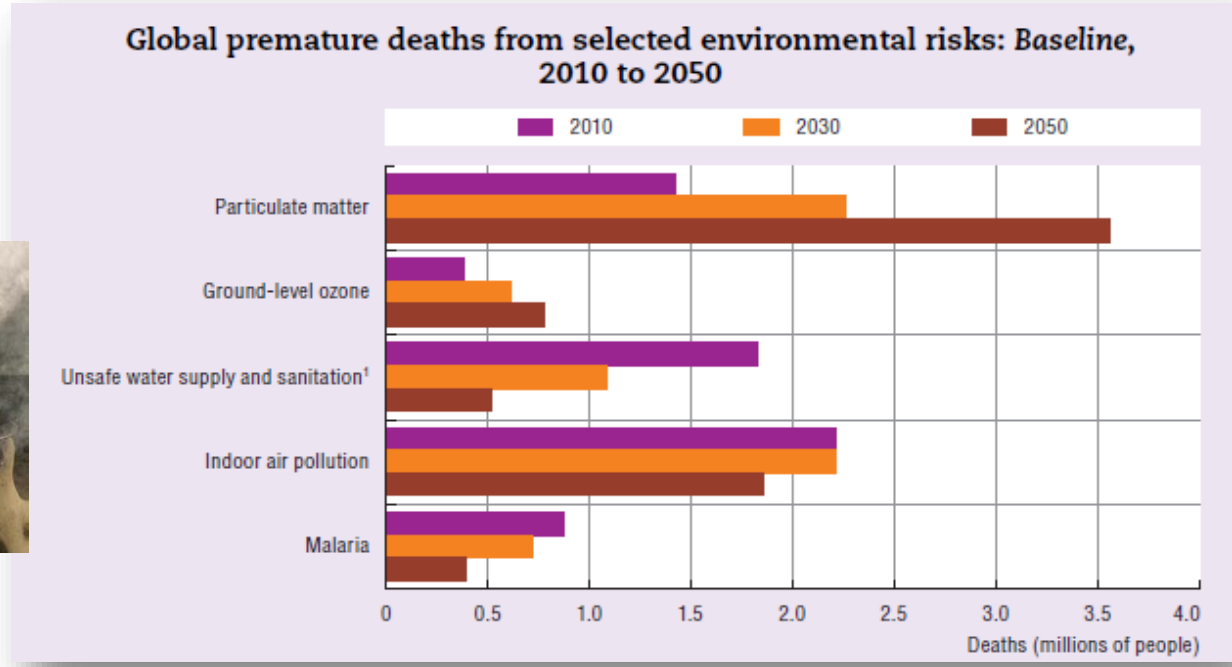
Dopady chemického znečištění na člověka

- malárie + AIDS + tuberkulóza 3,4 mil
- 8-9 mil lidí ročně zemře na následky znečištění
  - znečištěné venkovní ovzduší 3,7 mil
  - znečištěné vnitřní ovzduší (pece, kamna) 4,2 mil
  - znečištěná půda a voda 1 mil

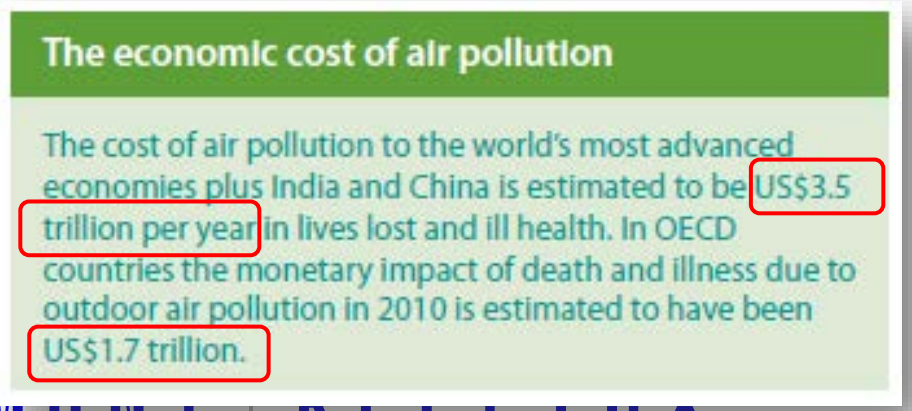
https://ensia.com/voices/leading-cause-death-developing-countries
http://gahp.net/the-lancet-report-2/
Landrigan et al. (2018)



UNEP (2014)



OECD (2012)

