

SKLÁDKOVÝ WORKSHOP LIBEREC – ŽITAVA

12. a 13. listopadu 2020

Evolúcia skládkovania.

Die Rolle von Deponien in XXI. Jahrhunderte.

Ing. Marek Hrabčák, Geosofting, s.r.o., Prešov - Slovensko



1. Politici - Aktivisti - Odborníci Politiker - Aktivisten - Experten



THE LANCET

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Offline: Science and the breakdown of trust

Richard Horton

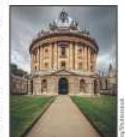
Published: October 03, 2020 • DOI: [https://doi.org/10.1016/S0140-6736\(20\)32064-X](https://doi.org/10.1016/S0140-6736(20)32064-X)

Offline: Science and the breakdown of trust

The COVID-19 pandemic is entering its most dangerous phase. There is a mounting breakdown of trust. Not only between politicians and the public. But also among politicians and publics with science and scientists. This breach of faith with science is far more threatening. For the public is slowly turning against those who have sought to guide the political response to COVID-19. As countries face a resurgence of coronavirus transmission, scientific advisers are recommending further restrictions to our liberties. There is now a palpable public reaction against these mandates. Whereas in March people were ready to stay at home to protect their health and health systems, the growing economic emergency that has followed national lockdowns is leading politicians to resist similar measures being applied once again. And it is scientists who are targets for public opprobrium. "Britain is in the grip of mad science", wrote one commentator last week. A UK Government minister was quoted as saying that "[Boris] Johnson has been totally captured by [Chris] Whitty and [Patrick] Vallance". "Boris is now a prisoner of the scientists", ran a newspaper headline. Robert Dingwall, a professor of science, wrote "we have found ourselves in the hands of a scientific and medical elite with limited understanding of humanity and its needs".



The reasons for this crisis in the science of COVID-19 are mostly self-inflicted. An early consensus about how to manage the spread of the virus has disintegrated. We see scientists splintering into factions. In the UK, the breach began with the formation of an independent Scientific Advisory Group for Emergencies (SAGE), chaired by a former Chief Scientific Adviser to the government. Independent SAGE holds weekly press briefings and produces reports that frequently differ from advice given by the official SAGE. The rupture continued with increasingly personalised attacks. Oxford University's Carl Heneghan and Tom Jefferson wrote that "It is unfortunate that Mr Johnson is surrounded by mediocre scientific advisers". Heneghan, Jefferson, and others went on to publish an open letter to the Prime Minister arguing that his existing policies, based on the advice of the current Chief Medical Officer (Chris Whitty) and Chief Scientific Adviser (Patrick Vallance), were causing "significant harm across all age groups". A counter-letter



Richard Horton
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Vedci nemajú jednotný názor na problém.
(napr. COVID)

Vedci stratili dôveru verejnosti.

Čo s tým ?

Neurážať sa navzájom.
Objasňovať odlišné koncepty.
Dôležitejšia je diskusia ako konsenzus.

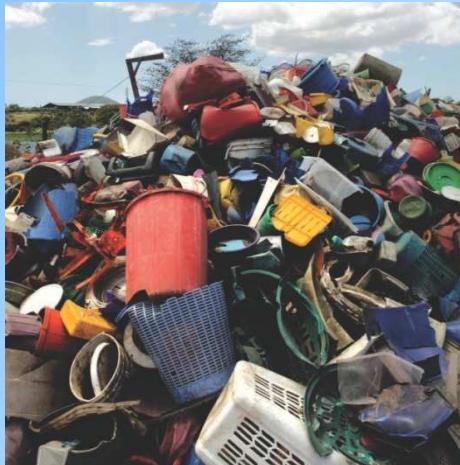
Komu teda máme dôverovať ???

Aj skúsený kapitán narazí.
Ale ani nadšenie aktivistov často nestačí.



Autor: Rvongher / Wikimedia Commons – Vlastné dielo, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=18045701>

2. Technologická evolúcia skládkovania



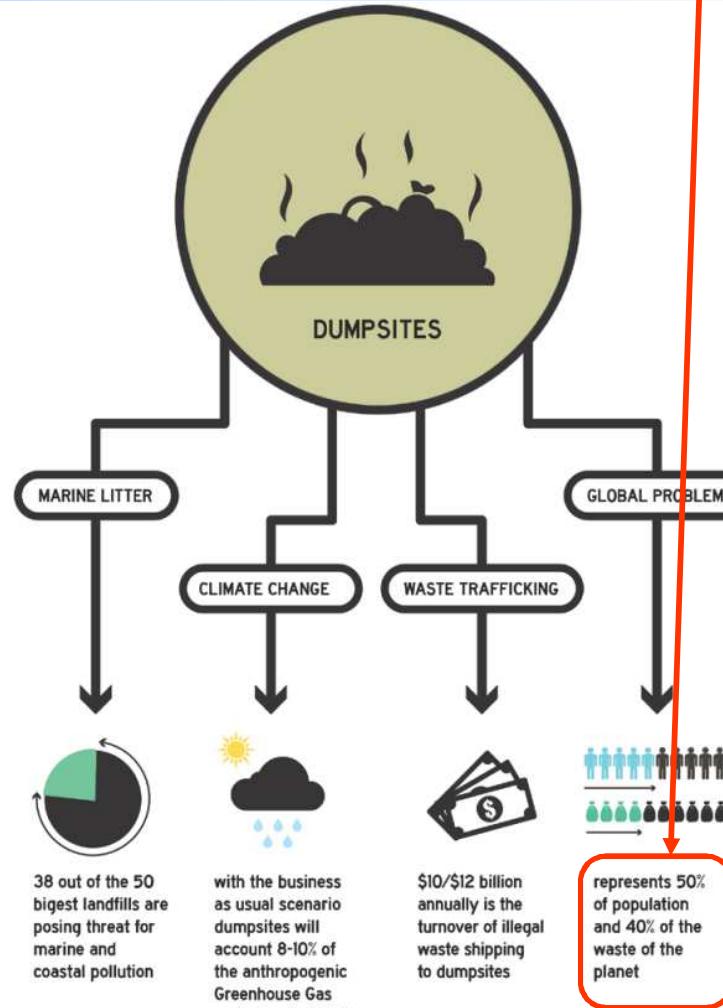
-10 000 B.C.
1950
1970/1980
1995/2000
2005/2010

- Deponie
- Sanitary landfills
- Engineered landfills
- Bioreactor landfills
- Sustainable landfills



2. Technologická evolúcia skládkovania

Deponie – Dumpsites – Smetisko



Ked' verejnosť počuje SKLÁDKA
najčastejšie si predstavuje SMETISKO.

A Roadmap
for closing
Waste
Dumpsites
The World's most
Polluted Places



WASTED HEALTH
THE TRAGIC CASE OF DUMPSITES

Antonis Mavropoulos, ISWA STC Chair
Contribution from David Newman, ISWA President

2. Technologická evolúcia skládkovania



1950-: Sanitary landfill



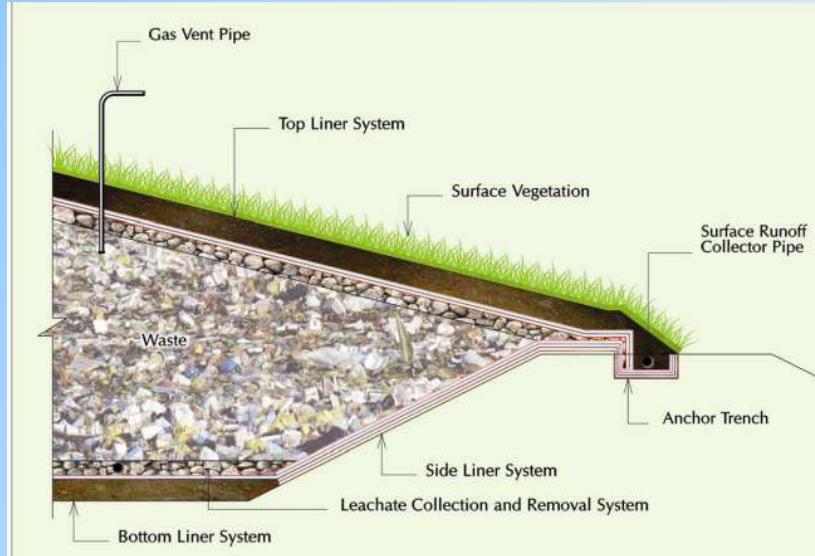
- aspoň minimálna starostlivosť



2. Technologická evolúcia skládkovania

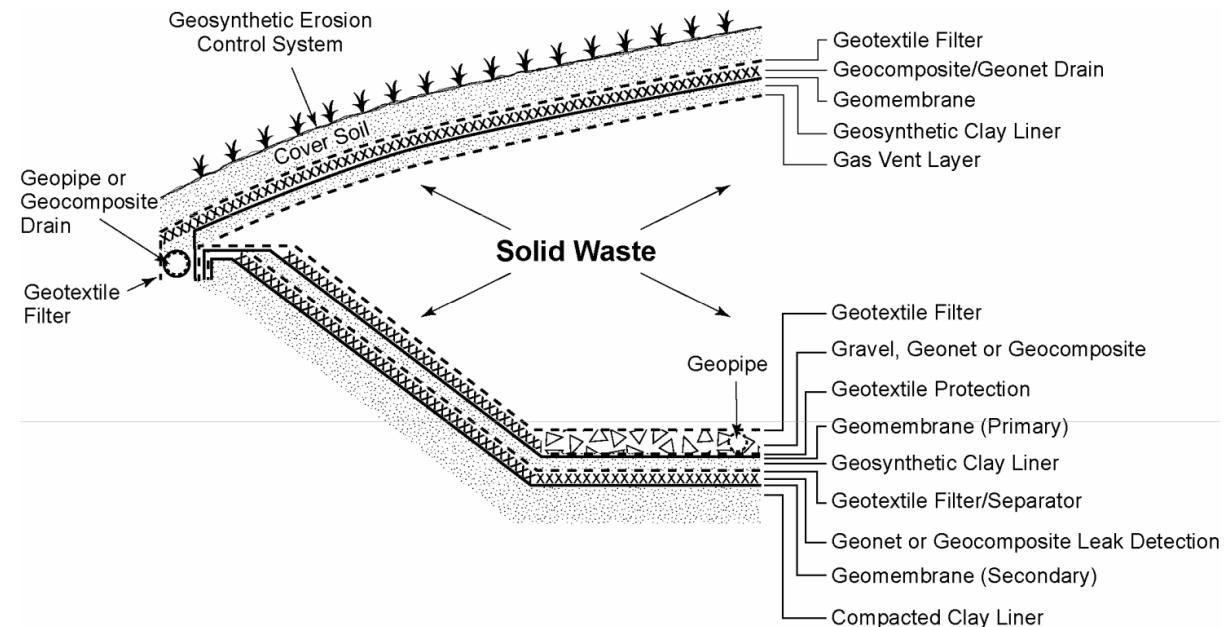


1970-1980: Engineered landfill



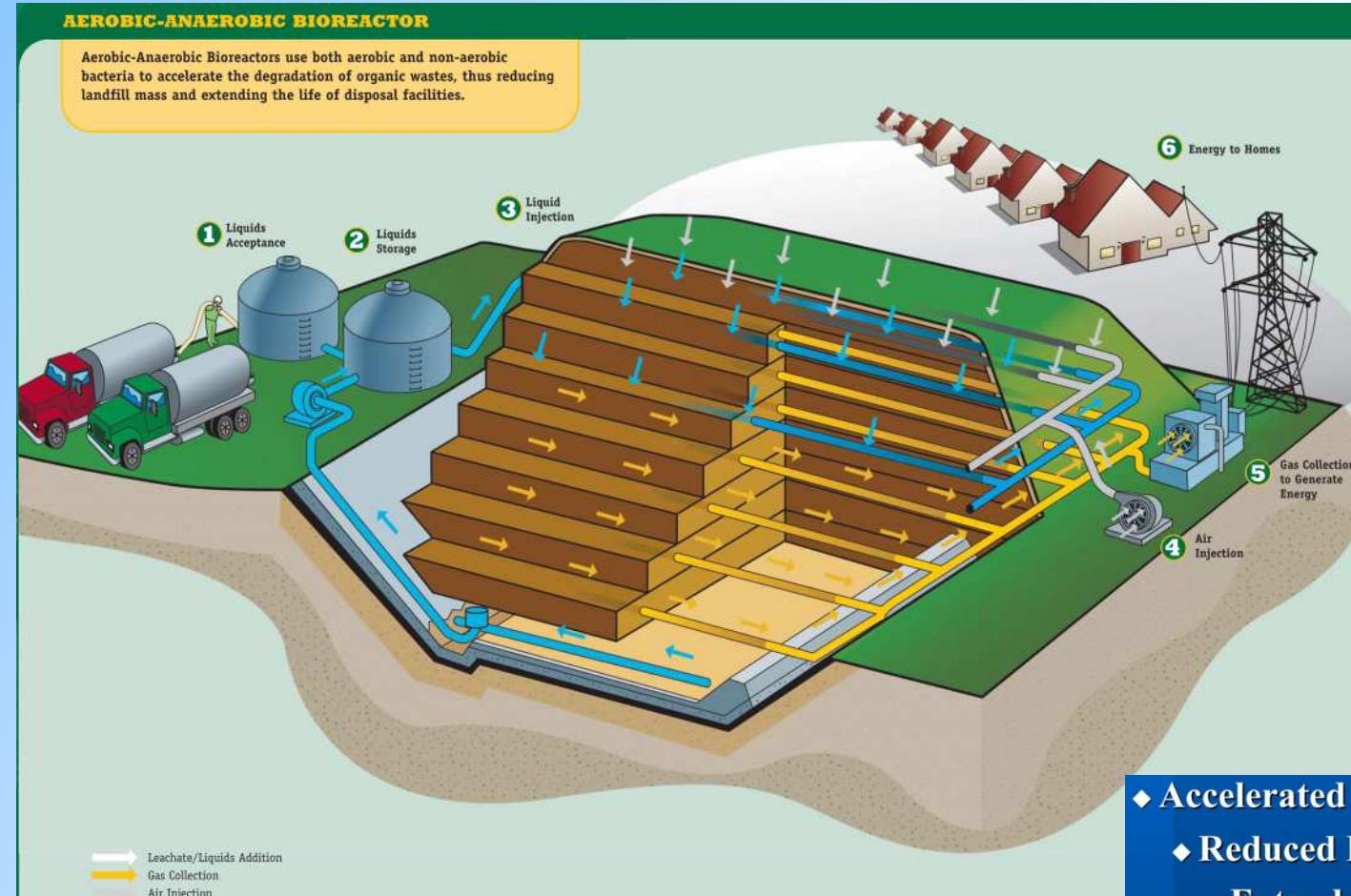
- navrhuje STAVEBNÝ INŽINIER
- prevádzka na základe LICENCIE
- kontrola nezávislým ORGÁNOM

- spodné aj horné tesnenie
- odvádzanie priesakov a plynov
- riadená prevádzka
- kontrola emisii
- následná starostlivosť



2. Technologická evolúcia skládkovania

1995–2000: Bioreaktor landfill



kombinácia 3 v jednom:

„SKLADKY + BIOplynky + KOMPOSTárne“



Infiltráciu priesakov reguluje PC na základe čidiel vlhkosti v telesu skládky a tvorby LFG



- ◆ Accelerated Waste Degradation
- ◆ Reduced Long Term Risks
- ◆ Extended Landfill Life
- ◆ Reduced Need for New Landfills
- ◆ More Efficient LFG Collection
- ◆ More Economical Leachate Treatment

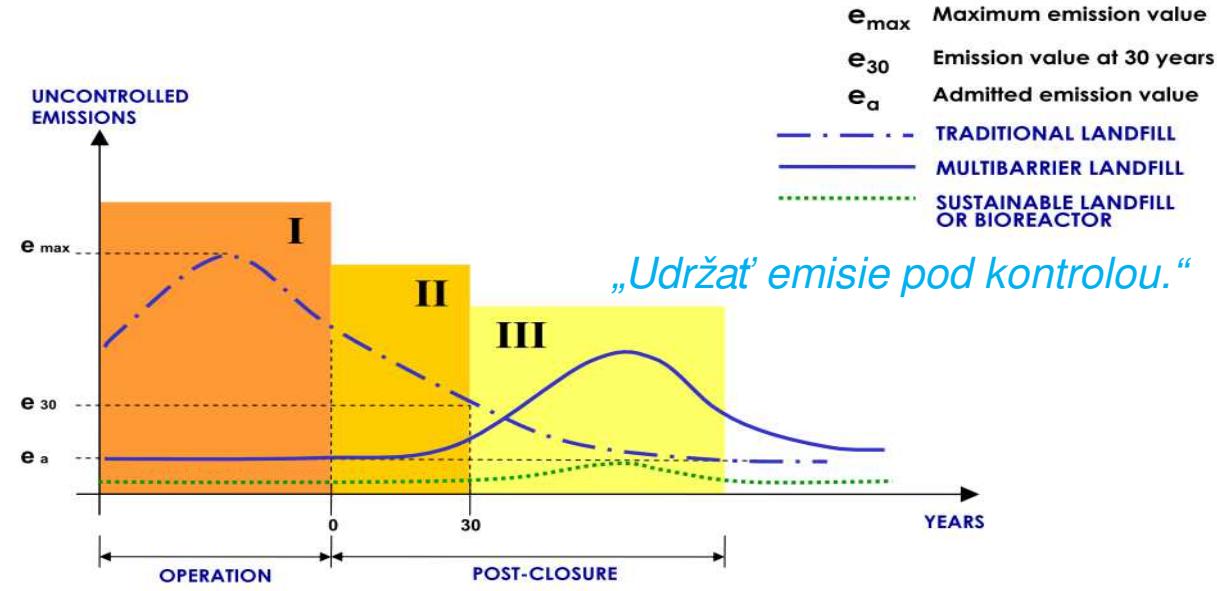


2. Technologická evolúcia skládkovania



2005–2010: Sustainable landfill

Emissions associated with the SUSTAINABLE LANDFILL:



Fundamentals and new developments in the in-situ aeration of landfills

Session Coordinators: Prof. Dr.-Ing. Rainer Stegmann¹ and Dr.-Ing. Marco Ritzkowski²

^{1,2} Institute of WasteResourceManagement, Hamburg University of Technology, Germany
Harburger Schloßstr. 36, D – 21079 Hamburg

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² E-Mail: m.ritzkowski@tuhh.de; phone: +49/40/42878-2053

DUTCH SUSTAINABLE LANDFILL RESEARCH PROGRAM: FOUR YEARS EXPERIENCE WITH THE BIOREACTOR TEST CELL.

