The Second Edition of European NO DIG Conference

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Paper 5

New environmental level

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ABSTRACT: We all know that No-Dig solutions, most times, are more environmentally friendly than Open Cut. But still we struggle to convince our customers, and No Dig solutions are mostly used in cases where Open Cut has practically challenges. Last month's there have been a development on material for conventional digging and will increase the environmental gap between No-Dig solution and Open Cut in smaller dimensions.

1. INTRODUCTION

Daily we hear news about climate change. "Extreme temperaures, winds, dryings, precipitation etc. etc." But it is really news? Since years the climate experts are convinced that the ongoing climate change is caused by CO2 emissions. Can we, in our business, do something?

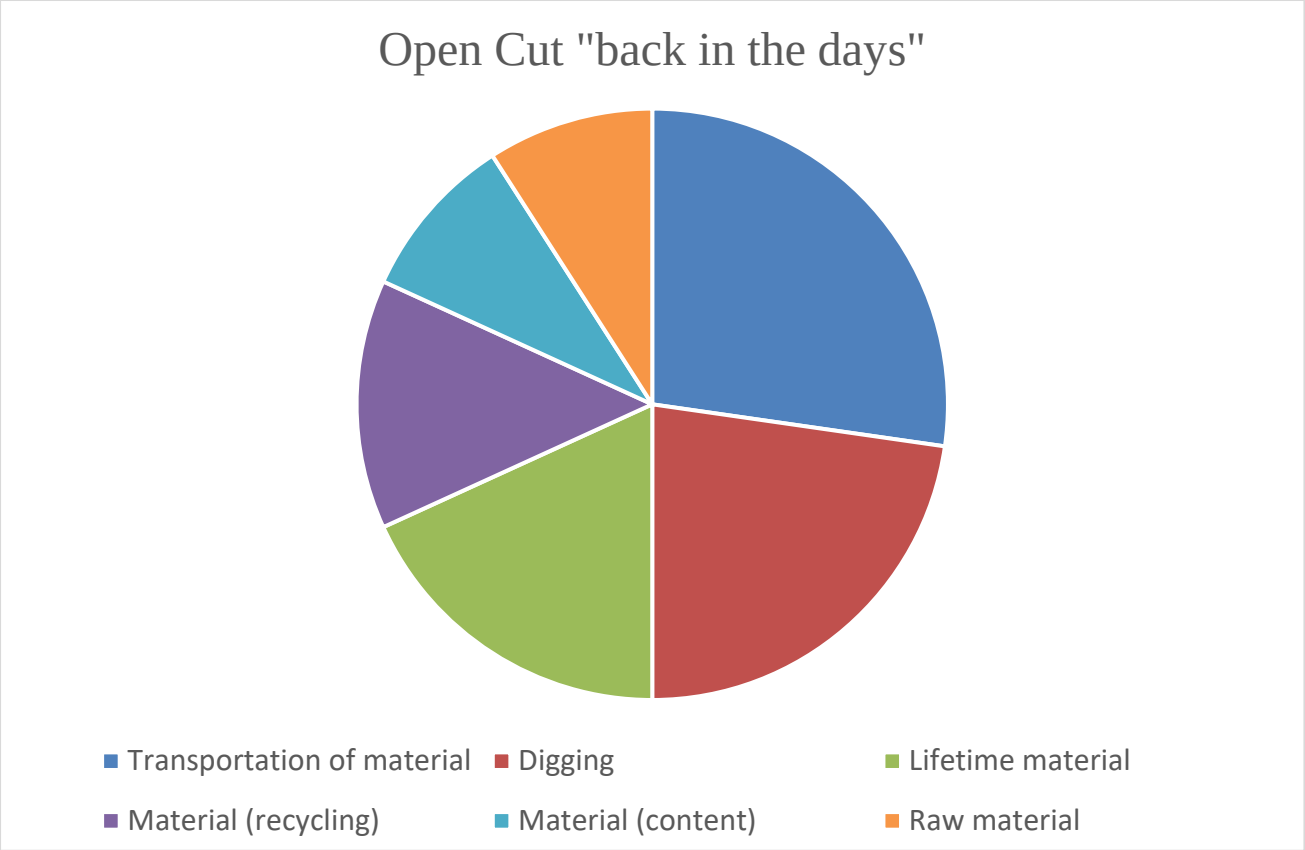


Figure 1. Open Cut old “footprint”

“Open Cut” for some years ago have big challenges due to fact that diesel fuel (no bio content). The digging and transportation material caused big CO2 impact.
The recycling level/possibilities was limited, content of raw material was not environmentally friendly.