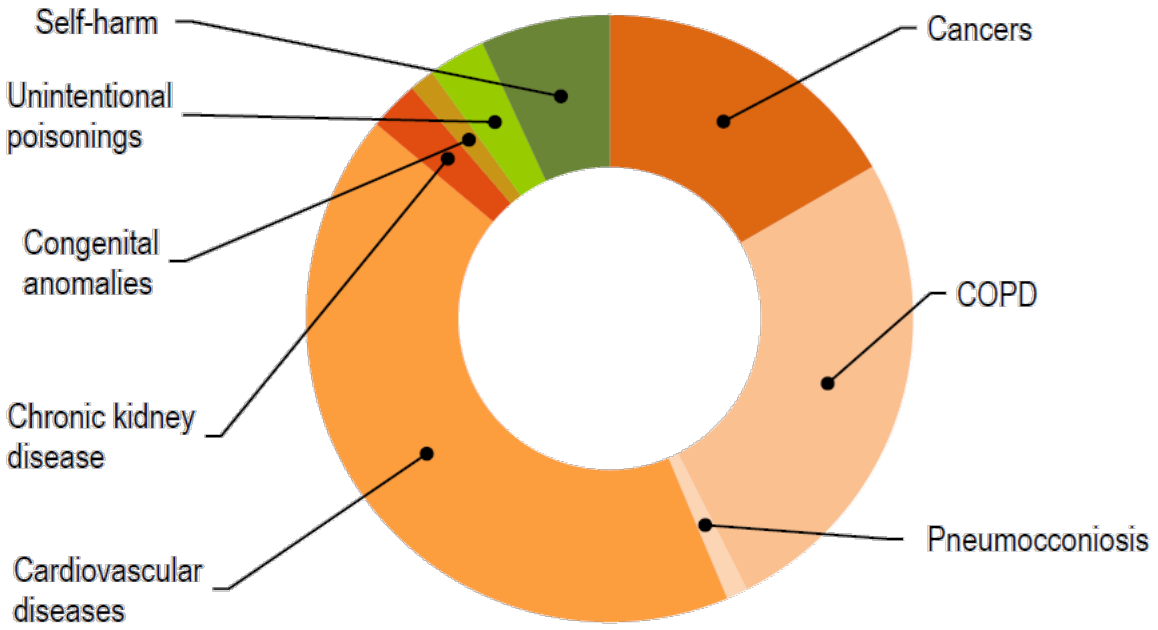


UNEP (2014)

Dopady chemického znečištění na člověka

Chemicals/ Groups of chemicals	Disease outcomes considered (population attributable fraction of DALYs)	Deaths	DALYs	Method
Chemicals in acute poisonings				
Chemicals involved in unintentional acute poisonings (methanol, diethylene glycol, kerosene, pesticides etc.)	Unintentional poisonings (73%)	61,523	3,489,814	Expert survey/ qualitative evidence synthesis
Chemicals involved in unintentional occupational poisonings (already included in the above poisonings)	Unintentional poisonings (occupational) (9.8%)	8,608	470,082	CRA
Pesticides involved in self-inflicted injuries	Self-inflicted injuries (20%)	137,831	6,245,500	Limited epidemiological data
Chemicals involved in congenital anomalies	Congenital anomalies (5.0%)	26,643	2,589,832	Expert survey/ qualitative evidence synthesis
Single chemicals with mostly longer term effects				
Lead	Cardiovascular diseases (CVD) (4.6%); chronic kidney diseases (CKD) (3.0%); idiopathic intellectual disability (IID) (30%)	901,716 (CVD: 848,778, CKD: 52,938)	21,676,385 (CVD: 17,734,898, CKD: 1,225,202, IID: 2,716,285)	CRA
Chemicals in occupational exposures (longer term effects)				
Occupational carcinogens (arsenic, asbestos, benzene, beryllium, cadmium, chromium, diesel engine exhaust, formaldehyde, nickel, silica, sulphuric acid, trichloroethylene)[b]	Cancers (2.9%); pneumoconiosis (79%)	350,325 (cancers: 333,867; pneumoconiosis: 16,458)	7,691,763 (cancers: 6,964,775, pneumoconiosis: 726,988)	CRA
Occupational particulates (dusts, fumes, gas)	COPD (16%); pneumoconiosis (21%)	524,290 (COPD: 517,734, pneumoconiosis: 6,556)	11,788,178 (COPD: 11,596,089, pneumoconiosis: 192,089)	CRA
Total	Considered diseases: poisonings, self-inflicted injuries, congenital anomalies, cardiovascular diseases, chronic kidney diseases, idiopathic intellectual disability, cancers, pneumoconiosis, COPD	2,002,328 (3.6% of total deaths)	53,481,472 (2.1% of total DALYs)	

Data sources: CRA: IHME (2021), disease statistics: WHO (2021a and 2021b); "expert survey" and "limited epidemiological data": Prüss-Ustün et al. (2016).
[a] without counting the effect of chemicals in general ambient air pollution, [b] excludes second-hand tobacco smoke.
Notes: DALYs: disability-adjusted life years, CRA: comparative risk assessment, COPD: chronic obstructive pulmonary disease, CVD: cardiovascular diseases, CKD: chronic kidney diseases, IID: idiopathic intellectual disability.