HANS WOELDERS*, L. LUNING, F. VAN VELTHOVEN, H. HERMIKES AND H. OONK

* Essent Milieu, P.O. Box 5, 9418 ZG Wijster, the Netherlands
E-mail: hans.woelders@essent.nl; Phone: +31 593 563985 ;FAX: +31 593 563993

MODELLING IN SUPPORT OF THE DEVELOPMENT OF SUSTAINABLE LANDFILL CONCEPTS

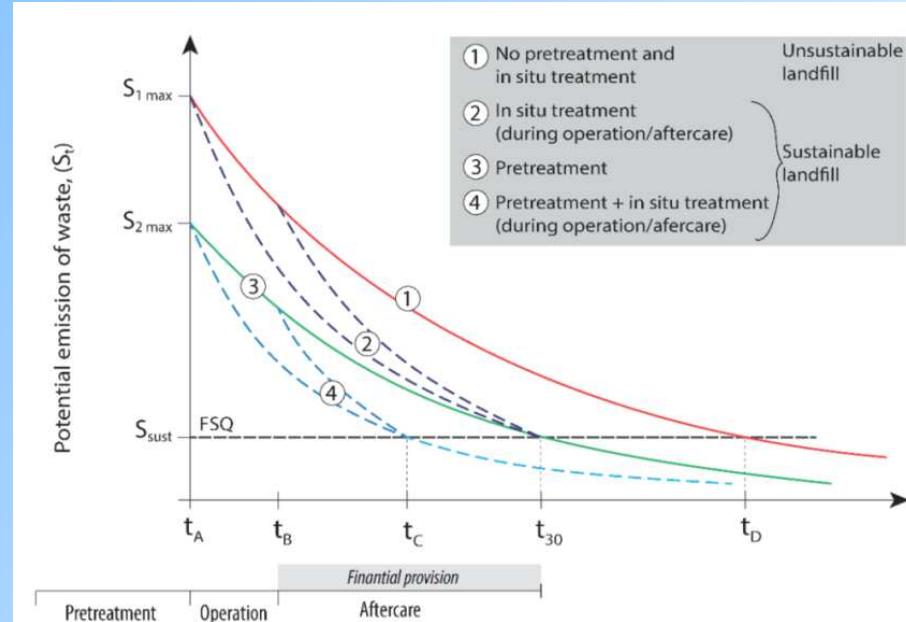
H. A. van der Sloot*, A. van Zomeren*, J.C.L. Meeussen* and H. Scharff**.
*ECN, Environmental Risk Assessment, P.O.Box 1, 1755 ZG Petten, The Netherlands
** NV Afvalzorg, P.O.Box 6343, 2001 HH Haarlem, The Netherlands
vandersloot@ecn.nl

Landfill stability and final storage quality

Heijo Scharff, h.scharff@afvalzorg.nl, NV Afvalzorg, NL-1566 ZG, Assendelft, Netherlands
André van Zomeren, vanzomeren@ecn.nl, ECN, NL-1755 ZG, Petten, Netherlands

2. Technologická evolúcia skládkovania

2005–2010: Sustainable landfill



„Udržať emisie pod kontrolou.“

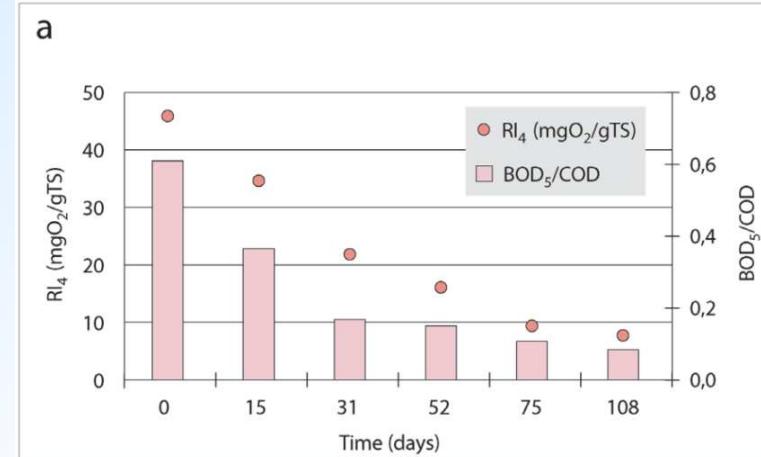


TABLE 1: Verification of the biological stability of wastes prior to landfilling and criteria per assessment applied in different countries.

Country	Verification	Index	Limit value	Reference
Australia	NO	-	-	(Clarke, 2020)
Austria	YES	RI ₄ , GB ₂₁	(7 mg O ₂ /g TS, 20 NI/kg TS) ^a	(Binner, 2020)
China	NO	RI ₄ ^b	20 mg O ₂ /g TS	(He, 2020)
Colombia	NO	-	-	(Gandini, 2020)
EU	YES	COD	80 mg/L	(EU-Landfill Directive 31/99)
France	NO ^c	-	-	(Hennebert, 2020)
Germany	YES	RI ₄ , GB ₂₁	5 mg O ₂ /g TS, 20 NI/kg TS	(Ritzkowski, 2020)
Japan	NO	-	-	(Ishii, 2020)
Greece	NO ^c	-	-	(Komilis, 2020)
Italy	YES	DRI	1000 g O ₂ /kg VS*	(DM 27 set. 2010)
Holland	NO ^c	-	-	(van der Sloot, 2020)
UK	NO	DRI ₄ , BMP ₁₀₀	-	(Knox, 2020)
Spain	NO ^c	-	-	(Sanchez, 2020)
Sweden	NO ^c	-	-	(Kumpiene, 2020)
USA	NO	-	-	(Thorneloe, 2020)

PROBLEMS IN TRADITIONAL LANDFILLING AND PROPOSALS FOR SOLUTIONS BASED ON SUSTAINABILITY

Valentina Grossule ^{1,*} and Rainer Stegmann ²

¹ DICAE, Department of Civil, Architectural and Environmental Engineering, University of Padova, Via Marzolo 9, 35131 Padova, Italy

² Hamburg University of Technology, Institute of Environmental Technology and Energy Economics, Harburger Schlossstrasse 36-21079 Hamburg, Germany

3. Koniec doby skládkovej

2008: Das Ende der Deponiezeit



20.IV.2004

Waste prevention and recycling

European Parliament resolution on the communication from the Commission: Towards a thematic strategy on the prevention and recycling of waste (COM(2003) 301 – C5-0385/2003 – 2003/2145(INI))

20. Proposes that a separate category, 're-use', be distinguished from the waste category 'recovery', between prevention and recycling; considers that, in this way, re-use will be defined in its own right and that it will be possible to take effective measures to promote re-use; takes the view that an optimal waste management strategy is a combination of prevention, re-use of products and components, recycling of materials, energy recovery and environmentally friendly disposal;

Politické rozhodnutie ! (nie odborné)

19.XI.2008

SMERNICA EURÓPSKEHO PARLAMENTU A RADY 2008/98/ES
z 19. novembra 2008
o odpade a o zrušení určitých smerníc

Článok 4

Hierarchia odpadového hospodárstva

1. V právnych predpisoch a politikách, ktoré sa týkajú predchádzania vzniku odpadu a nakladania s odpadom, sa ako poradie priorít uplatňuje táto hierarchia odpadového hospodárstva:



3. Koniec doby skládkovej CIRCULAR ECONOMY !

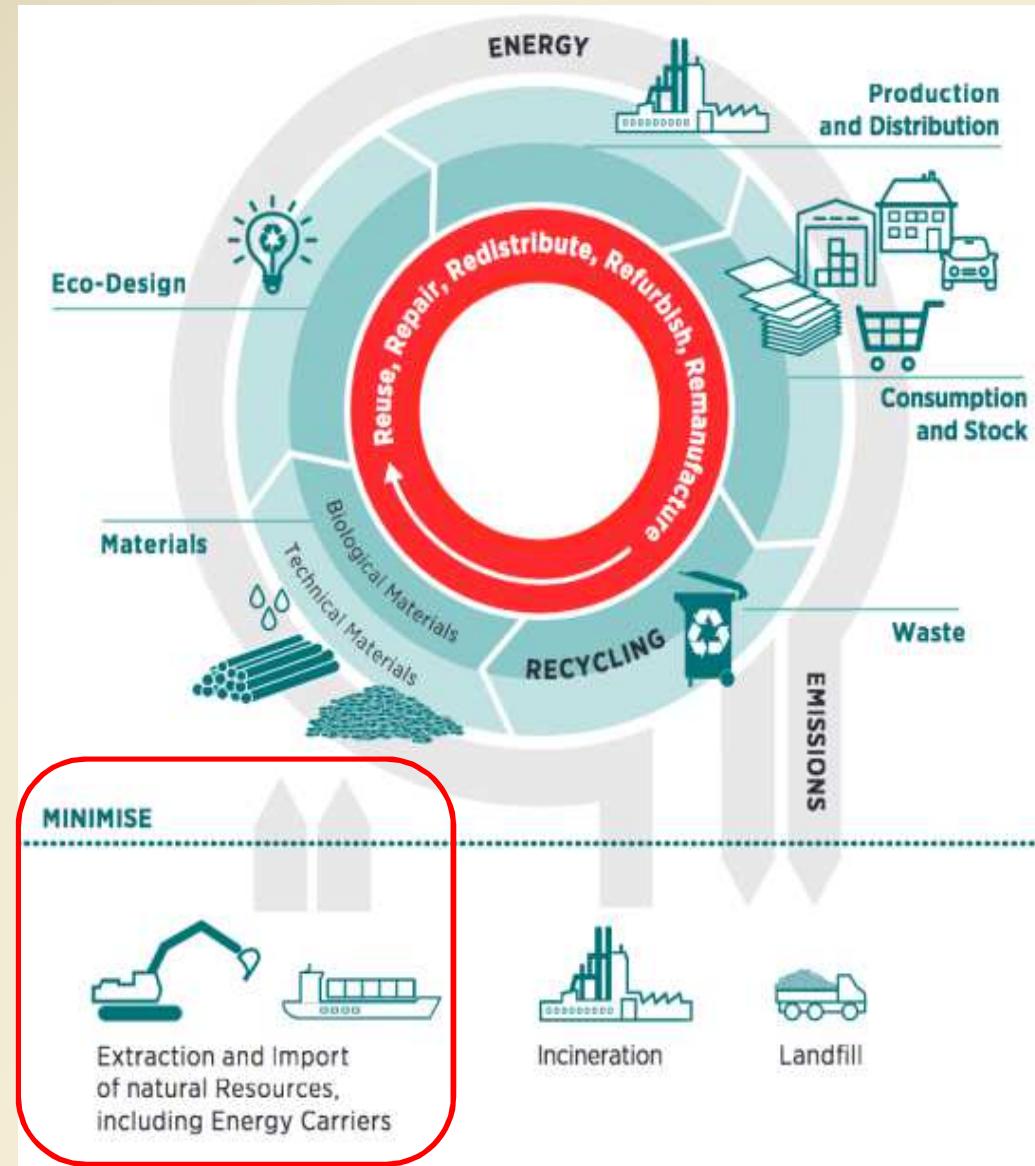


Figure 2: The Concept of Circular Economy (Wilts & Berg, 2017)

3. Koniec doby skládkovej

2008: Das Ende der Deponiezeit



16.II.2020



EURACTIV

**Nový plán pro oběhové
hospodářství chce množství
komunálního odpadu snížit na
polovinu**

„Množství komunálního odpadu by se mělo v nadcházejících 10 letech omezit o polovinu,” slibuje dokument. O polovinu by se mělo snížit také užívání materiálových zdrojů, nicméně takový cíl je v dokumentu uveden v závorce, a bude tak ještě předmětem další debaty.



- 50%

???

3. Koniec doby skládkovej



EURACTIV



16.2.2020

Evropská komise zamýšlí ve svém očekávaném akčním plánu pro oběhové hospodářství zcela oddělit ekonomický růst od využívání přírodních zdrojů. Samotný návrh by měl být oficiálně předložen v březnu.

???

Science for Environment Policy
DG Environment News Alert Service

European Commission

8 July 2010

Breaking the link between economic growth and waste generation

High levels of waste production must be tackled as part of the move towards sustainable living. Recent research has used Sweden as a case study to assess the strength of suitable policies and strategies that are required to break the link between economic growth and waste generation.

Over the past few decades the amount of solid waste has grown alongside growth in Gross Domestic Product (GDP). For example, in the EU-15 the total quantity of municipal waste grew by 54 per cent per person between 1980 and 2005. In Sweden, manufacturing waste increased by 60 per cent over the same time.

8.7.2010



Koniec doby skládkovej ? Das Ende der Deponiezeit ?

J. Budaj: Musíme smerovať k úplnému zastaveniu skládkovania

Miera energetického zhodnocovania odpadu musí na nejaký čas stúpnut', aby sa ukončila éra skládkovania, myslí si minister životného prostredia.



Wir müssen uns einer vollständigen Einstellung der Deponierung nähern.

Úloha skládok v XXI. st.

Die Rolle von Deponien in XXI. Jahrhunderte.



Hľadaný výraz ...

Skládkování v 21. století je anachronismus



NOVÝ NÁVRH ZÁKONA O ODPADECH

Jak jste spokojen s podobou návrhu zákona o odpadech?
Jsem rád, že se nám podařilo od začátku roku projednat ve všem, kdo má ji en tici k odpadům, obsahy zákona o odpadech a také doprát k jejich kompromitující změně. Našli jsme shodu se všemi ministry, především s MPO a ME, se zástupci primáky jako HK ČR a SP ČR a samozřejmě se zástupci obcí, zejména se SMO ČR nebo SMS ČR. Dáv rona budeme moci oba návrhy začít v neblízkých měsících začít provazovat ve vládě i v Parlamentu.