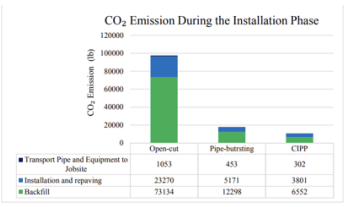
Everybody knows, but….

With ”No-Dig”

- No transportation of material (CO2)
- No digging impacts (CO2)
- Less traffic problems- less extra traffic

Environmental Protection Agency (EPA). (2014). eGRID2014 US Grid Intensity. Washington, DC: Environmental Protection Agency.
Gao, W., Ariyama, T., Ojima, T., and Meier, A. (2001). Energy impacts of recycling disassembly material in residential buildings. Energy Buildings 33, 553–562. doi: 10.1016/S0378-7788(00)00096-7
Gupta, R. S. (2008). Hydrology and Hydraulic Systems. Long Grove, IL: Waveland Press.
Hammond, G., and Jones C. (2011). Inventory of Carbon and Energy (ICE), Version 2.0. Sustainable Energy Research Team. Department of Mechanical Engineering, University of Bath, Bath, United Kingdom.
He, Y., Zhu, L., Fan, J., Li, L., and Liu, G. (2021). Life cycle assessment of CO2 emission reduction potential of carbon capture and utilization for liquid fuel and power cogeneration. Fuel Process. Technol. 221, 106924. doi: 10.1016/j.fuproc.2021.106924
ImpEE Project. (2005). Recycling of Plastics. University of Cambridge.
Karl, T. R., Melillo, J. M., Peterson, T. C., and Hassol, S. J. (Eds.). (2009). Global Climate Change Impacts in the United States. Cambridge University Press.
Kaushal, V., Najafi, M., and Serajiantehrani, R. (2020). Environmental impacts of conventional open-cut pipeline installation and trenchless technology methods: state-of-the-art review. J. Pipeline Syst. Eng. Pract. 11, 03120001. doi: 10.1061/(ASCE)PS.1949-1204.0000459
Latake, P. T., Pawar, P., and Ranveer, A. C. (2015). The greenhouse effect and its impacts on environment. Int. J. Innov. Res. Creative Technol. 1, 333–337.
Lloyd, N., and Rangan, V. (2009). “Geopolymer concrete-sustainable cementless concrete,” in Proceedings of Tenth ACI International Conference (American Concrete Institute), 33–53.
Lu, H., Matthews, J., and Iseley, T. (2020). How does trenchless technology make pipeline construction greener? A comprehensive carbon footprint and energy consumption analysis. J. Clean. Prod. 261, 121215. doi: 10.1016/j.jclepro.2020.121215
Matthews, J., Condit, W., Wensink, R., Lewis, G., and Sterling, R. (2012). Performance Evaluation of Innovative Water Main Rehabilitation Spray-on Lining Product. Washington, DC: US Environmental Protection Agency, Office.
Matthews, J. C., Selvakumar, A., Sterling, R. L., and Condit, W. (2014). Innovative rehabilitation technology demonstration and evaluation program. Tunnell. Underground Space Technol. 39, 73–81. doi: 10.1016/j.tust.2012.02.003
Monfared, M. A. N. (2018). Comparison of Trenchless Technologies and Open Cut Methods in New Residential Land Development. University of Alberta
National Liner Specifications. (2019). Available online at: https://www. nationalliner.com/Portals/0/PDF/national-liner-specifications.pdf. Pachauri, R. K., Allen, M. R., Barros, V. R., Broome, J., Cramer, W., Christ, R., et al. (2014). “Climate change 2014: synthesis report,” in Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (Geneva), 151. Rudolph, L., and Harrison, C. (2016). A Physician’s Guide to Climate Change, Health and Equity. Oakland, CA: Public Health Institute. Säynäjoki, A., Heinonen, J., and Junnila, S. (2012). A scenario analysis of the life cycle greenhouse gas emissions of a new residential area. Environ. Res. Lett. 7, 034037. doi: 10.1088/1748-9326/7/3/034037 Turner, L. K., and Collins, F. G. (2013). Carbon dioxide equivalent (CO2-e) emissions: a comparison between geopolymer and OPC cement concrete. Construct. Building Mater. 43, 125–130. doi: 10.1016/j.conbuildmat.2013.01.023 Wiedmann, T., and Minx, J. (2008). A definition of ‘carbon footprint’. Ecol. Econ. Res. Trends 1, 1–11 Xu, C., Liu, Z., Chen, Z., Zhu, Y., Yin, D., Leng, L., et al. (2021). Environmental and economic benefit comparison between coupled grey-green infrastructure system and traditional grey one through a life cycle perspective. Resour. Conserv. Recycl. 174, 105804. doi: 10.1016/j.resconrec.2021.