WHO (2021): The public health impact of chemicals: knowns and unknowns - 2021 data addendum.
https://www.who.int/publications/i/item/WHO-HEP-ECH-EHD-21.01

Dopady chemického znečištění na člověka

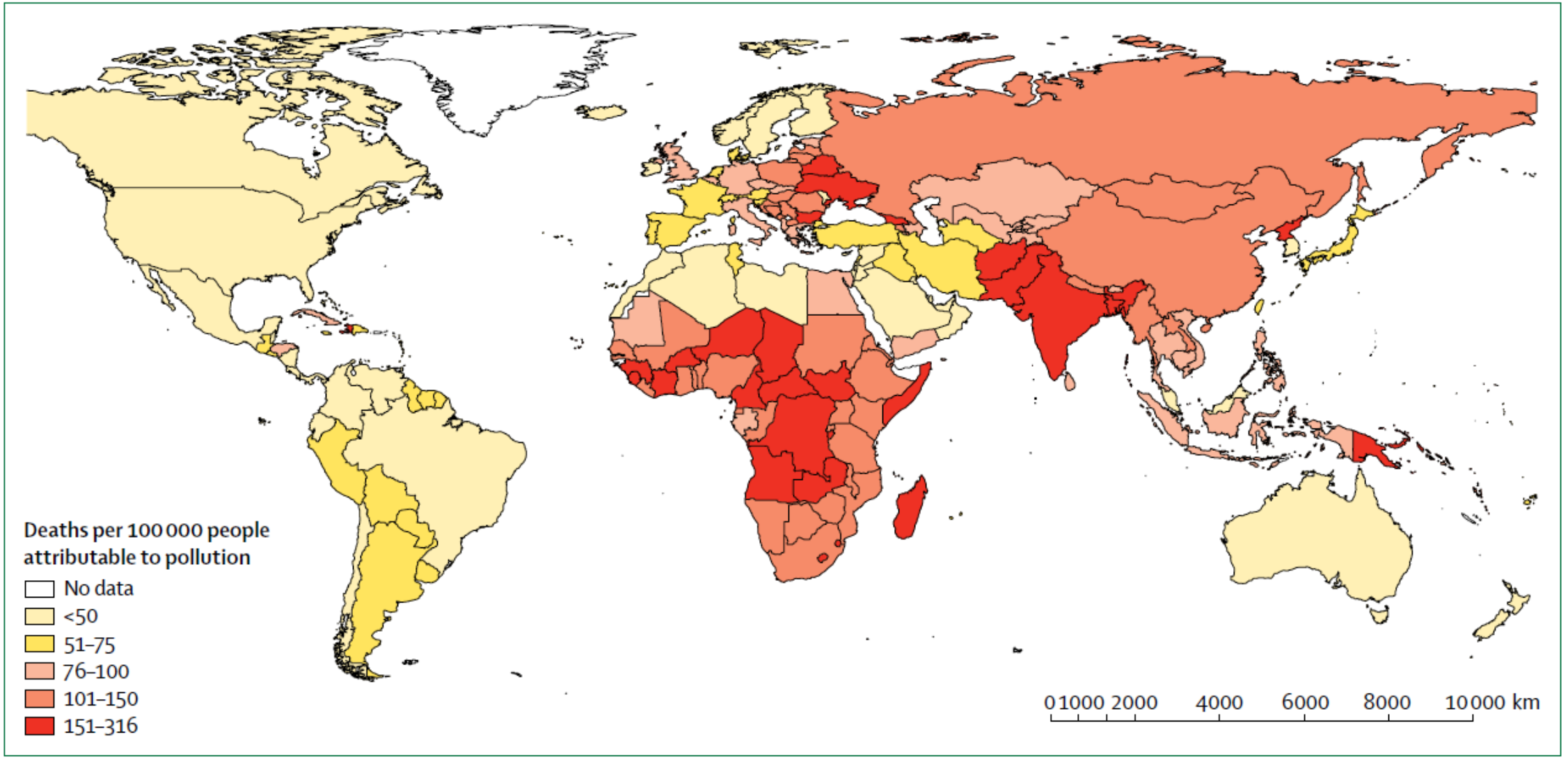
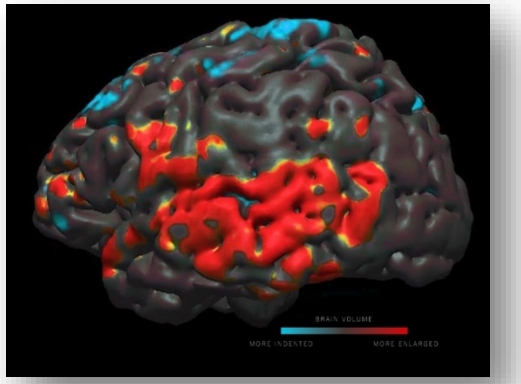


Figure 8: Number of deaths per 100 000 people that are attributable to all forms of pollution, 2015
GBD Study, 2016.[42]

Landrigan et al. (2018)

Dopady chemického znečištění na člověka



Special issue: Perspectives on the technosphere

THE ANTHROPOCENE REVIEW

Toxic chemicals as enablers and poisoners of the technosphere

The Anthropocene Review
2017, Vol. 4(2) 72–80

DOI: 10.1177/2053019617726308
journals.sagepub.com/home/anr
SAGE

Miriam L Diamond

„Neurobehavioural effects caused by toxic chemical exposure have profound **implications for society and its ability to self-perpetuate**. Not only does society have to shoulder associated health and management costs, but a five point decrease in IQ related to neurotoxicant exposure could also **decrease the number gifted individuals needed to solve complex problems in the technosphere**."