Proměna českého odpadového hospodářství o 90. let je evidentní, ale jakým směrem se podle Vas bude ubírat po změně zákona o odpadech?
Z návrhů obou zákonů by mělo být zřela patrné, že stavíme na přechodu

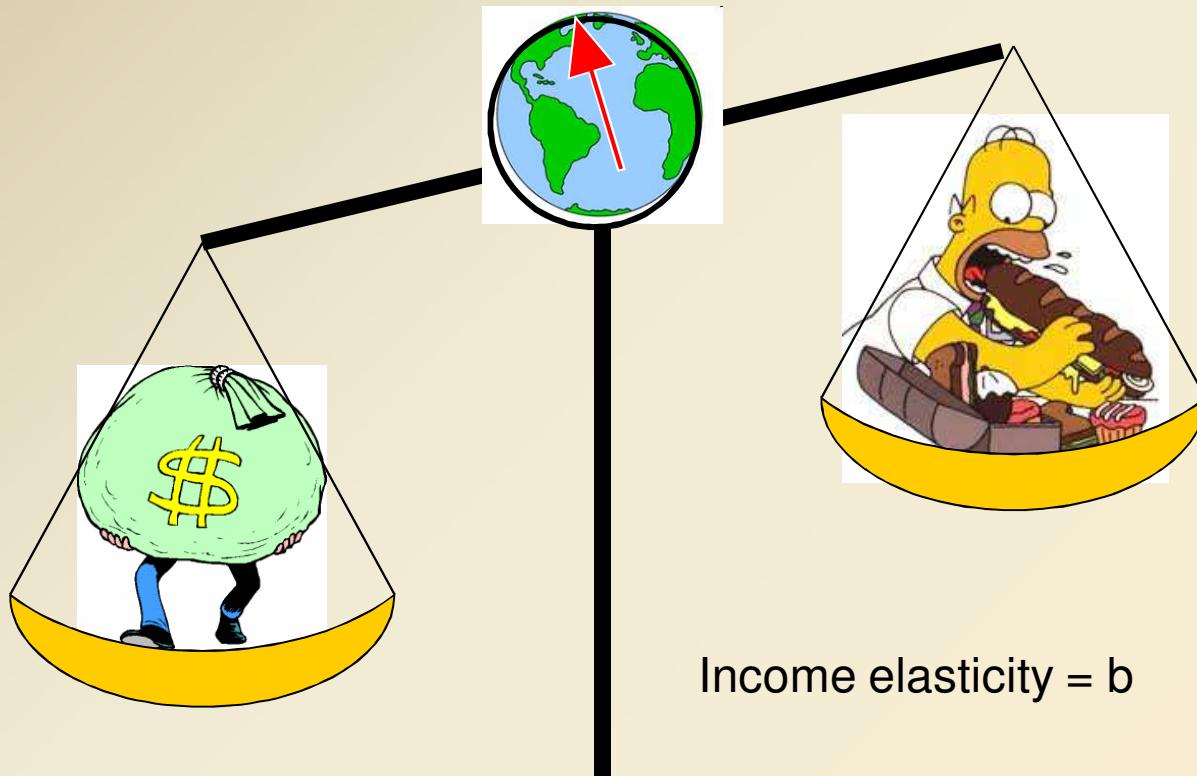
Die Deponierung im 21. Jahrhundert ist ein Anachronismus.

3.1. Zero waste ?



Consumption = $a \cdot \text{Income}^b$

Waste = $a \cdot \text{Consumption}^b$



Income elasticity = b



Ministryně financí Alena Schillerová. |
Foto: Petr Topič, MAFRA

"Podpořme chut' utrácet,
což pomůže znova roztočit kola
české ekonomiky....."

(17.9.2020 – A. S.)

When income increases by 1% - consumption increases by $b\%$

When GDP increases by 1,0% - MSW increases by 0,7%
(A. Mavropoulos, 2010)

- Julia K. Steinberger, Fridolin Krausmann
- Marina Fischer-Kowalski, Nina Eisenmenger
- International Society of Ecological Economics
- Oldenburg/Bremen, Germany
- August 22-25 2010

3.2 Metabolic theory of WASTE ?



Ecology, 85(7), 2004, pp. 1771–1789
© 2004 by the Ecological Society of America

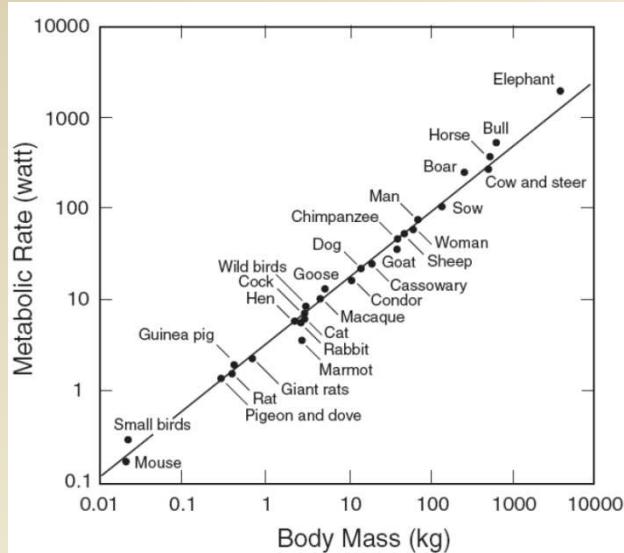
TOWARD A METABOLIC THEORY OF ECOLOGY

JAMES H. BROWN,^{1,2} JAMES F. GILLOOLY,¹ ANDREW P. ALLEN,¹ VAN M. SAVAGE,^{2,3} AND GEOFFREY B. WEST^{2,3}

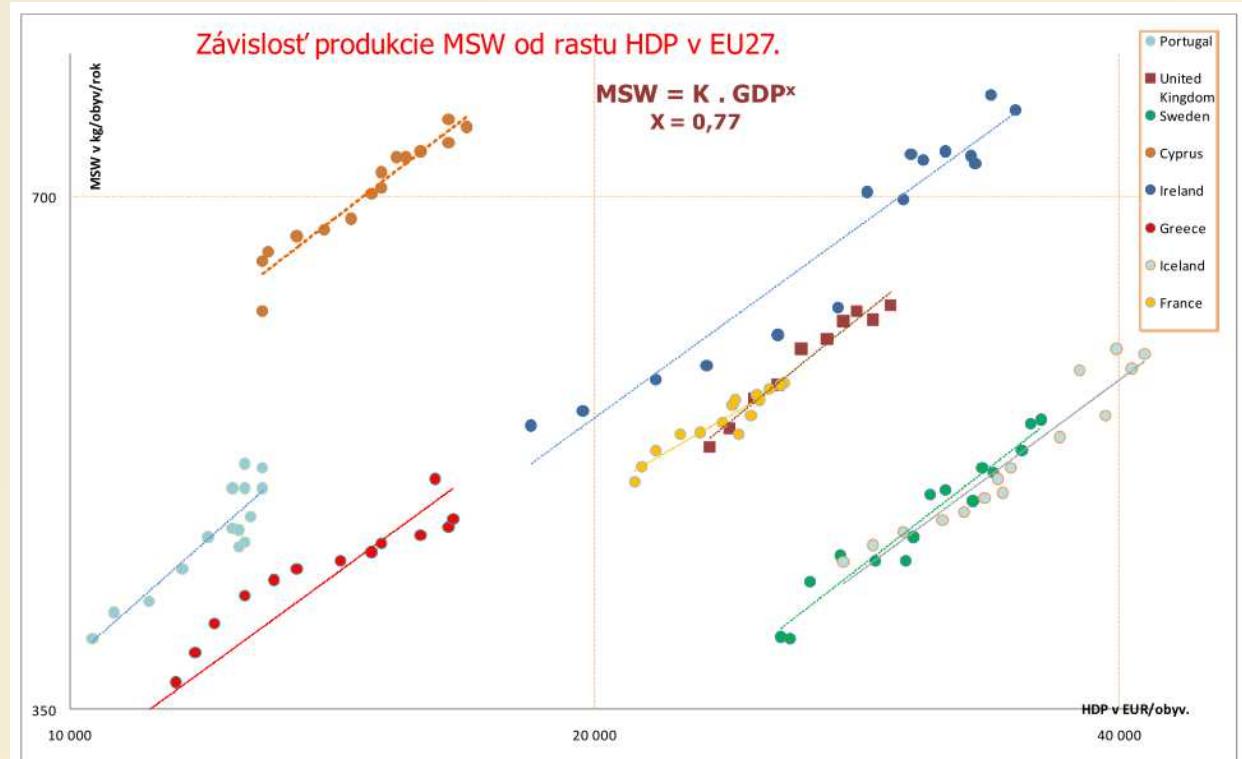
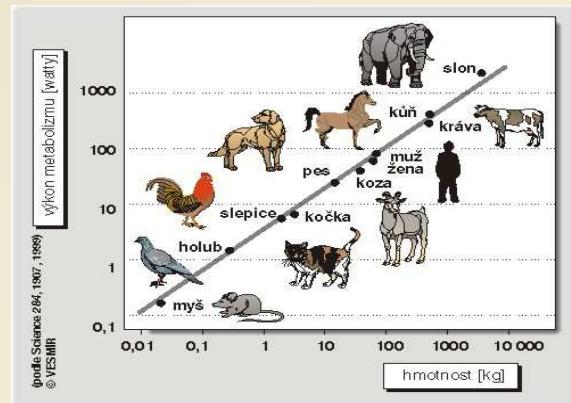
¹Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131 USA

²Santa Fe Institute, 1399 Hyde Park Road, Santa Fe, New Mexico 87501 USA

³Theoretical Division, MS B283, Los Alamos National Laboratory, Los Alamos, New Mexico 87545 USA



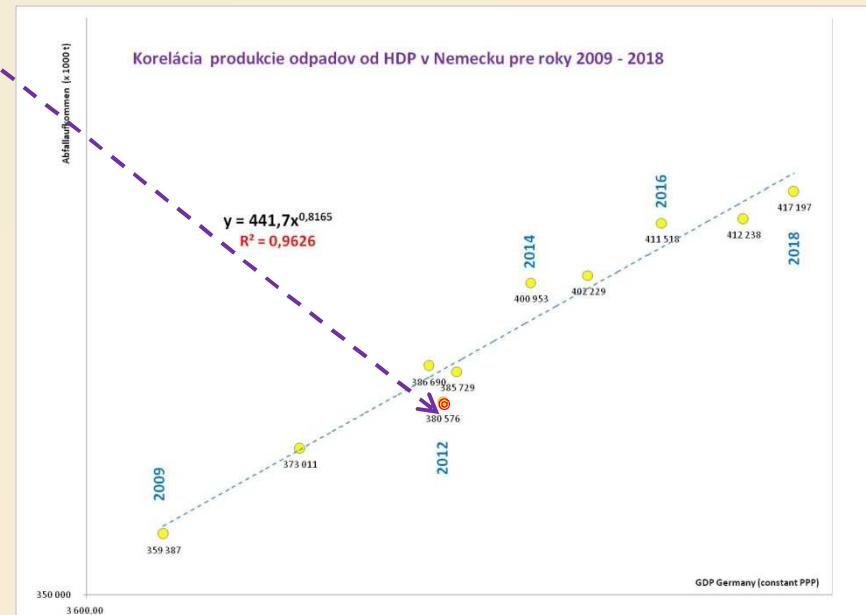
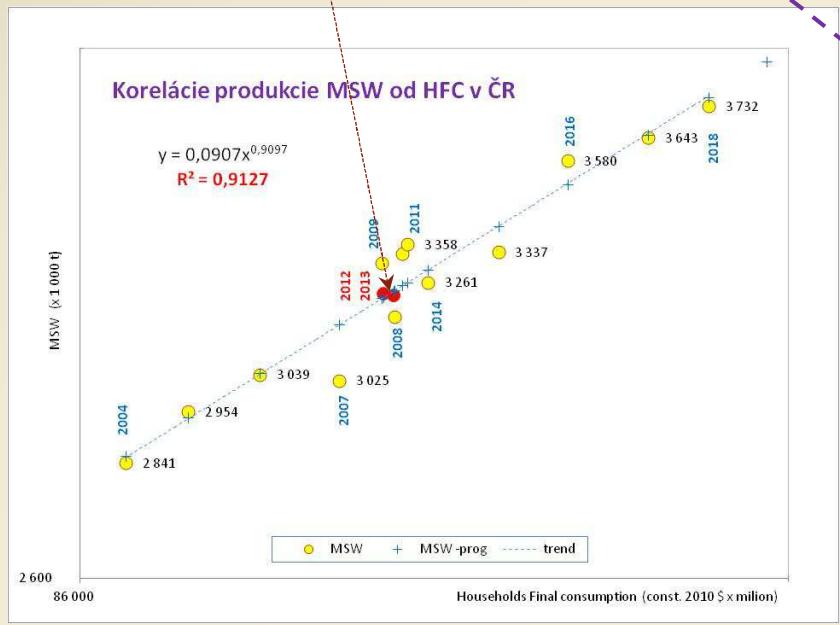
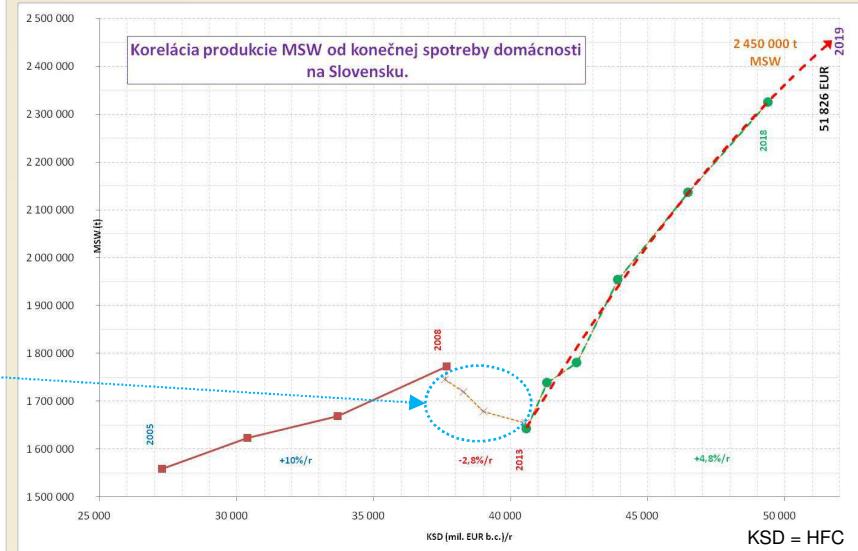
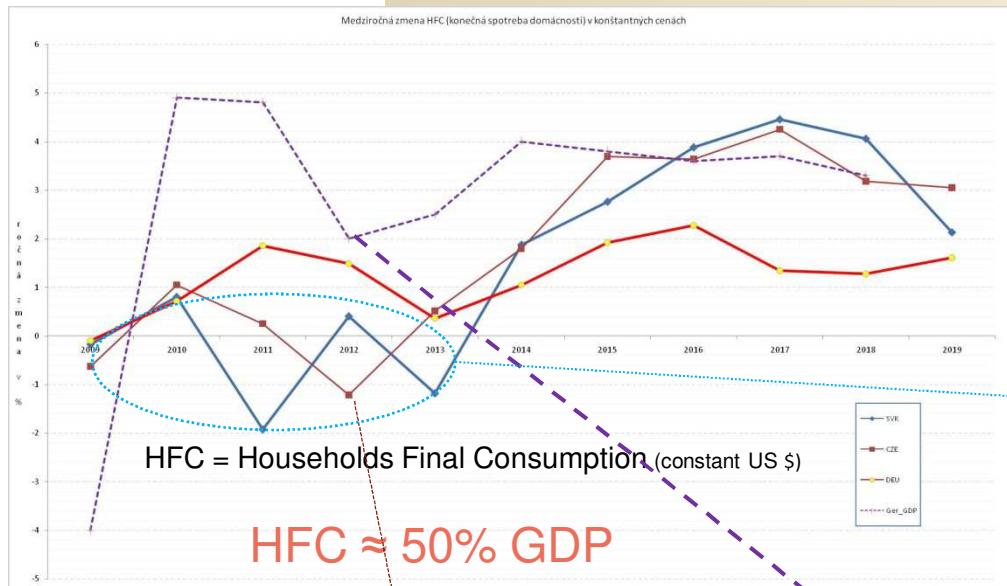
$$B \sim M^{3/4}$$



$$\text{Consumption} = a \cdot \text{Income}^b$$

$$\text{Waste} = a \cdot \text{Consumption}^b$$

3.3 GDP / Waste decoupling ???



4. Úloha skládok v XXI. st.

Die Rolle von Deponien in XXI. Jahrhunderte.



Key Issue Paper



The Role of Landfills in the Transition toward Resource Management

ISWA. (2014). *The Role of Landfills in the Transition towards Resource Management*. 1080 Vienna, Austria: International Solid Waste Association, ISWA General Secretariat.