Example



Source: Louisiana Tech University

Figure 2. Example of investigation

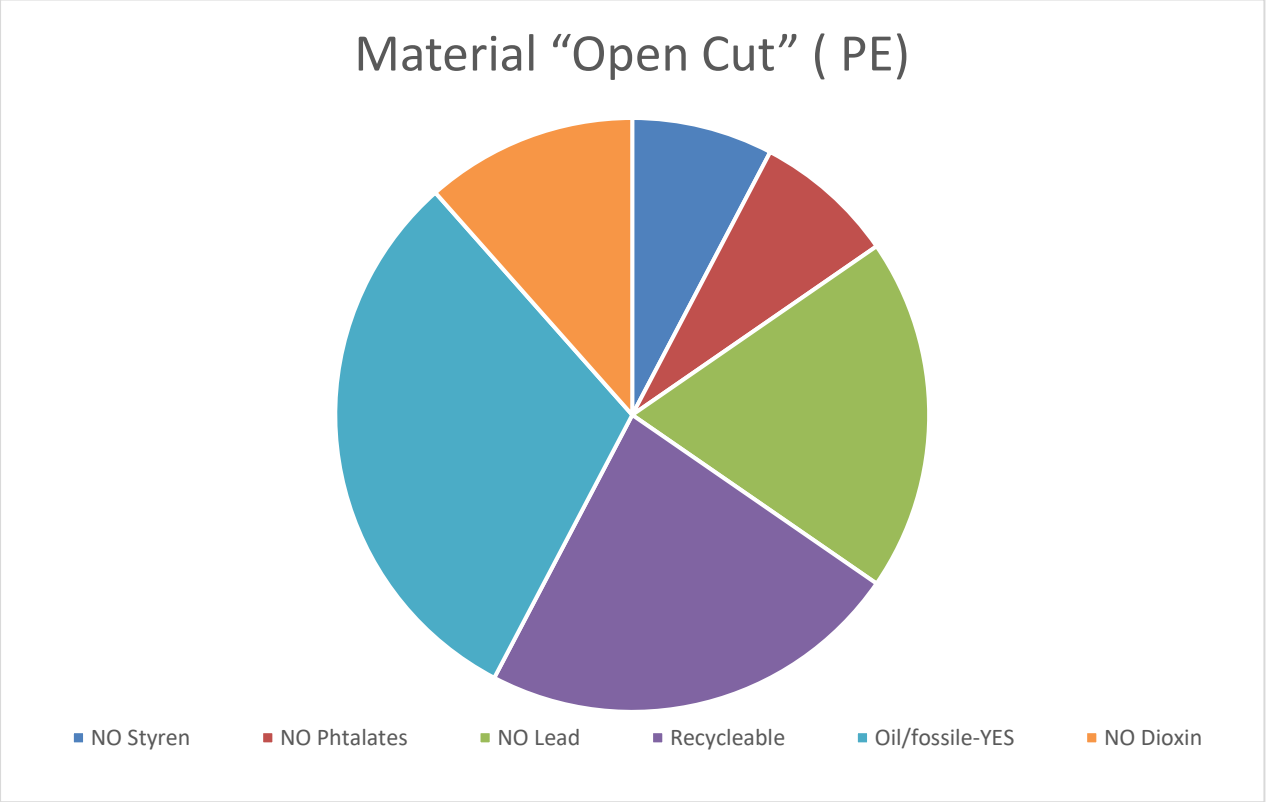


Figure 3. Material for installation “Open Cut”

The Open Cut installations with PP pipes are more environmentally friendly.