Diamond et al. (2017)

Neurobehavioral Deficits, Diseases, and Associated Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union

Martine Bellanger, Barbara Demeneix, Philippe Grandjean, R. Thomas Zoeller, and Leonardo Trasande

Results: The panel identified a 70–100% probability that polybrominated diphenyl ether and organophosphate exposures contribute to IQ loss in the European population. Polybrominated diphenyl ether exposures were associated with 873 000 (sensitivity analysis, 148 000 to 2.02 million) lost IQ points and 3290 (sensitivity analysis, 3290 to 8080) cases of intellectual disability, at costs of €9.59 billion (sensitivity analysis, €1.58 billion to €22.4 billion). Organophosphate exposures were associated with 13.0 million (sensitivity analysis, 4.24 million to 17.1 million) lost IQ points and 59 300 (sensitivity analysis, 16 500 to 84 400) cases of intellectual disability, at costs of €146 billion (sensitivity analysis, €46.8 billion to €194 billion). Autism spectrum disorder causation by multiple EDCs was assigned a 20–39% probability, with 316 (sensitivity analysis, 126–631) attributable cases at a cost of €199 million (sensitivity analysis, €79.7 million to €399 million). Attention-deficit hyperactivity disorder causation by multiple EDCs was assigned a 20–69% probability, with 19 300 to 31 200 attributable cases at a cost of €1.21 billion to €2.86 billion.

Conclusions: EDC exposures in Europe contribute substantially to neurobehavioral deficits and disease, with a high probability of >€150 billion costs/year. These results emphasize the advantages of controlling EDC exposure. (*J Clin Endocrinol Metab* 100: 1256–1266, 2015)

Bellanger et al. (2015)

Co ve mně vyvolávají zprávy/data o špatném stavu ŽP a jaký k tomu zaujímám postoj?

Neovlivňují moji náladu a chci je znát
0%

Neovlivňují moji náladu, ale i tak si je nechci moc pouštět do hlavy
0%

Přináší mi smutek či špatnou náladu či depresi, ale i tak je chci znát
0%

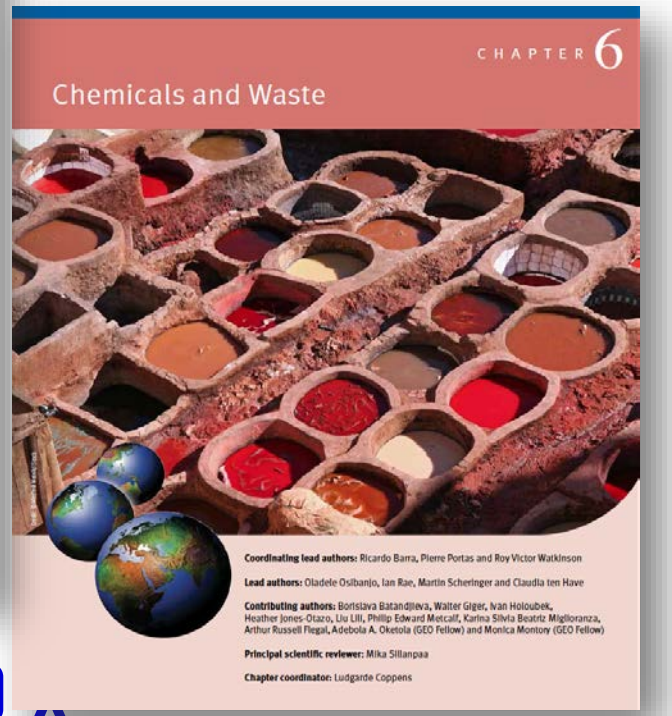
Přináší mi smutek či špatnou náladu či depresi a proto si je nechci moc pouštět do hlavy
0%