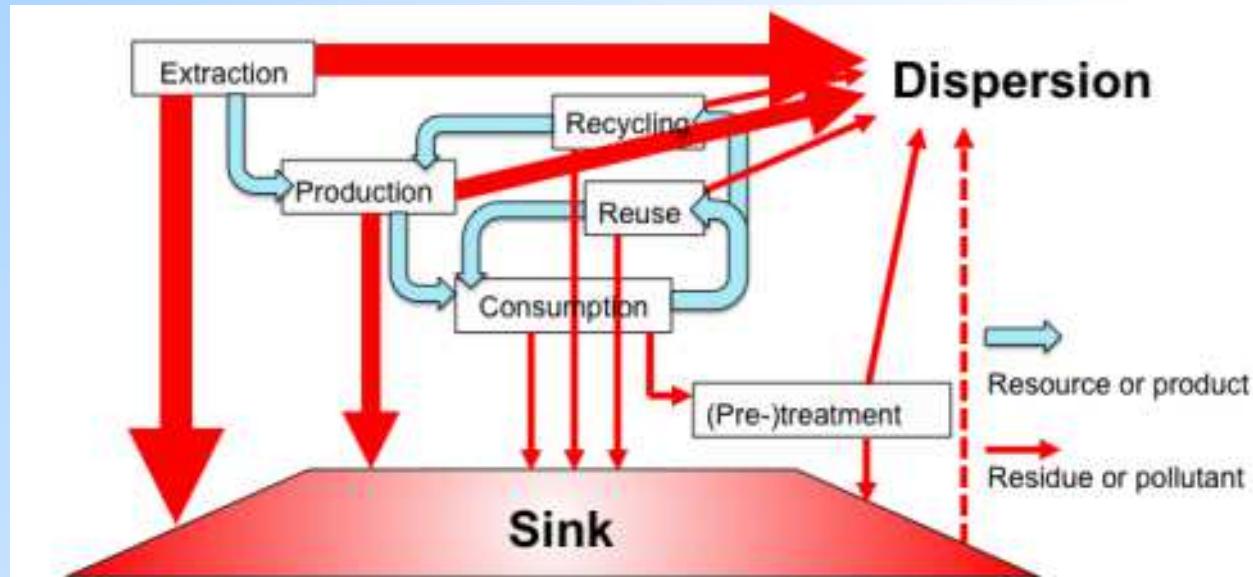


Figure 1. Pathways for resources, products, residues and pollutants (amended with permission from Lægreid et al. 2008)

Cossu, R. (2016). Back to Earth Sites: From “nasty and unsightly” landfilling to final sink and geological repository. *Waste Management* 55 , pp 1-2.

4. Úloha skládok v XXI. st.



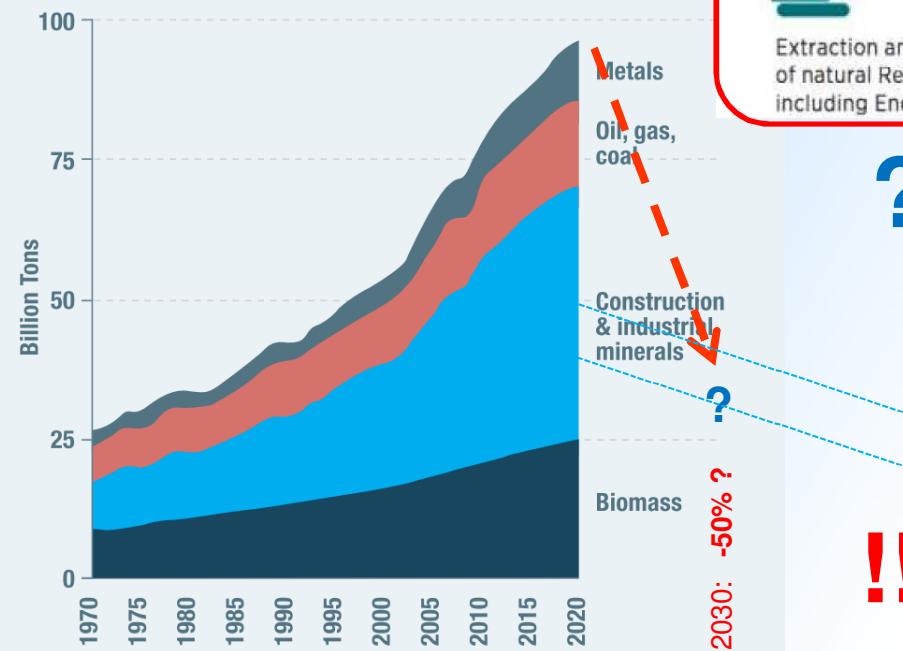
Die Rolle von Deponien in XXI. Jahrhunderte.

„Množství komunálního odpadu by se mělo v nadcházejících 10 letech omezit o polovinu,” slibuje dokument. O polovinu by se mělo snížit také užívání materiálových zdrojů, nicméně takový cíl je v dokumentu uveden v závorce, a bude tak ještě předmětem další debaty.



FIGURE 2.

Global Use of Materials



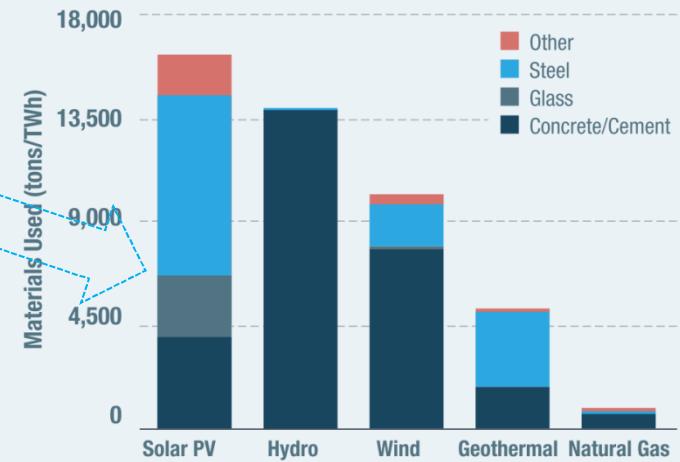
Source: Gillian Foster et al., “Sustainable Consumption and Production,” in Stephan Lutter, Fred Luks, and Sigrid Stagl, eds., *Towards a Socio-Ecological Transformation of the Economy*, Institute for Ecological Economics / Vienna University of Economics and Business (January 2019); Circle Economy, “Circularity Gap Report 2020”

Chart: Manhattan Institute

Substitutes fossil energy

FIGURE 1.

Materials Requirements to Build Different Energy Machines



Source: U.S. Department of Energy (DOE), “Quadrennial Technology Review: An Assessment of Energy Technologies and Research Opportunities,” September 2015, p. 390

Chart: Manhattan Institute



5. Limity recyklácie Grenzen der Rezyklierung

Emerging Challenges of Waste Management in Europe

Limits of Recycling

Rotterdam, 6th March 2020

Client: European Environment Agency (EEA)
Direct Service Contract No EEA/HSR/19/003

Key messages

The following key messages can be drawn from this report:

- There is potential to increase the percentage of material collected for recycling in the C&DW, MSW and WEEE waste streams. In absolute terms, the largest potential appears to exist in the MSW stream, calculated at approximately 111 or 139 million tonnes (depending on the method used). In relative terms, WEEE shows the highest increase in potential recycling (+103% or +112%, depending on the method used);

Table 0-1 Current recycling rates versus estimated recycling potential, per waste stream

Waste stream	Current recycling rate	Recycling potential (bottom-up)	Change from current recycling (%)	Recycling potential (top-down)	Change from current recycling (%)
C&DW ³	74% ⁴	96%	+30%	96%	+29%
MSW	43%	80%	+88%	90%	+110%
WEEE	37%	78%	+112%	75%	+103%

Source: Own development.

5. Limity recyklácie Grenzen der Rezyklierung



Table 3-3 MSW material fractions and their recycling potential (EEA-32), as found in literature

Material fraction	Share of the waste stream (kt, %)	Maximum recycling potential (%)	Maximum recycling potential (kt)	Evidence base or assumptions
Food waste	73,793 (25%)	95%	70,103	World Economic Forum (2019).
Paper and board	53,131 (18%)	96%	50,894	IMPACTPaperRec (2016).
Plastic	35,421 (12%)	70%	24,794	Nordic Council of Ministers (2014).
Other combustible	29,517 (10%)	43%	12,646	<i>The make-up of this material fraction is unknown and no definition could be found. The current recycling rate of EEA-32 countries was used as a proxy.²²</i>
Other	23,614 (8%)	43%	10,117	<i>The make-up of this material fraction is unknown and no definition could be found. The current recycling rate of EEA-32 countries was used as a proxy.²³</i>
Garden waste	17,710 (6%)	100%	17,710	Danish Environmental Agency (1999).
Glass	14,759 (5%)	77%	11,305	Dutch Waste Management Association (2015).
Rubble	14,759 (5%)	96%	14,192	The maximum estimated potential recycling rate of mineral C&DW (as found in section 3.1.3) was used.
Textiles	11,807 (4%)	74 ²⁴	8,737	Bartl (2018).
Nappies and other sanitary products	8,855 (3%)	70%	6,199	EC (n.d. ^b).
Steel	5,903 (2%)	95%	5,608	Deloitte (2017).
Aluminium	2,952 (1%)	97%	2,863	Green Alliance (2019).
White goods	2,952 (1%)	75%	2,215	Estonia's recycling rate of large household appliances (Category 1 WEEE), the highest recycling rate for such appliances in the EU, was used as a proxy (based on data from Eurostat, 2019d; and EC, 2019b).
Total	295,171 (100%)	80%	237,383	-



5. Limity recyklácie

Grenzen der Rezyklierung



Table 3-3 MSW material fractions and their recycling potential (EEA-32), as found in literature

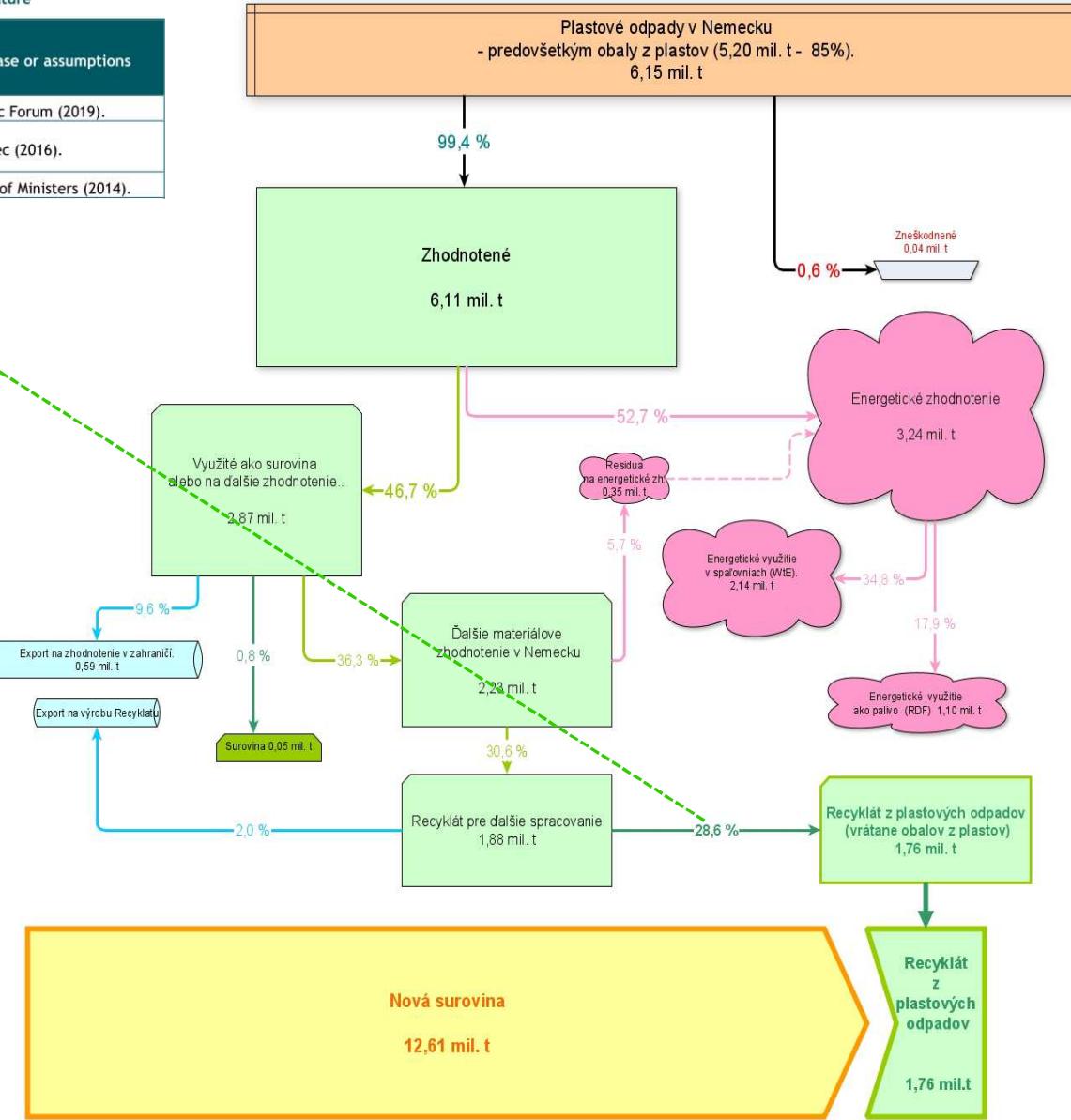
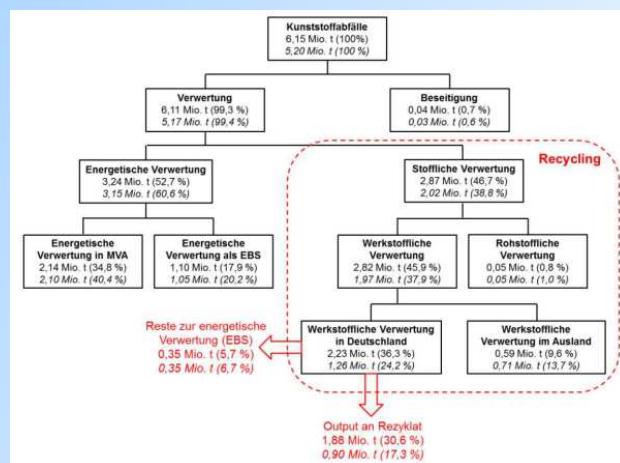
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Miriam Labbert¹

Fachkonferenz „Deponien und Abfallwirtschaft“ in Zittau
Deponien – Altlasten – Sickerwasser – „Bürgermeisterkippen“
DEPONIWORKSHOP ZITTAU-LIBEREC 2019
14.-15. November 2019

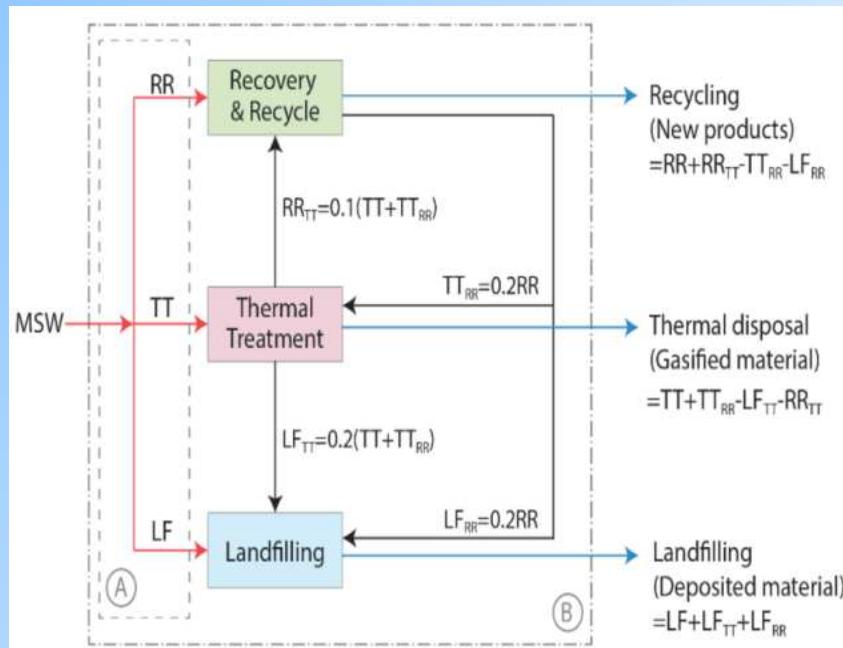
Kunststoffsortierung im Recycling



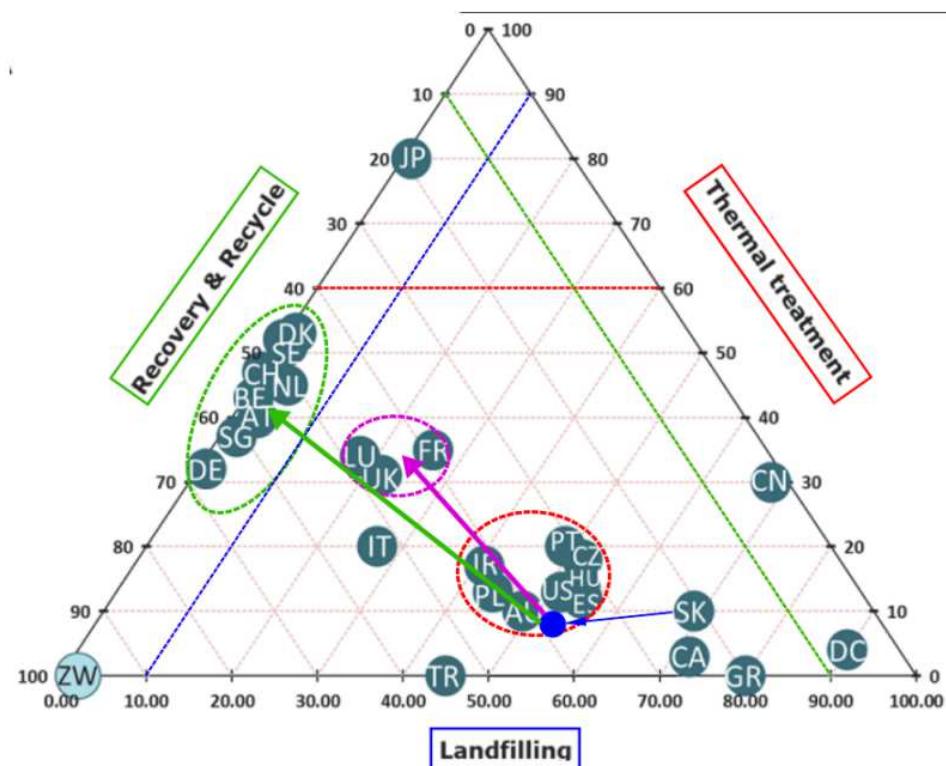
5. Residua – Überreste



Cossu, R. (2020). WHAT ABOUT RESIDUES FROM CIRCULAR ECONOMY AND ROLE OF LANDFILLING? *DETРИTUS*, Detritus / Volume 09 - 2020 / pages 1-3.