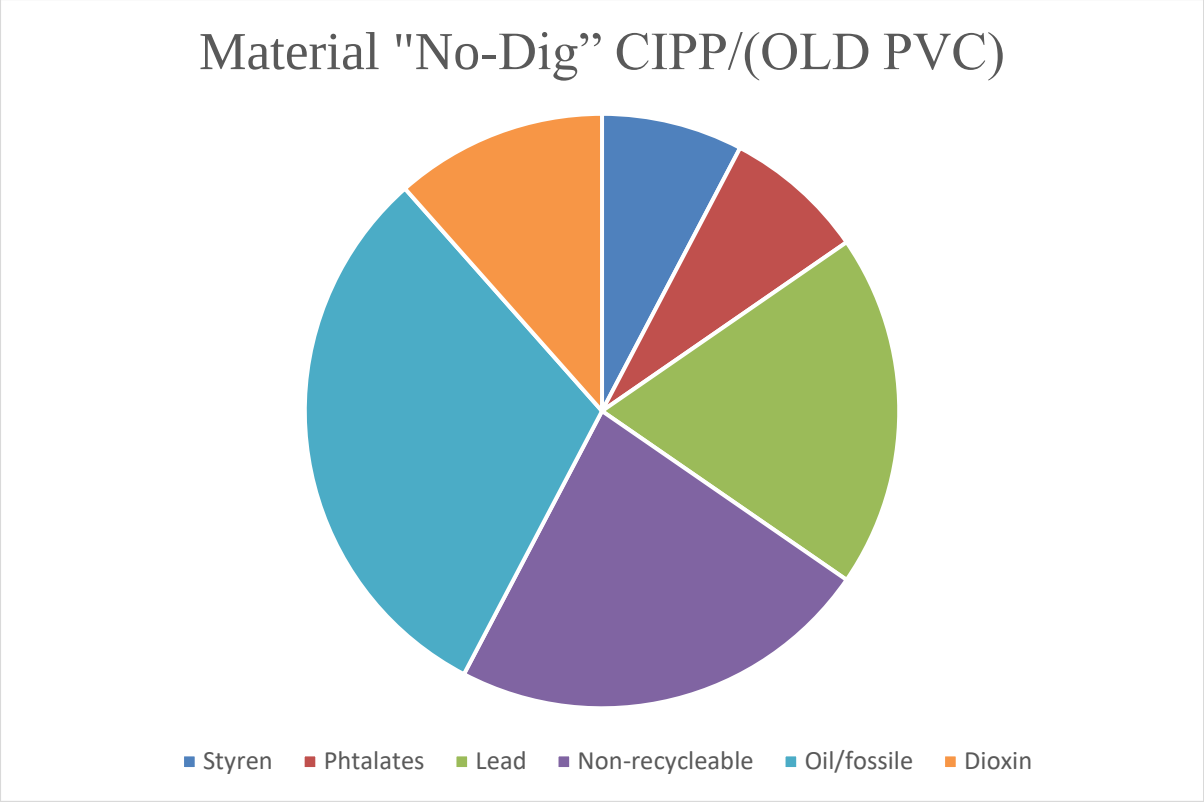


Figure 3. Material for "No Dig"

The material for relining have another profile….

New tenders asks for

- Price
- Organisation
- Environment!!