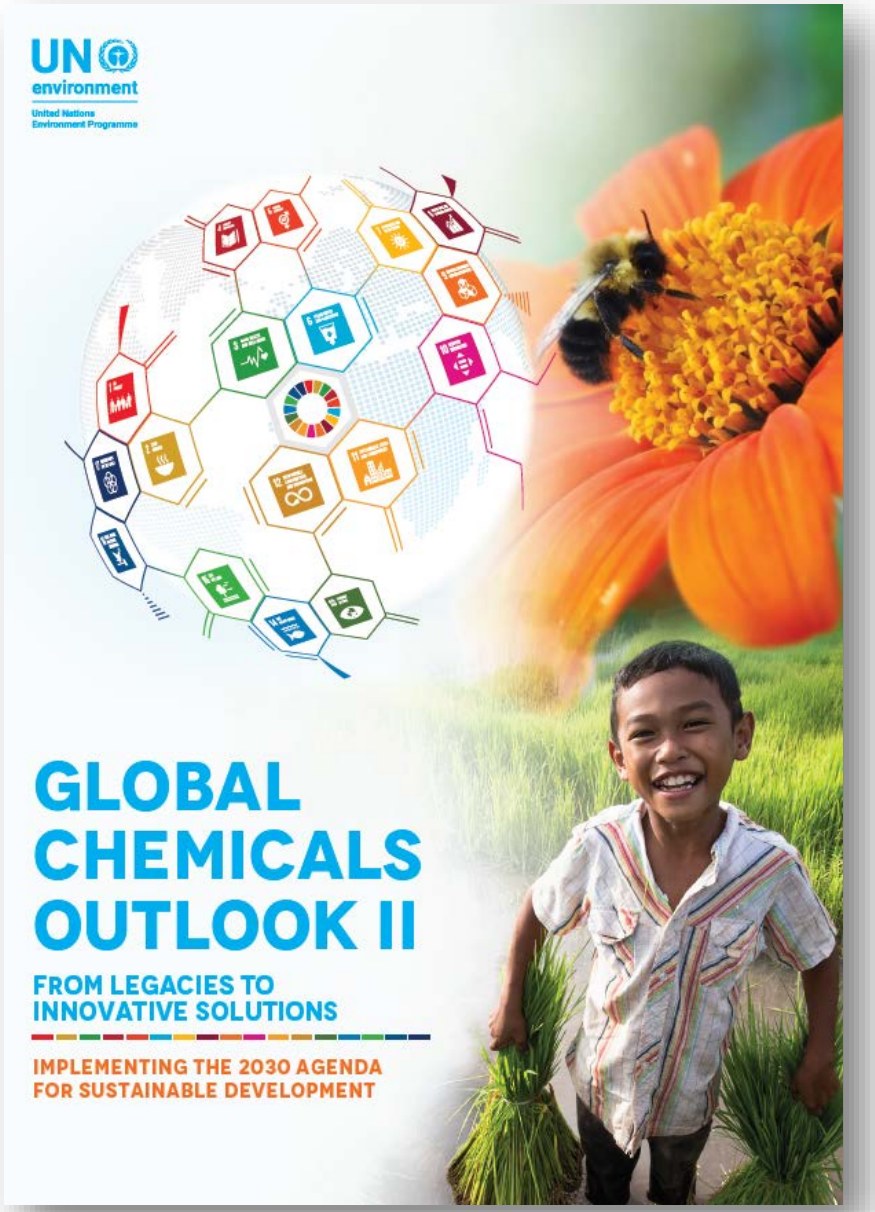
Ani jedno z výše uvedeného na mě nesedí
0%