Oficiálne prezentované materiálové toky
nadhodnocujú RECYKLACIU



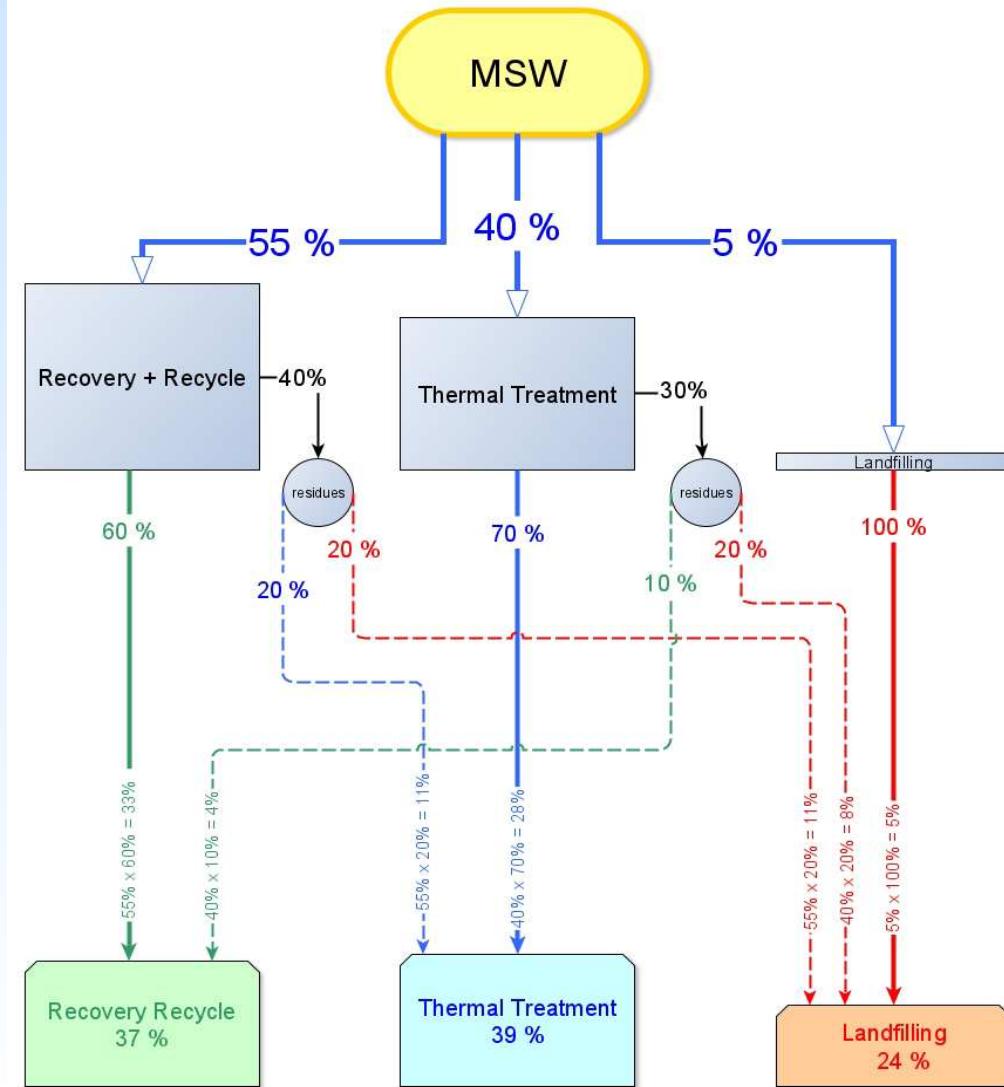
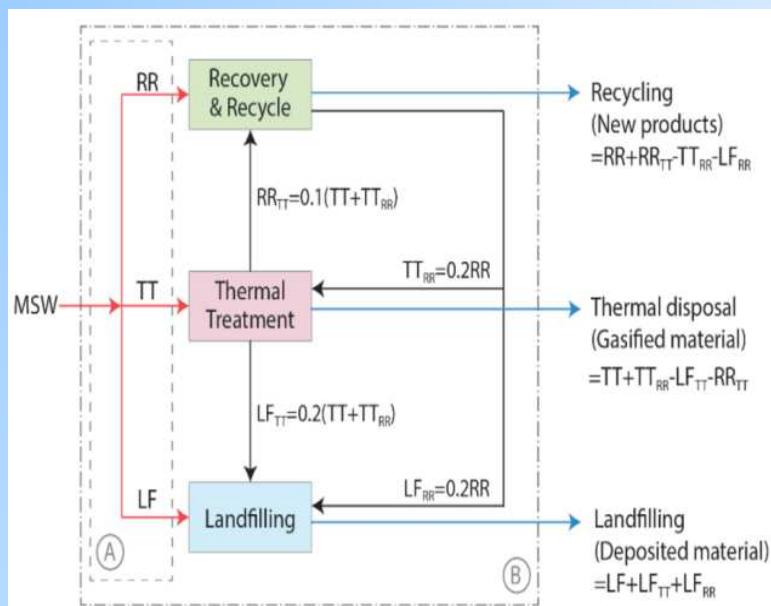
Detritus / Volume 09 - 2020 / pages 1-3
<https://doi.org/10.31025/2611-4135/2020.13920>

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5. Residua – Überreste



Cossu, R. (2020). WHAT ABOUT RESIDUES FROM CIRCULAR ECONOMY AND ROLE OF LANDFILLING? *DETITUS*, Detritus / Volume 09 - 2020 / pages 1-3.



Skutočné materiálové toky odpadov
sú iné
ako uvádzajú politici.

5. Rizika z recyklovaných materiálov.

Risiken aus rezyklierenden Materialien



Biedermann, M., & Uematsu, Y. (2011). Mineral Oil Contents in Paper and Board Recycled to . *Packaging Technology & Science* , 24(2): p. 61-73. .

XII/2012 – aféra s kontamináciou potravinárskych výrobkov (čokoláda, ryža, cereália) PAH a ďalšími ropnými látkami zrejme z recyklované lepenky. Zdroj: RECYCLINGmagazin.de 12/2012 „Mineralöl in Lebensmittelverpackungen: Werden alarmierende Studienergebnisse verschwiegen?“, „Neue Untersuchung der Adventskalender bestätigt erste Testergebnisse“, „Belastung von Lebensmitteln durch Mineralölbestandteile“...

Američané nechťejí potraviny balit do recyklátu, říká šéf kartonové firmy

<https://www.idnes.cz/zlin/zpravy/cardbox-packaging-zadverice-karton...>

Sosnovcová, J. (2020). Jsou PET lahve vyrobené z recyklátu zdravotně bezpečné ?
Odpadové forum, ročník 21 číslo 6 , 8.

X/2018 – ARNIKA.CZ „Jedy z plastového odpadu se vrací do našich domácností kvůli špatné recyklaci“ Zdroj:
<https://arnika.org/jedy-z-plastoveho-odpadu-se-vraci-do-nasich-domacnosti-kvuli-spatne-recyklaci>



**Smarter, greener,
more inclusive?**

Indicators to support the
Europe 2020 strategy

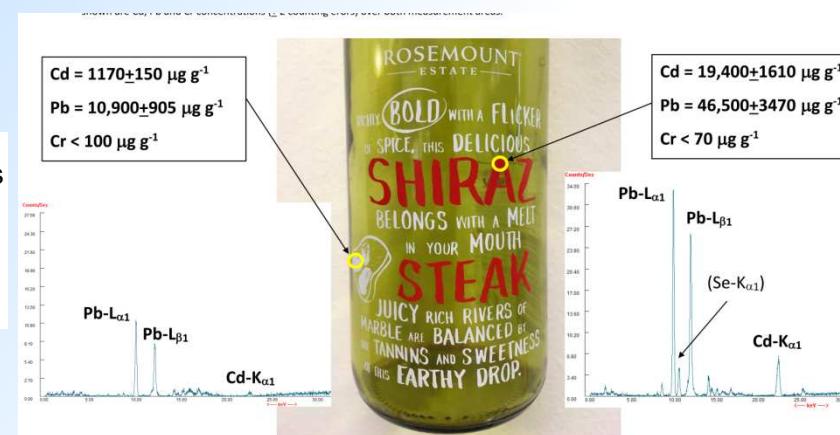


2019-07-16

Heavy Metals in the Glass and Enamels of Consumer Container Bottles

Turner, A

<http://hdl.handle.net/10026.1/14646>





Dr. rer. nat. Karl Biedermann

6. Sú skládky skutočné mŕtve ? Sind Deponien wirklich tot?



„Vízia spoločnosti s nulovým odpadom,
kde žiadny odpad nebude zneškodňovaný
a každý bude na 100% recyklovaný
je nemožná.“

Die Vision eines Null-Abfall-Unternehmens ist... *unmöglich.*



Bundesministerium
für Umwelt, Naturschutz,
Bau und Reaktorsicherheit

Die Deponie – unverzichtbares Element der Kreislaufwirtschaft

Dr. Karl Biedermann

Leiter des Referates WR II 5

„Produktionsabfälle, gefährliche Abfälle, Deponierung“
im

Bundesministerium für Umwelt, Naturschutz,
Bau und Reaktorsicherheit



21.5.2014 Forum: Entsorgung mineralischer Abfälle Hannover Karl Biedermann BMUB

Biedermann, K. (2012). Die Weiterentwicklung der Deponieverordnung / die Zukunft der Deponie in der Kreislaufwirtschaft. *ABSCHLUSS UND REKULTIVIERUNG VON DEPONIEN UND ALTLASTEN*. Karlsruhe : 22. Karlsruher Deponie- und Altlastenseminar 2012 .

Schenk, K. (2012). Die zukünftige Rolle der Deponie in der Technischen Verordnung über Abfälle (TVA) der Schweiz. *ABSCHLUSS UND REKULTIVIERUNG VON DEPONIEN UND ALTLASTEN*. Karlsruhe: 22. Karlsruher Deponie- und Altlastenseminar 2012 .

Huber-Humer, M. (2012). Die zukünftige Rolle der Deponie in der Abfallwirtschaft Österreichs. *ABSCHLUSS UND REKULTIVIERUNG VON DEPONIEN UND ALTLASTEN*. Karlsruhe: 22. Karlsruher Deponie- und Altlastenseminar 2012 .

6. Sú skládky skutočné mŕtve ? Sind Deponien wirklich tot?



Review

Landfill Impacts on the Environment—Review

Magdalena Daria Vaverková ^{1,2}

- ¹ Department of Applied and Landscape Ecology, Faculty of AgriSciences, Zemědělská 1, Mendel University in Brno, 613 00 Brno, Czech Republic; magda.vaverkova@uake.cz
² Faculty of Civil and Environmental Engineering, Nowoursynowska 159, Warsaw University of Life Sciences—SGGW, 02 776 Warsaw, Poland

Received: 11 June 2019; Accepted: 29 September 2019; Published: 3 October 2019



doc. Mgr. Ing. Magdalena Daria Vaverková, Ph.D.

„Bez ohľadu na to, aké preventívne opatrenia na predchádzanie vzniku, opäťovné použitie alebo recykláciu sa v spoločnosti realizujú, v systéme odpadového hospodárstva **budú vždy mať svoju úlohu aj skládky.**“

Deponien werden im Abfallmanagementsystem *immer eine Rolle spielen.*

6. Conclusions

Thus far, however, with respect to the current situation and rich style of living adopted in industrially developed countries, the **idea of waste management systems functioning without landfilling—at least in the foreseeable future within one generation**—seems to be somewhat utopian.

From the literature review, it is evident that even if high levels of waste avoidance, reuse and recycling are achieved, **some waste materials will always need to be forwarded for disposal.** Therefore, the **concept of sustainable landfill should be implemented.** A truly sustainable landfill is one in which the waste materials are safely assimilated into the surrounding environment.

6. Sú skládky skutočné mŕtve ? Sind Deponien wirklich tot?



 detritus | Multidisciplinary Journal for Waste Resources & Residues

Editorial

WHAT ABOUT RESIDUES FROM CIRCULAR ECONOMY AND ROLE OF LANDFILLING?



Prof. Raffaello Cossu
Ordinario di
Ingegneria-Sanitaria
Ambientale
Università di Padova

- landfilling plays a much higher crucial role in waste management strategy than generally recognised by authorities;
- landfilling should be conceptually and technically remodelled in order to fulfil the fundamental strategic role of acting as a sink in Circular Economy strategies; this should be reflected in a new set of landfill regulations.
- “zero waste” (ZW) appears an even more unrealistic proposal, and can be considered solely when viewed as a conceptual trend;

6. Sú skládky skutočné mŕtve ? Sind Deponien wirklich tot?



PROBLEMS IN TRADITIONAL LANDFILLING AND PROPOSALS FOR
SOLUTIONS BASED ON SUSTAINABILITY

Valentina Grossule ^{1,*} and Rainer Stegmann ²

¹ DICEE, Department of Civil, Architectural and Environmental Engineering, University of Padova, Via Marzolo 9, 35131 Padova, Italy
² Hamburg University of Technology, Institute of Environmental Technology and Energy Economics, Harburger Schlossstrasse 36 - 21079 Hamburg, Germany



1. INTRODUCTION

In recent years, the Circular Economy has become the key lynchpin underlying the waste management system. This has led to an increased focus on the role of recycling, viewed as a definitive solution for waste management, and to landfill being deemed an obsolete and potentially redundant system.



Rainer Stegmann

TuTech Innovation GmbH, Germany

„To viedlo k presvedčeniu,
že **recyklácia** sa považuje za **definitívne riešenie** odpadového hospodárstva,
a že **skládky** sa považujú za zastaraný a potenciálne **nadbytočný systém OH**.“

- not all materials can be recycled and recyclable products cannot be recycled endlessly;
 - even when materials are recycled waste will be produced;
 - contaminants contained in the products tend to accumulate in the recycled materials and residues;



Prof. Raffaello Cossu
Ordinario di
Ingegneria-Sanitaria
Ambientale
Università di Padova



6. Sú skládky skutočné mŕtve ? Sind Deponien wirklich tot?



THE LANCET

COMMENT | VOLUME 396, ISSUE 10256, P945, OCTOBER 03, 2020

Offline: Science and the breakdown of trust

Richard Horton

Published: October 03, 2020 • DOI: [https://doi.org/10.1016/S0140-6736\(20\)32064-X](https://doi.org/10.1016/S0140-6736(20)32064-X)

Mezinárodní odborný workshop
„Problematika nakládání s odpady
v česko-saském pohraničí“

SKLÁDKOVÝ WORKSHOP LIBEREC – ŽITAVA

12. a 13. listopadu 2020

Odborníci / Politici

Komu teda máme
dôverovať ???

Aj skúsený kapitán narazí.
Ale ani nadšenie aktivistov často nestačí.



Skládkování v 21. století je anachronismus



NOVÝ NÁVRH ZÁKONA
O ODPADECKU

Jak ještě spolejou s podobou návrhu zákona o odpadech? Jaké rády a rady nebo místní jednotky nebo rady o odpadech, oba návrhy zákona o odpadech a také dospej k jejich kompromisnímu znění. Našli jsme shodu se všechny místními představiteli OPO a MĚ a následně připravili jako HK CR a SP CR a samozřejmě se zastupují obec, režimem se SMO ČR nebo SMS ČR. Díky tomu budeme moci oba návrhy začít v nejbližších měsících načít prosazovat ve vlastním i Parlamentu.

Promítna českého odpadového hospodářství od 90. let je evidentní, ale jakým způsobem se může Váš návrh po změně zákona o odpadech? Z návrhu obou zákona by mohl být zcela patrné, že stavíme na přeходu



Hľadaný výraz ...

J. Budaj: Musíme smerovať k
úplnému zastaveniu
skládkovania

Miera energetického zhodnocovania odpadu musí na nejaký čas stúpnuť, aby sa ukončila éra skládkovania, myslí si minister životného prostredia.