Material has a big CO2 impact in the total ”No-Dig” project. Example below from a big Danish community

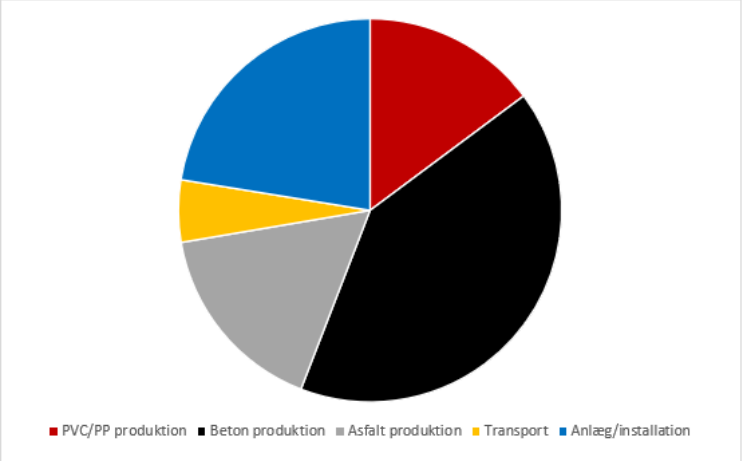


Figure 4. From Esbjerg community

PVC/PP-production (pipes <Ø500 + Ø600 chambers): 15 %
Concrete production (pipes >Ø500 + chambers > Ø600): 41 %
Asphalt tproduction: 16 %
Transport of material (sand, pebbles and cement for concrete production + transport from production to worksite): 6 %
Produktion on site (diesel for entrepreneur): 22 %

Water organisations start to measure based on ”Ecoinvent” (www.ecoinvent.org)

	Standard verdi	Dokumentert verdi	Brukt faktor	Enhet
PE	2,37		2,37	kg CO_2 ekv./kg
PP	2,30		2,30	kg CO_2 ekv./kg
PVC	2,33		2,33	kg CO_2 ekv./kg
Betong	0,12		0,12	kg CO_2 ekv./kg
GRP	6,32		6,32	kg CO_2 ekv./kg
Støpejern	1,59		1,59	kg CO_2 ekv./kg
Rustfritt stål	5,13		5,13	kg CO_2 ekv./kg

Source ”Norsk Vann” October 2022

Figure 6. Table on CO2 “footprint”