Chemicals at UNEP

- 2019: Global Environment Outlook 6
- 2019: Global Chemical Outlook II

https://www.unep.org/resources/global-environment-outlook-6





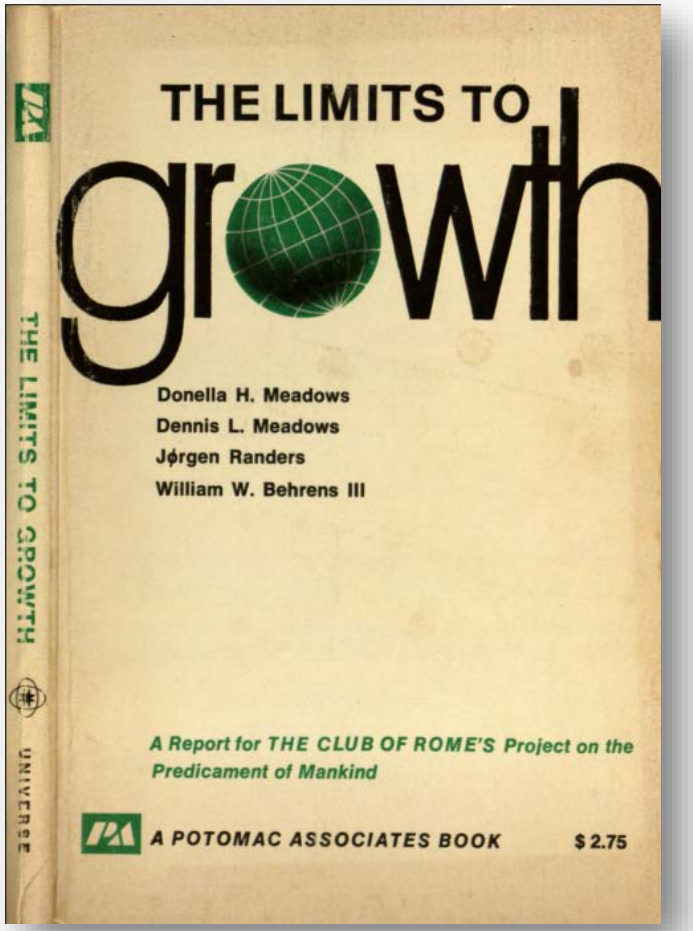
Chemicals at UNEP

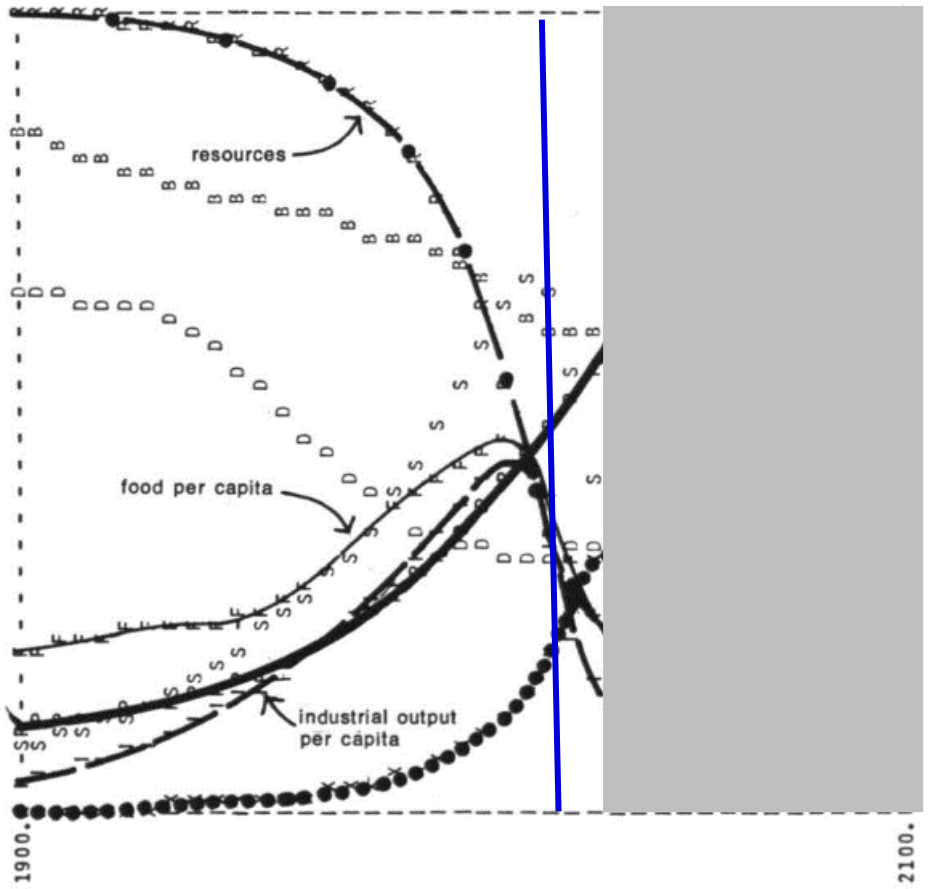
Modern society is living in the most chemical-intensive era in human history, the pace of **production of new chemicals largely surpasses the capacity to fully assess their potential adverse impacts on human health and ecosystems** (...) and now chemical pollution is considered a global threat. (p. 76 and 88)

https://www.unep.org/resources/global-environment-outlook-6

Globální chemické znečištění - dopady

- přelomová studie z roku 1972
- modely dynamiky naší přítomnosti na planetě
- pokračování modelu růstu "business as usual" (BAU) pravděpodobně povede ke kolapsu ŽP a ekonomiky [redacted], protože **čerpání zdrojů a produkce odpadu a znečištění překročí únosnou kapacitu planety**
- exponenciální růst v uzavřeném systému nemůže donekonečna růst
- kontroverze mezi vědci, odborníky i širokou veřejností, ale v následujících desetiletích byly tyto objevy podpořeny modely růstu, stavu ŽP a využívání zdrojů
- i dnes, 50 let po svém vydání, zůstává kniha důležitým zdrojem informací pro každého, kdo doufá, že lépe porozumí složitému systému, kterým je naše planeta





The "standard" world model run assumes no major change in the physical, economic, or social relationships that have historically governed the development of the world system. All variables plotted here follow historical values from 1900 to 1970. Food, industrial output, and population grow exponentially until the rapidly diminishing resource base forces a slowdown in industrial growth. Because of natural delays in the system, both population and pollution continue to increase for some time after the peak of industrialization. Population growth is finally halted by a rise in the death rate due to decreased food and medical services.