Von 6/2006 bis 11/2010 wurden
ingesamt 8 Minister Umw.
ersetzt...

7. Landfilling XXI. –baling waste.



Landfill ? or Sink ? or Storage ?

...zneškodnený / uložený ... trvalo / dočasne....

Smernica o skládkach je ešte z roku 1999.

Nutne potrebujeme novú terminológiu !!!

(viď: WtE / pyrolýza / splyňovanie / plazma...)



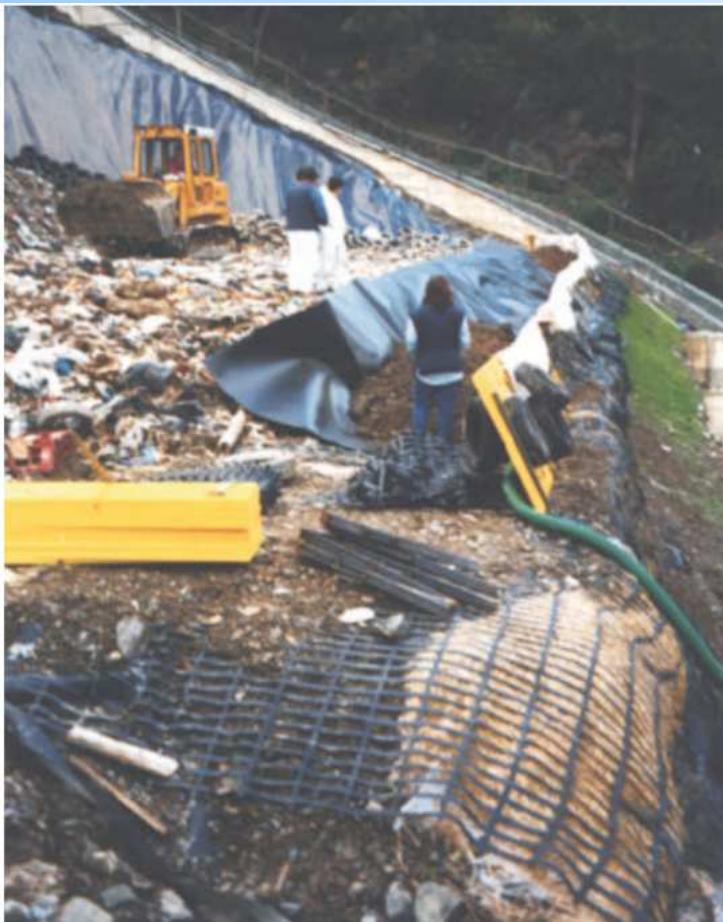
Figure 9.1

Placing of bales at the landfill. The open “front” of the landfill is about 500 m^2 . To the right filled lane with top cover can be seen.



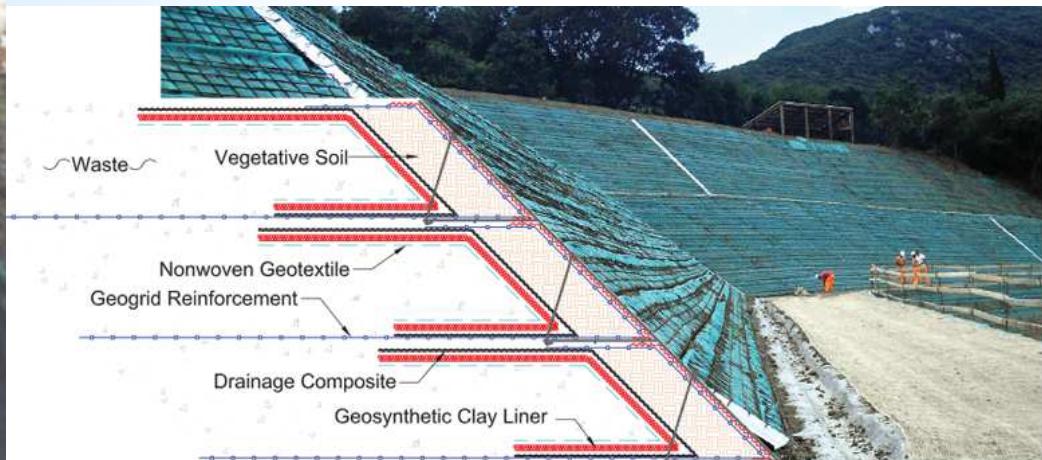
7. Landfilling XXI. - reinforced waste.

Mení sa technológia skládkovania.



After construction

"REINFORCED WASTE" EMBANKMENT
CAVAGLIA' – BIELLA, ITALY





7. Landfilling XXI.

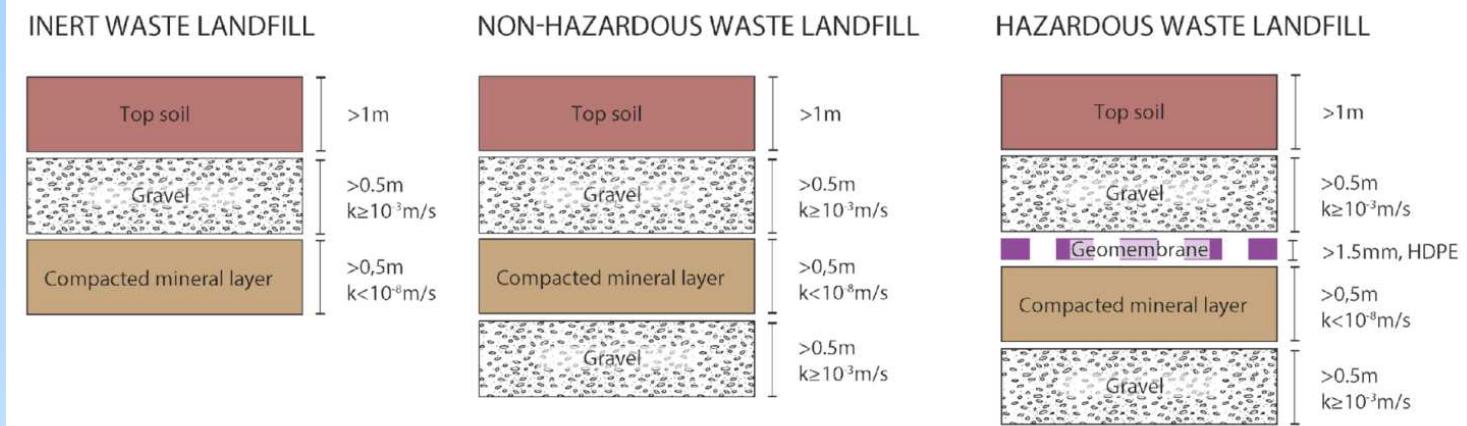
FIRST WORLDWIDE REGULATION ON SUSTAINABLE LANDFILLING: GUIDELINES OF THE LOMBARDY REGION (ITALY)

Raffaello Cossu¹, Dario Sciunnach², Silvia Cappa², Giorgio Gallina², Valentina Grossule^{1,*}
and Roberto Raga¹

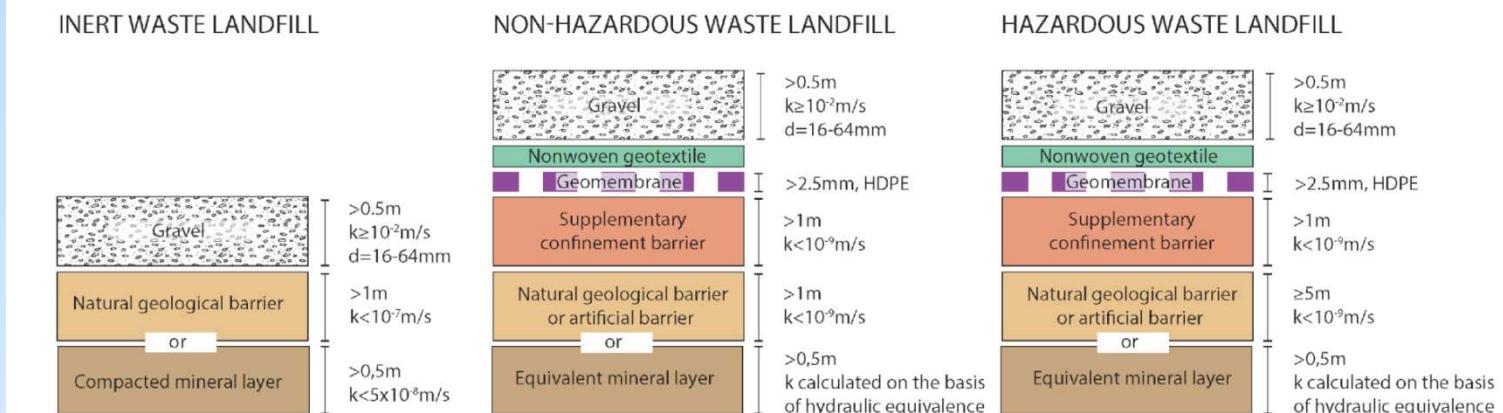
¹ DICEA, Department of Civil, Architectural and Environmental Engineering, University of Padova, via Marzolo 9, 35131 Padova, Italy

² Regione Lombardia, Piazza Città di Lombardia 1, 20124 Milano, Italy

Top
landfill:



Bottom
landfill:



7. Landfilling XXI.



DRENAŽ je kritický faktor skládky !

hrubo zrnný štrk (16/32-64)
veľký priemer rúry (min DN315)
rúry ničím neobaľovať !
perforácia min. pr. 10 mm (plocha 3-5%)

časte tlakové preplachovanie potrubia
radšej priame úseky dren. rúr ako „rybia“ kostť
možnosť inšpekcie rúr pomocou kamery

zvislým žb. čerpacím šachtám sa radšej vyhýbať !

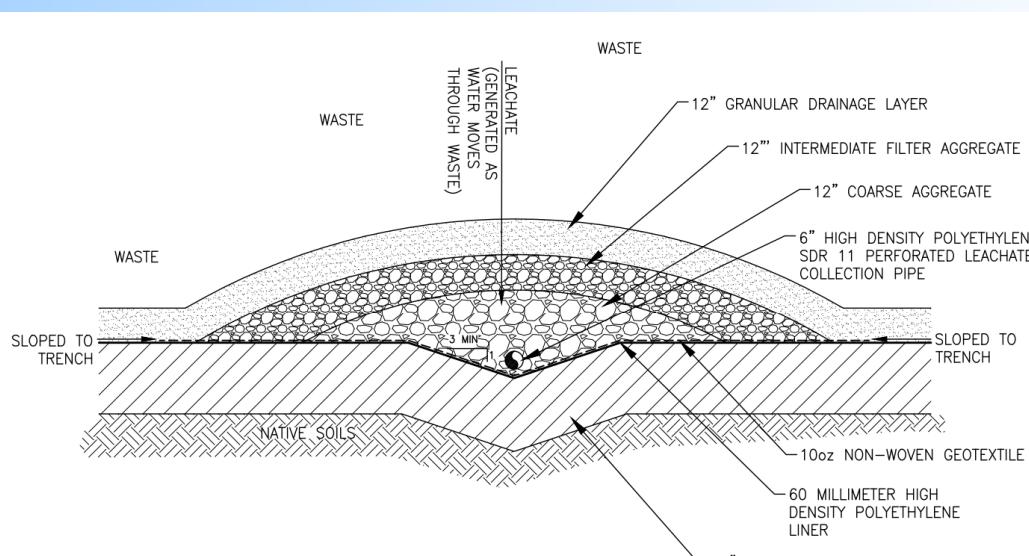
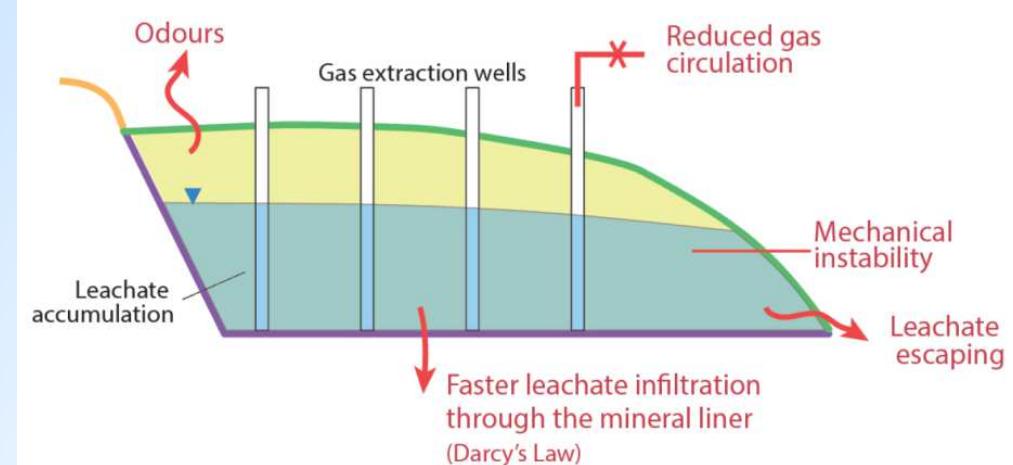
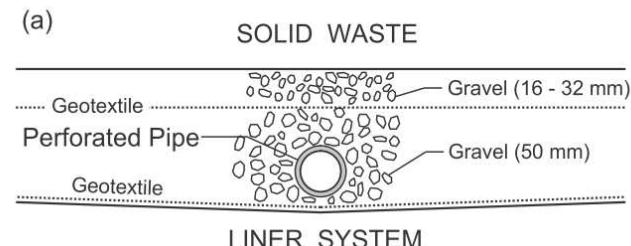
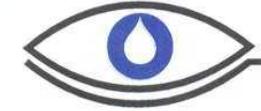


Fig. 1. (a) Cross section through a typical primary leachate collection system in a municipal solid waste landfill; **(b)** idealized loads acting on a soil–pipe system with distant boundary stress σ_m .





7. Landfilling XXI.



Dodatočne čerpanie
priesakov
pri zlyhani drenáže:

vrtu z povrchu
alebo plynové studne

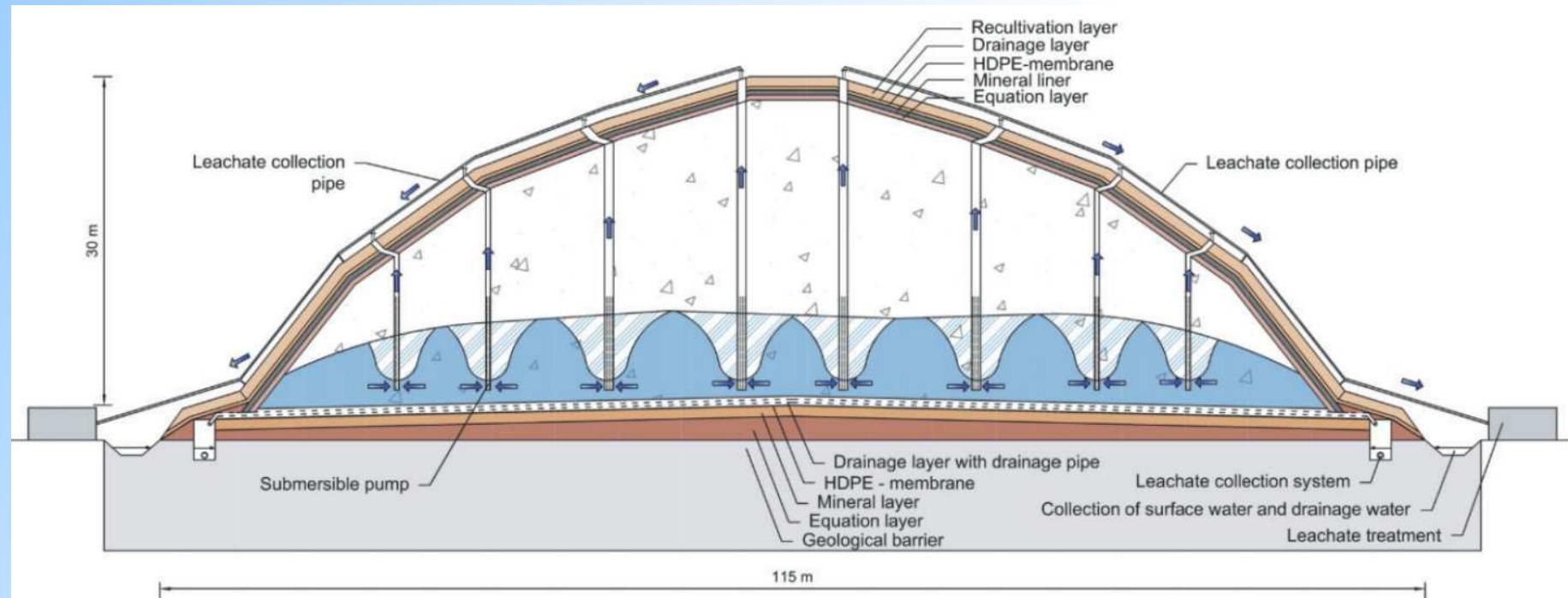


FIGURE 5: Lowering water table by means of vertical wells with submersible pumps.