Open cut starts to use Bio based material, PP, PE and PVC

Figure 7. “Open Cut” pitch

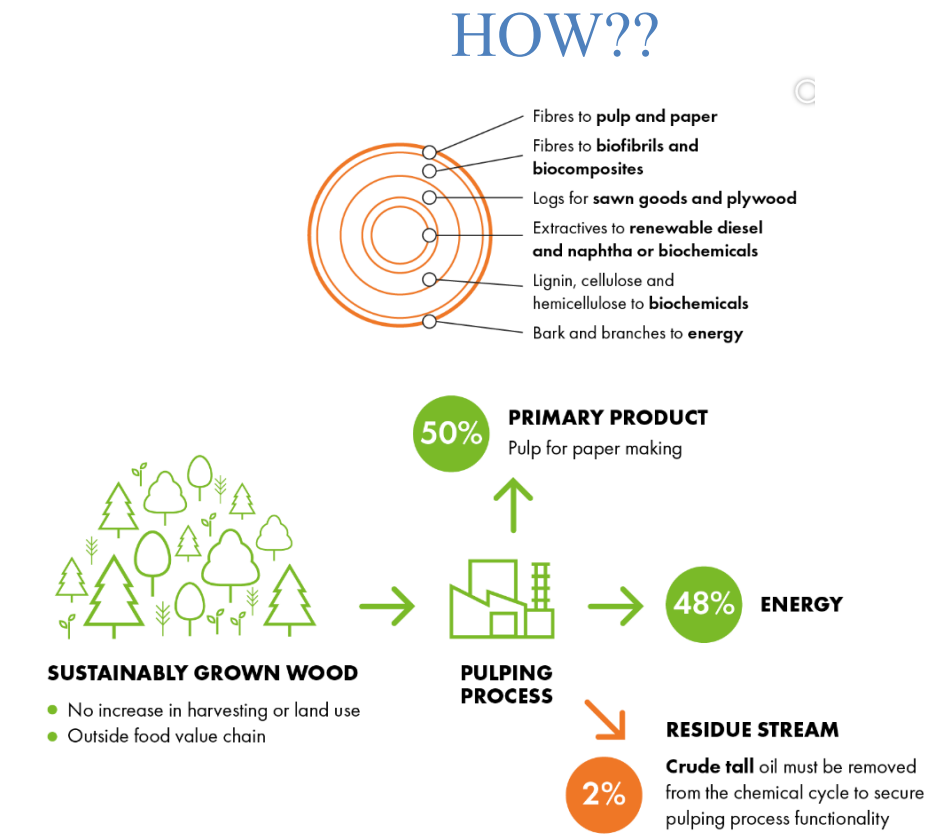


Figure 8. UPM BIOFUELS production

Only wood-based residue, scrap from paper industry, are used

HOW??