Globální chemické znečištění - dopady

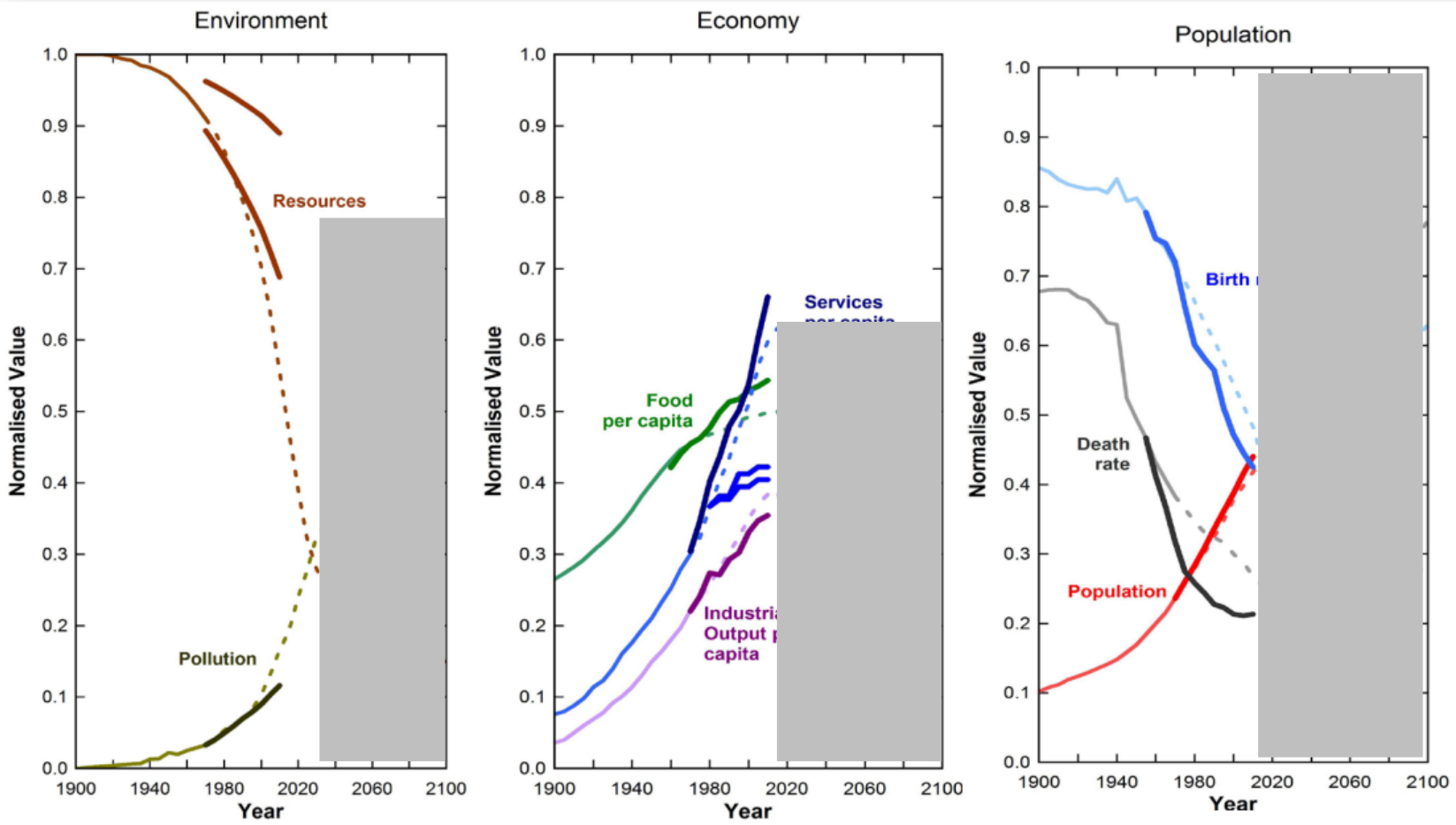
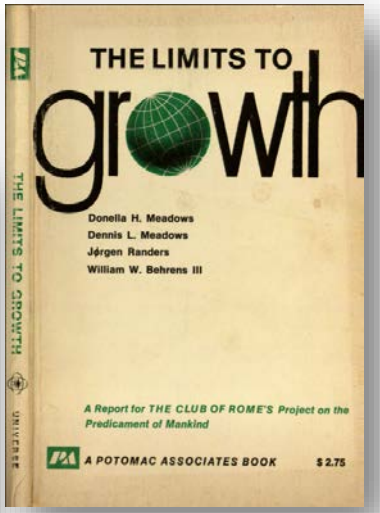
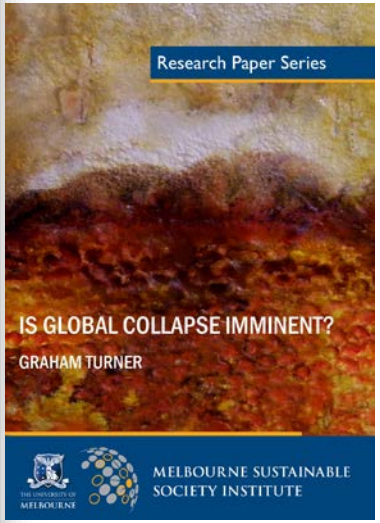