7. Landfilling XXI.



Nový KONCEPT skládkovania

- počas prevádzky skládky budovať:

horizontálne drenážne vrstvy
á 3 m od dna do cca 12-15 m výšky
á 5 m v hornej časti skládky
hrúbka 30-50 cm odpad. kamenivo fr. +30 mm
alebo aspoň drenážne rebrá

Výhody:

- zlepšuje odvádzanie priesakov
- znižuje potrebu prekrývania
- zvyšuje stabilitu telesa
- zlepšuje zachytávanie LFG
- rýchlejší rozklad BRO
- skracuje dobu následnej starostlivosti

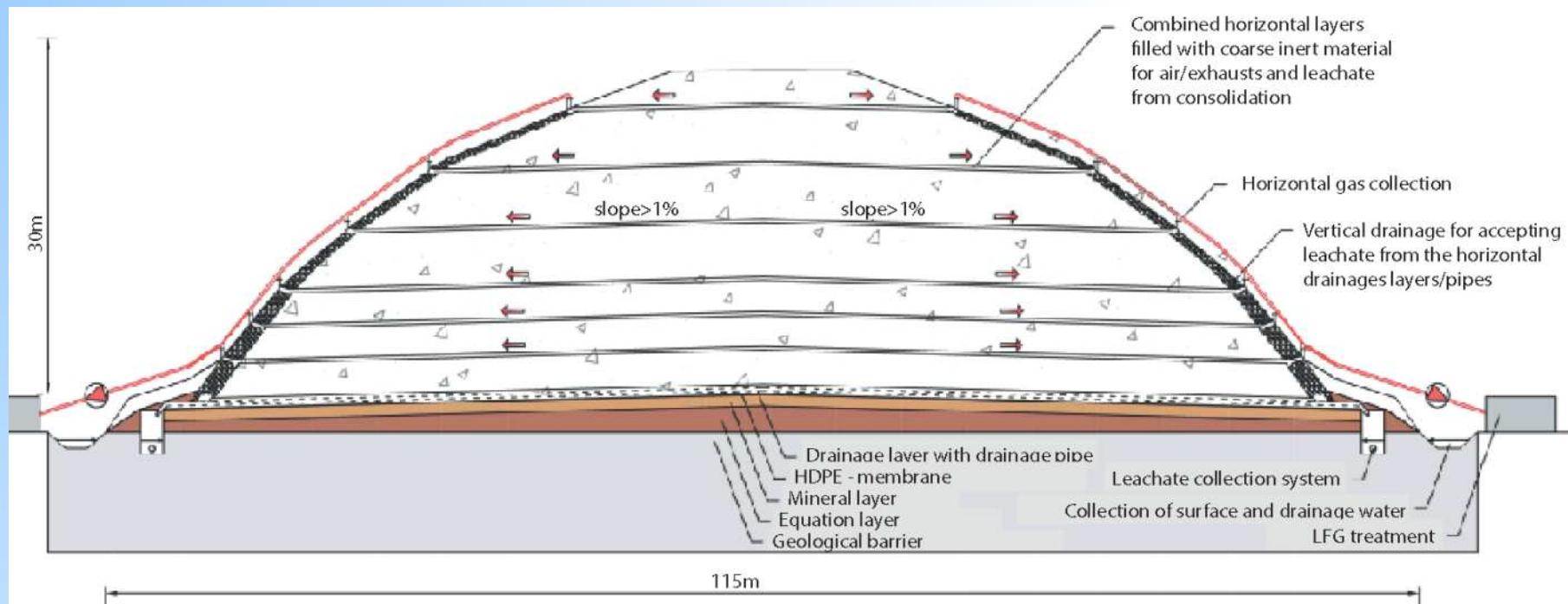


FIGURE 6: Modified landfill concept with multi-purpose horizontal layers of coarse material (Stegmann, 2017).

7. Landfilling XXI.



Možnosti na-výšovania kapacity existujúcich skládok

Some topics of current practical relevance in environmental geotechnics

Maria Eugenia Giménez Bosco¹, Paulo Scarano Hemsi^{2,a}

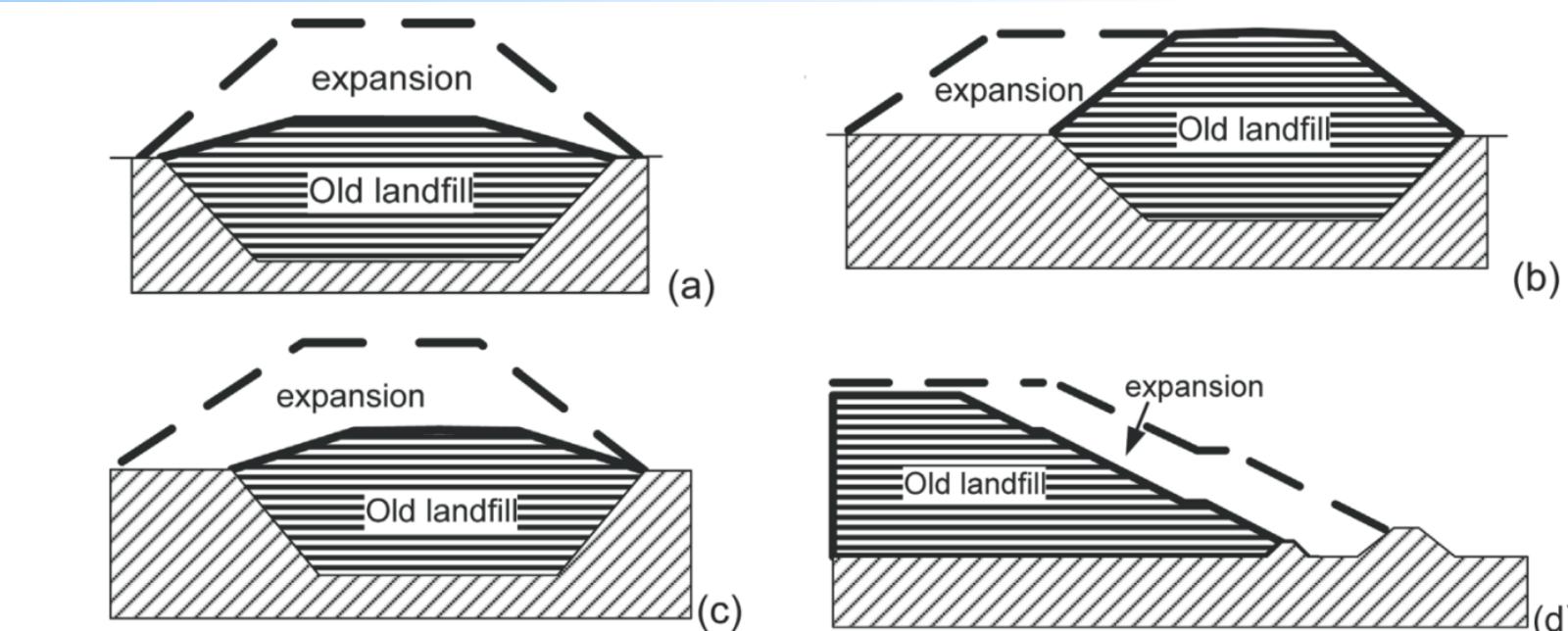


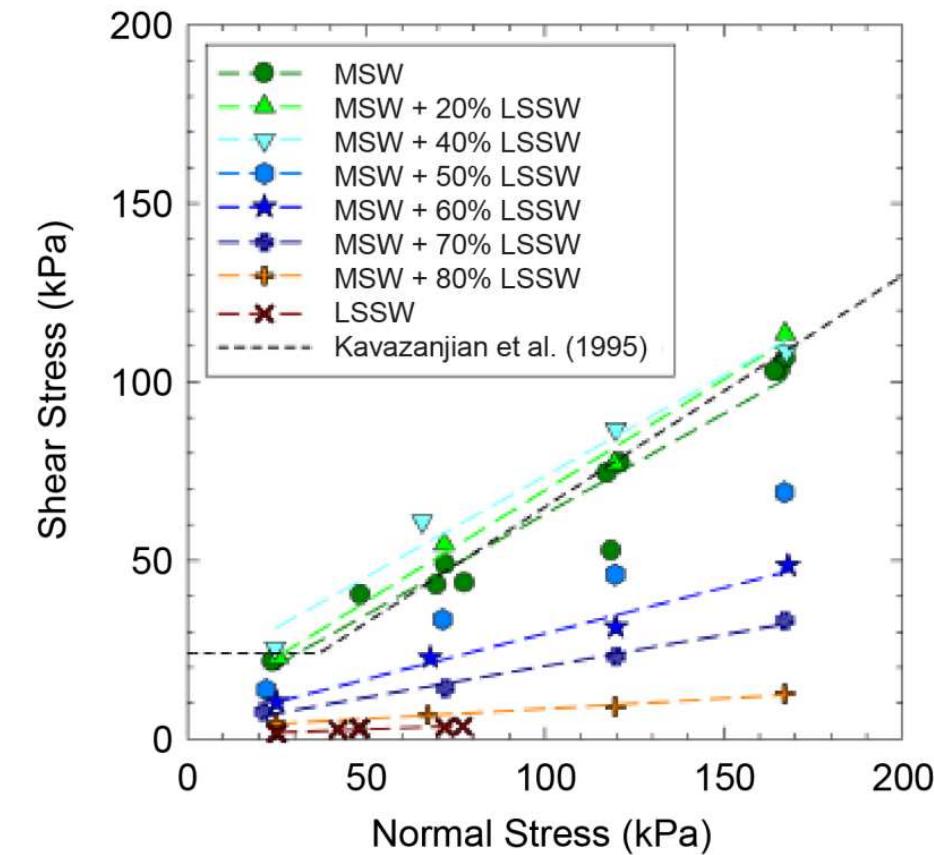
Figure 3. Geometric configurations in piggyback expansions: (a) vertical, (b) lateral, (c) mixed, and (d) veneer (Based on Qian *et al.*, 2001, Tano & Olivier, 2014, Bonaparte, 2018).



7. Landfilling XXI.

POZOR !

Zmena vlastnosti skládkovaných odpadov
po výstupe z MBU !



Rudolph Bonaparte Ph.D., P.E., D.GE., NAE, F.ASCE
Chairman and Senior Principal
Geosyntec Consultants, Inc.

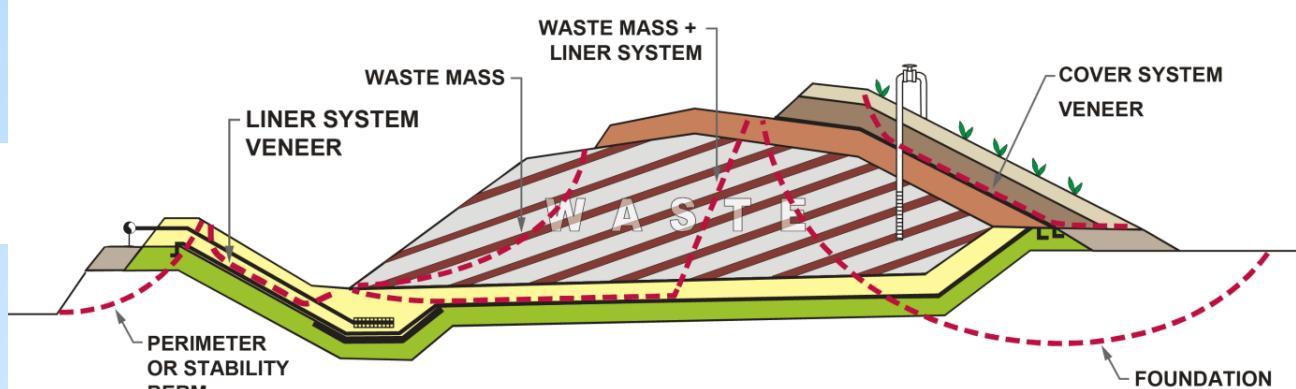
Rozdielna **kohezia + frikcia** = potrebný je **iný typ skládky** !

7. Landfilling XXI.



Možnosti na-výšovania kapacity existujúcich skládok – RIZIKO !

Rudolph Bonaparte Ph.D., P.E., D.GE., NAE, F.ASCE
Chairman and Senior Principal
Geosyntec Consultants, Inc.



Geotechnical design engineers must be cognizant of multiple potential static and seismic failure and displacement modes, at each stage of waste fill development.

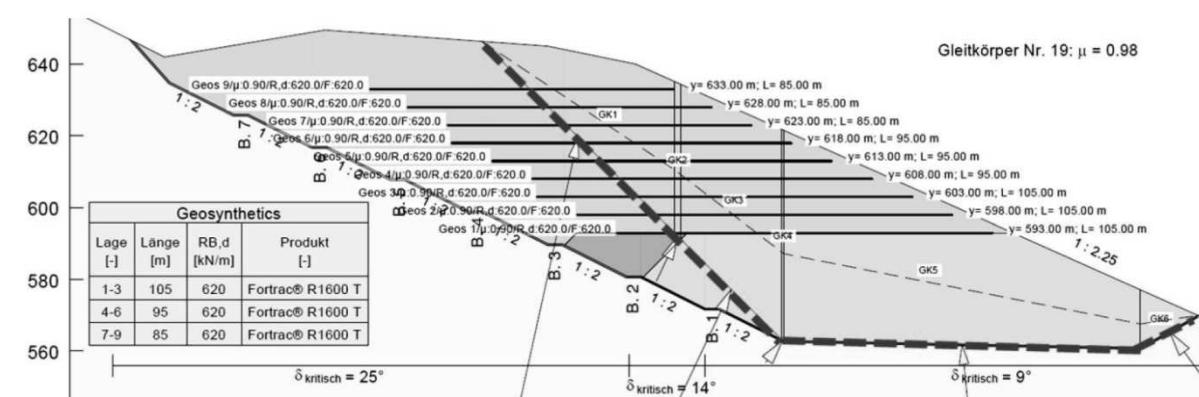


Figure 4. Example of stability calculation for waste Assumption 2, failure Mode 2, final height with horizontal multilayered geogrid reinforcement

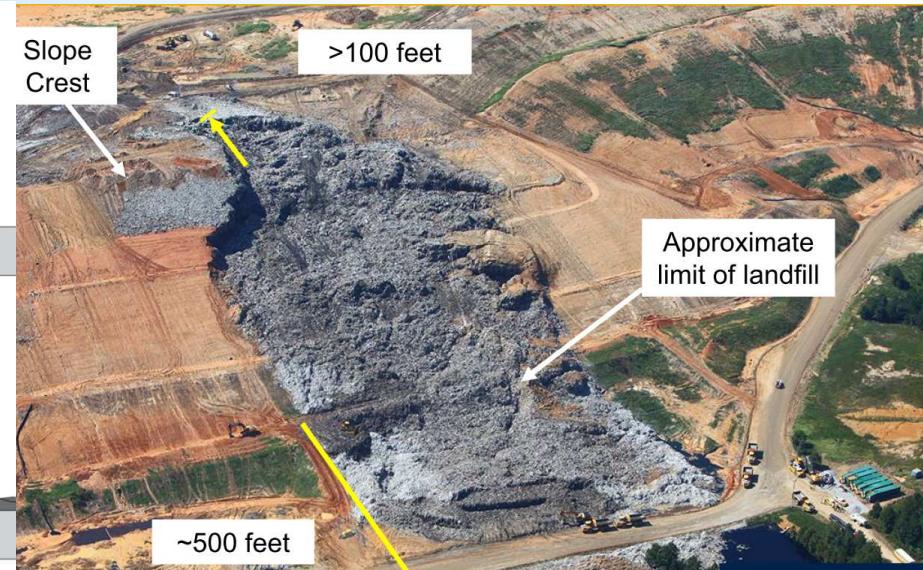
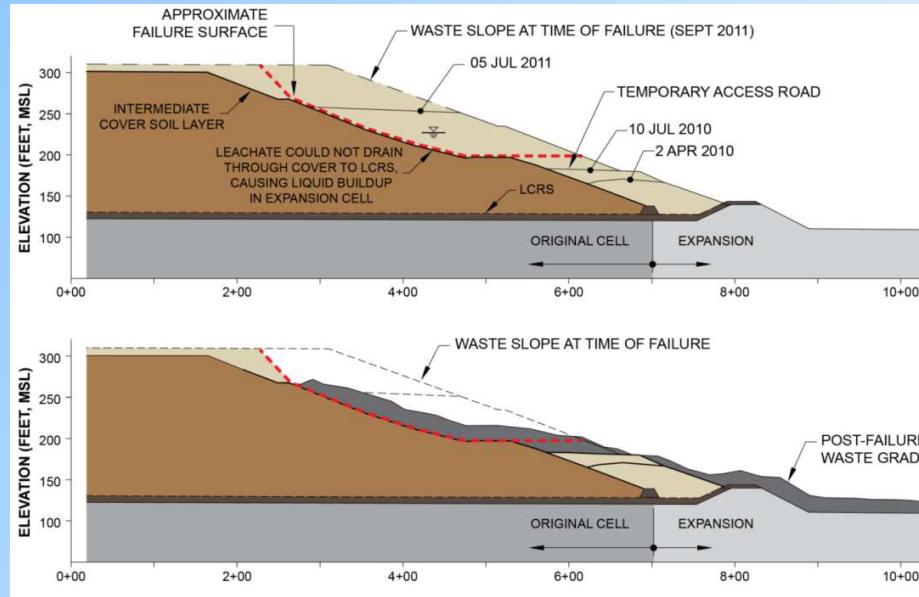
A landfill with innovative reinforcing solutions:
history, experience, solution flexibility
Un ISDN avec solution de renforcement innovante: histoire,
expérience, solutions flexibles

Dimiter Alexiew¹, Anton Plankel², Martin Widerin², July Jaramillo¹



7. Landfilling XXI.

Možnosti na-výšovania kapacity existujúcich skládok – RIZIKO !