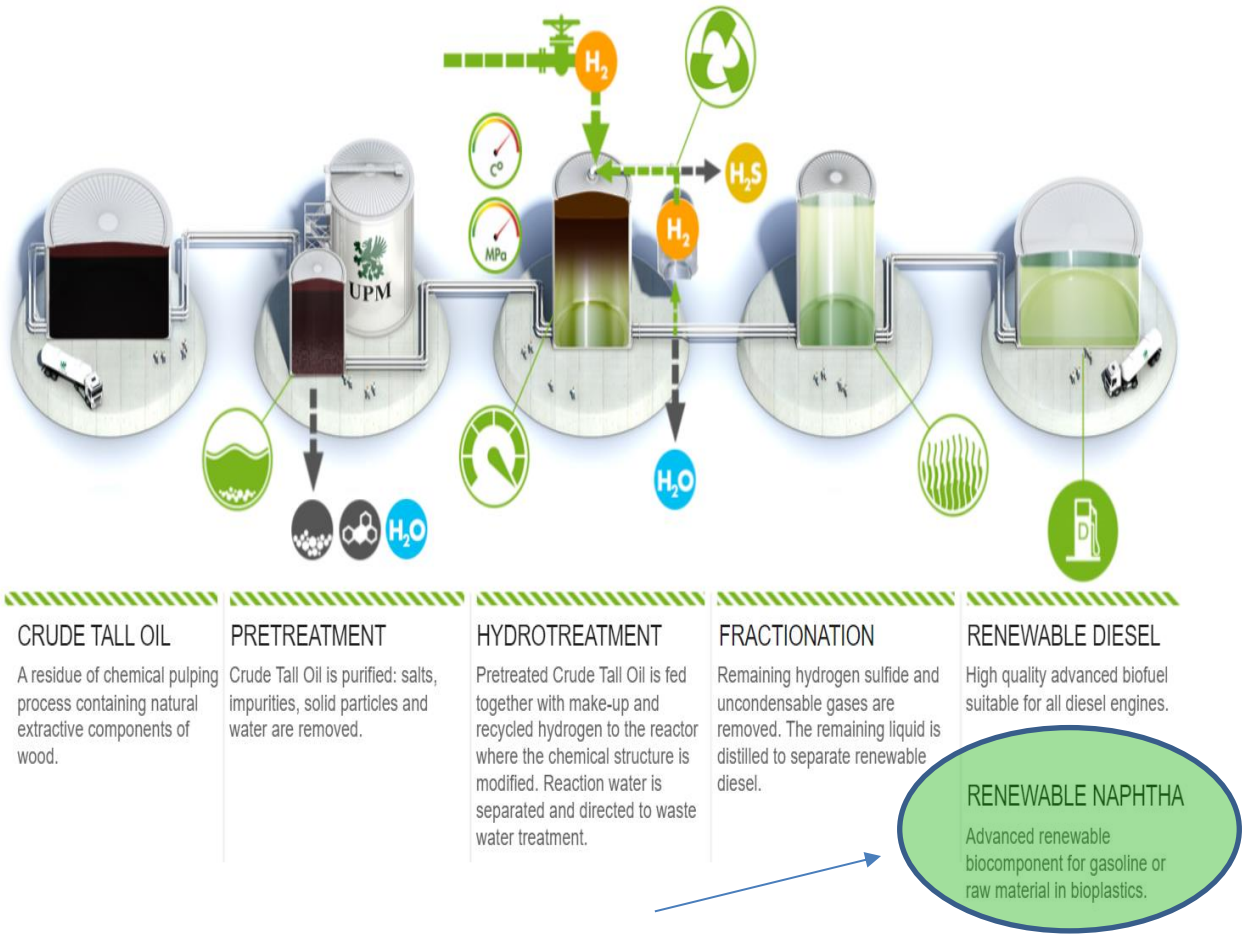


Figure 9. UPM BIOFUELS production

Facts BIO-liner

Figures 9 and 10. Bio-Liner PVC

- 100% BIO BASED PVC raw material, SALT and WOODBASED RESIDUE
- CO2 footprint from BIO-PVC rawmaterial **-0,158 kg/kg**, certified by RSB/ISCC+
- CO2 from BIO-Liner 0,5 kg/kg (GRP=6 kg/kg)
- Styren free
- No Ftalates for softening, replaced by BIO material
- Ring stiffnes SN 4 or SN 8 tested acc to EN ISO 9969
- Lifetime >100 years
- Dimension from DN 150 to DN 400
- Recycling accordig to SS-EN ISO 11296-3:2018
- Completly Made in Sweden with ISO 9001 and ISO 14001

Can we do something?

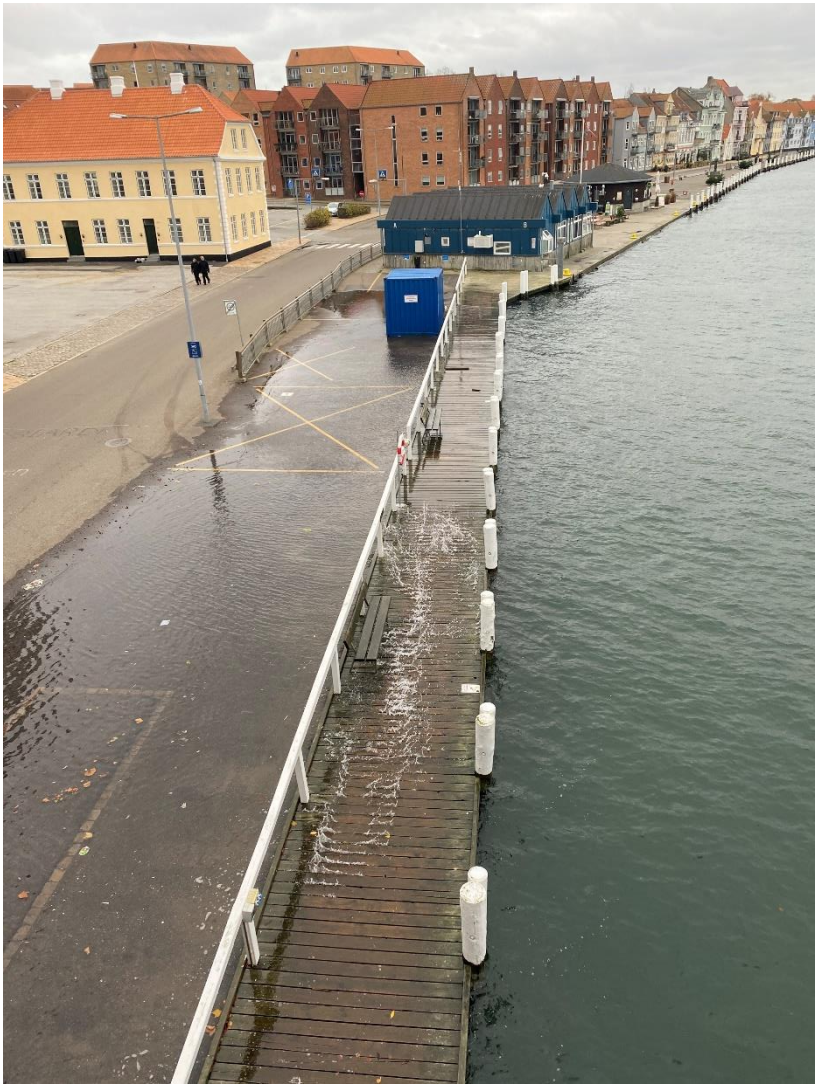


Figure 12. High water because of…