Figure 1. *LTG* BAU (Standard Run) scenario (dotted lines) compared with historical data from 1970 to 2010 (solid lines)—for demographic variables: population, crude birth rate, crude death rate; for economic output variables: industrial output per capita, food per capita, services per capita (upper curve: electricity p.c.; lower curves: literacy rates for adults, and youths [lowest data curve]); for environmental variables: global persistent pollution, fraction of non-renewable resources remaining (upper curve uses an upper limit of 150,000 EJ for ultimate energy resources; lower curve uses a lower limit of 60,000 EJ [Turner 2008]).



po 40 letech

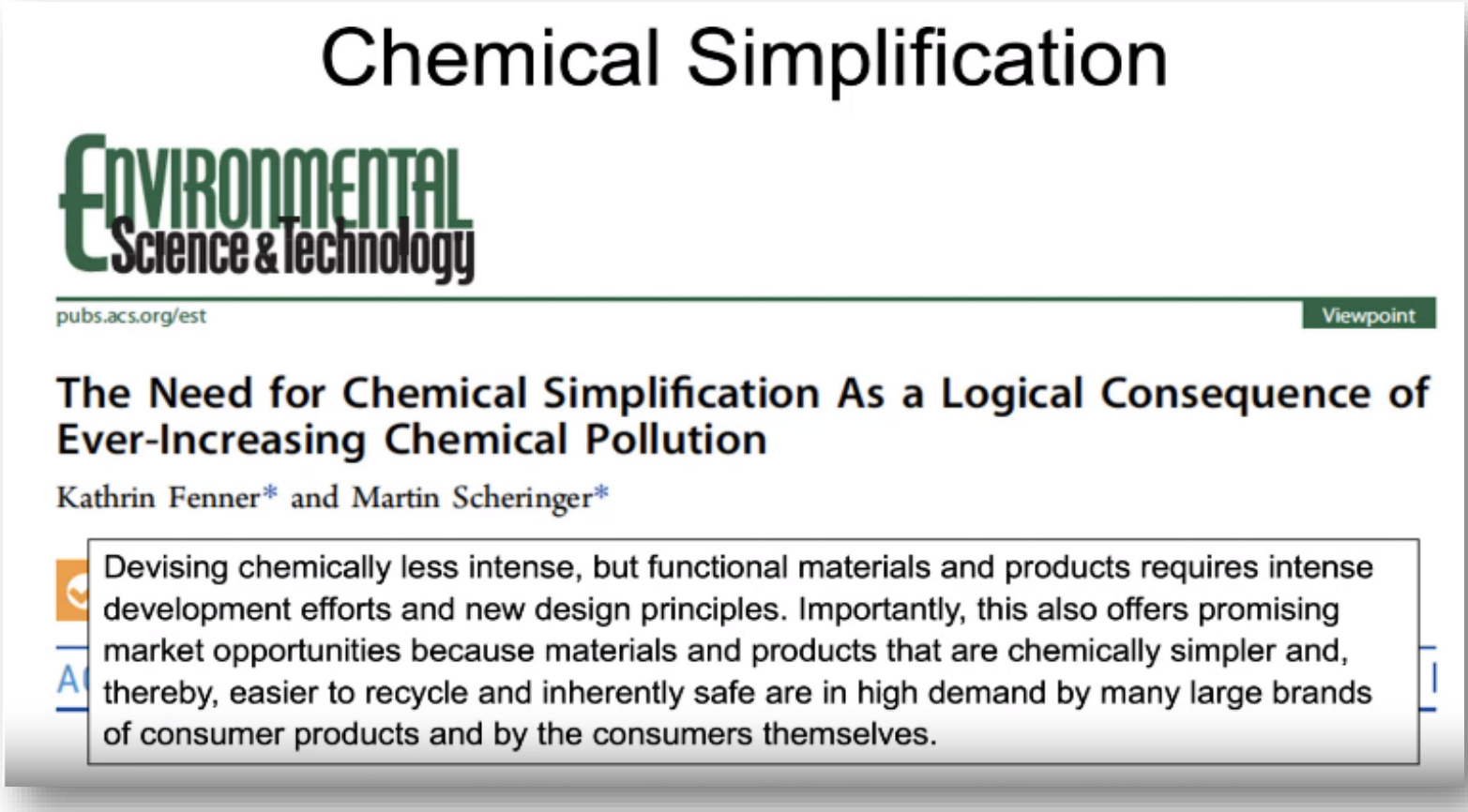


Turner, G. (2014): Is Global Collapse Imminent? MSSI Research Paper No. 4, Melbourne Sustainable Society Institute, The University of Melbourne. ISBN: 978 0 7340 4940 7

Na závěr ...

myšlenky prof Scheringera z přednášky na RECETOX semináři 19/9/2023:

- Společnost je v **chemickém přebytku**: Příliš mnoho různých látek v příliš mnoha různých aplikacích
- Chemické výrobky jsou potřebné, ale společnost musí být mnohem více **„chemicky efektivní“**
- Je také nutná podstatná změna týkající se chemických látek
- Problémem není jen uhlíková stopa chemický průmyslu, ale i jeho „toxická stopa“



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