Geosynthetics 2015
CONFERENCE
Feb. 15-18 | Portland OR

Geosynthetics 2015
February 15-18, Portland, Oregon

State-of-the-art of piggy-back landfills worldwide: comparison of containment barrier technical designs and performance analysis in terms of geosynthetics stability

Tano, F., Ecogeo, Irstea, Lille (University of Grenoble), Arras, France, francis.tano@ecogeos.fr
Oliver, F., Ecogeo, Arras, France, franck.oliver@ecogeos.fr
Touze-Foltz, N., Irstea, Antony, France, nathalie.touze@iste.fr
Dias, D., Lille (University of Grenoble), Grenoble, France, daniel.dias@ujf-grenoble.fr

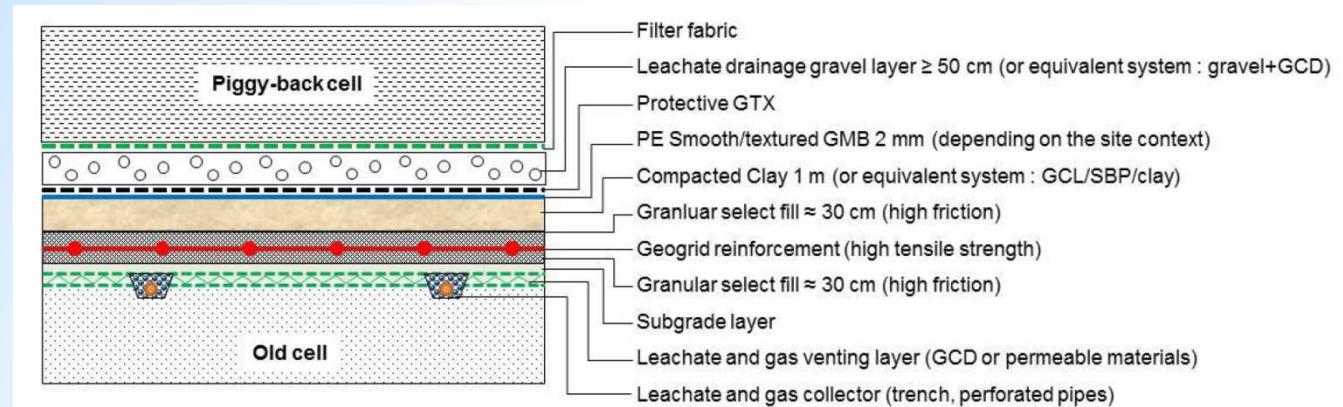


Figure 5. Proposed typical section of piggy-back liner system.

8. MSEB

vystužené zemné hrádze pre navýšenie kapacity skládky

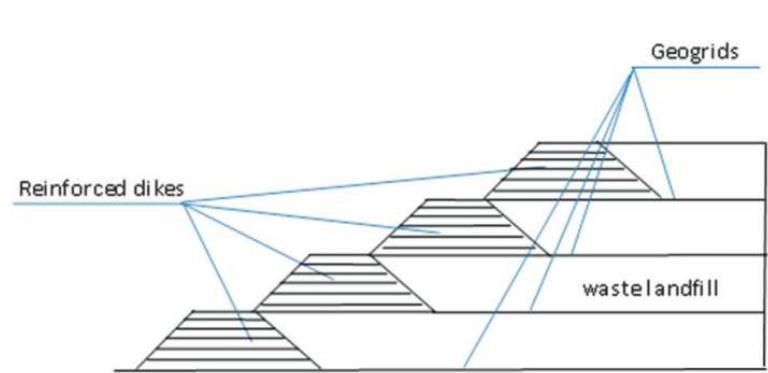
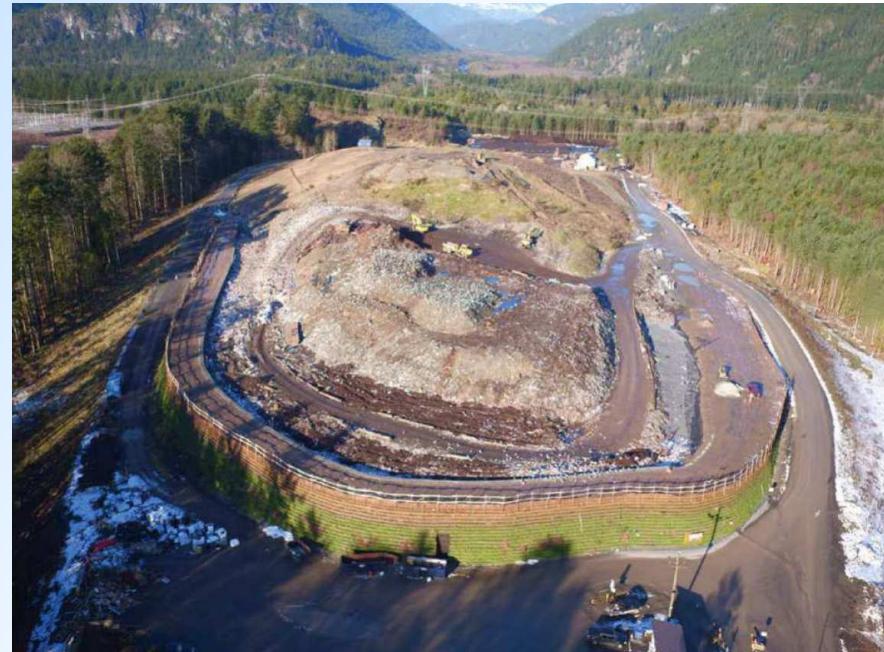


Figure 7. First four stages of construction in the reinforced landfill configuration proposed in Boscov *et al.* (2020).

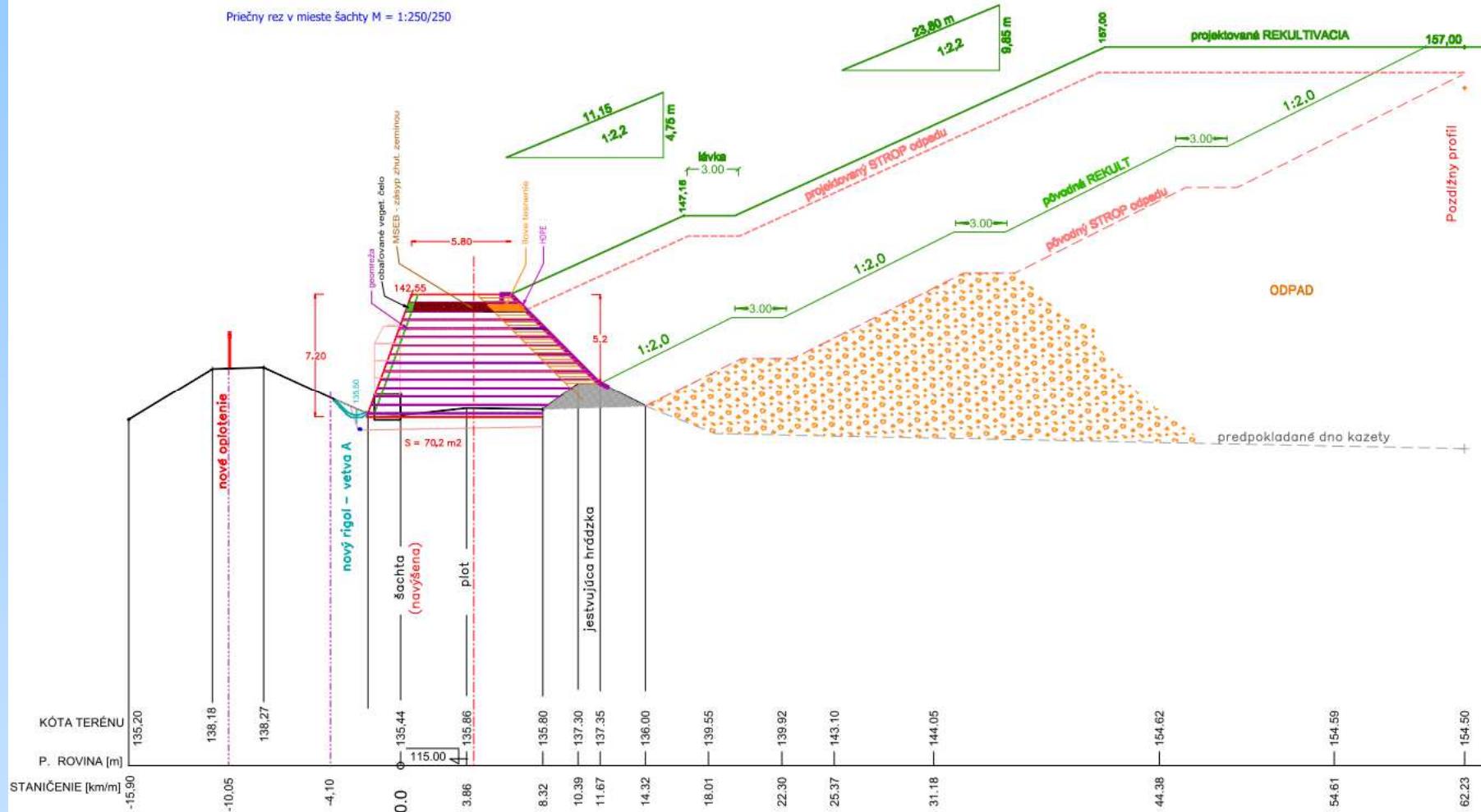


8. MSEB – 1x na Slovensku ?

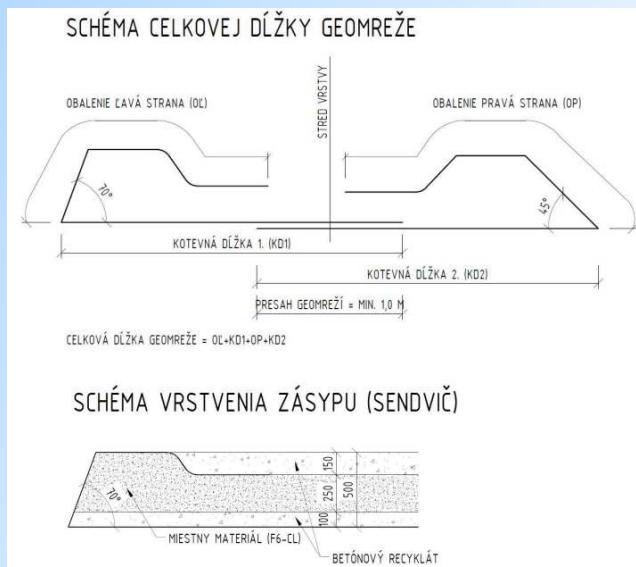
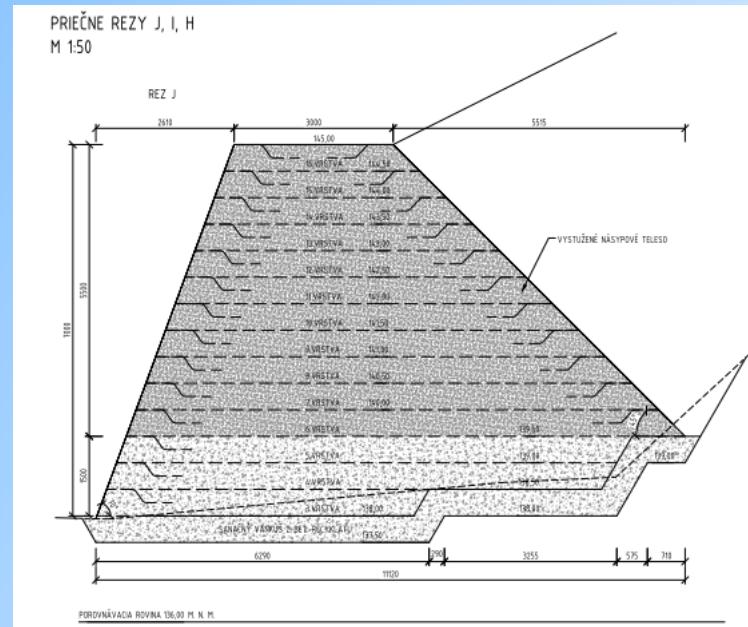


Vertikálne navýšenie skládky pomocou MSEB.

Priečny rez v mieste šachty M = 1:250/250

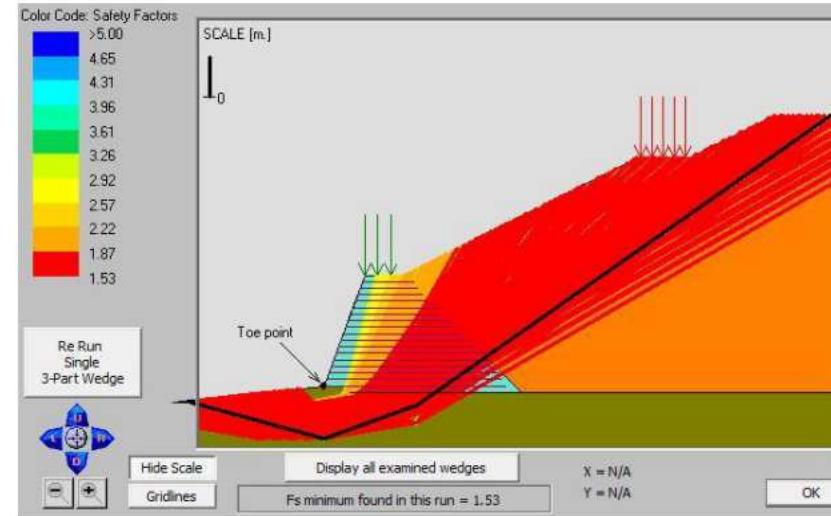


8. MSEB – 1x na Slovensku ?



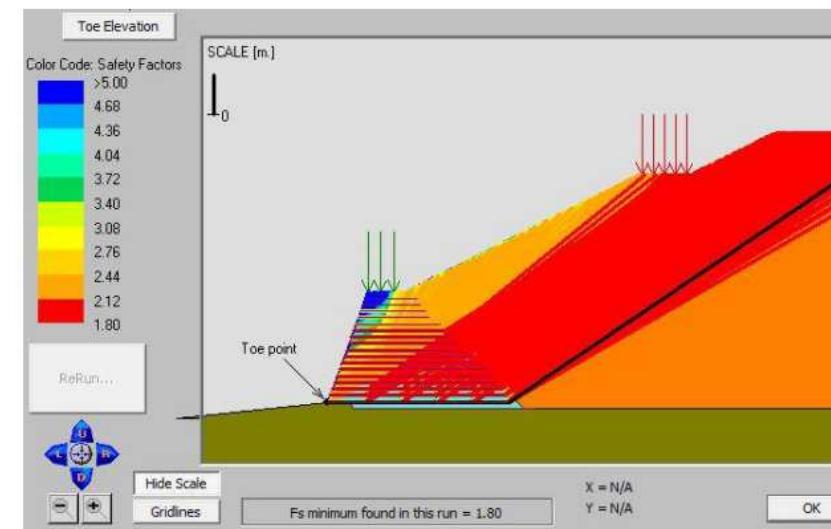
Vonkajšia a vnútorná stabilita násypového telesa

Obr. 4.: Polygonálna šmyková plocha (Three-part wedge) - $F_{s,min} = 1,53$



Stabilita proti ušmyknutiu po geomrežiach

Obr. 5.: Vnútorná stabilita (2-part wedge) - $F_{s,\min} = 1,80$





Das ist alles... 😊
Ďakujem za Vašu pozornosť
a teším sa na diskusiu.



Ing. Marek Hrabčák
odpadový konzultант
Prešov - Slovensko
Email: m.hrbacak61@gmail.com

Tento projekt neboli financovaný žiadnym grantom z EU.
Ďakujem mojej manželke Eve za pochopenie a trpeznosť.

