

# Questionnaire comparing soil (SOC) surveys/monitoring systems in Lithuania, Sweden and Denmark (March 2022)

- Summary

- But much more detail and nuances found in the questionnaire itself
- Useful for NorForSoil work 2023?
- Could be extended to more countries

## The questionnaire:

- Theme I: sampling design
- Theme II: Field protocol
- Theme III: Sample pre- treatment, laboratory analyses and calculations
- (Theme IV. Logistical and practical issues)
- Theme V: General

**Thank you** to: Iveta Kabasinskiene et al., Inge Stupak, Lars Vesterdal, Johan Stendahl and Erik Karlton for providing the answers describing methods in the Lithuanian, Danish and Swedish forest soil inventory

The tables crudely summarize a very large amount of detailed information – I may not have been able to extract the details, fit it into the table or could have misunderstood answers – my apologies in advance and errors can be adjusted



I: DESIGN	Sweden	Lithuania	Denmark	Differences
no. soil plots/no. NFI plots	10 000 (top) 4 500 (min) /35 000	754 / 16 257	300 / 9000 (adding soil plots over time relevant)	
Selection criteria	Systematic subset in NFI tracts	Systematic 2015-panel	Random selection in systematic NFI grid Power analysis	Different criteria (and different purposes?)
Plot radius (m), sampling inside or outside	R=10 inside	R=12.62 outside	R=15 inside	
Breaking down datasets to groups	Yes, SOC stocks (forest, site type)	Yes, SOC stocks (WRB soil groups)	? Meaningful conifers vs broadleaved Sandy, loamy, organic	
Soil type criteria for splitting plots	Yes when peat (humusform)	Yes, > 40 cm peat then histosol	No, BD functions for sandy, loamy, organic	Samples may contain range of soil types in DK?
Split plot sampling	Largest part	Largest? – circle extended	No split	
«over sampling»	no	Intended for organic soil but not done	no	



II: FIELD PROTOCOL	Sweden	Lithuania	Denmark	Differences
no. Cores/plot (scale) Sampling depth Split organic/mineral horizons	1-5 (ca. 1 m <sup>2</sup> ) 0-10,10-20,55-65, upper B Yes	5 (FF), 5 (BD), 10 (C%) 1-10, 10-30 yes	10 (across circle plot) 0-10,10-25,25-50,50-75,75-100 yes	Vertical and horizontal resolution
Spatial variation	Bulked samples	Bulked samples	Bulked samples	
Moving/skipping criteria	specified and alternative positions given	Specified (alternative positions given?)	Permanent water, other?	Could be some differences
Humus auger/frame L,F,H split Omitted material	10 cm diam auger F+H (no L) > 2 cm	25x25 cm frame LFH, not split > 2 cm	Frame LFH, not split > 2 cm	Method and pool (IPCC)
Mineral auger/tool	spade	2 cm diam auger	2.5 (3.0) cm diam auger	method
Heterogenous soil type on plot	Bulk, two layer humus form	Gley soil ex: peat layer vs. mineral layer	Rare, 1-2 cases	
Deep organic soils	10 cm diam auger to 50 cm, probe to 1 m (total depth done once)	-	No organic soils > 1m deep (1 case in other grid)	Different needs
Charcoal Buried deadwood	Thick layers omitted If decomposed then included	-	Discarded Included if encountered	
Profile description Coarser fractions	WRB – field observation 1 time rod penetration	WRB – extensive field obs, classification in office Weight of > 2 mm fragments	None Weight of > 2 mm fragments (volume f(density 2.65 g/cm <sup>3</sup> ))	Different stone sizes accounted for = different needs?



III: SAMPLE PRETREATMENT, LABORATORY ANALYSES, CALCULATIONS	Sweden	Lithuania	Denmark	Differences
Bulk density organic layer Bulk density mineral layers	Not calculated, total area-related stock sampled Bulk density mineral from transfer function	Sampled on site	?  Bulk density mineral from transfer function (data stratified with relatively more data to organic soils)	Sampled/ptf
Humus samples Prior to milling/grinding	Grinded/milled >2cm removed, <2mm and < 2mm separated Live roots > 2 mm removed	Ground/milled Fragments > 2mm excluded Live roots > 2 mm removed	Ground/milled >2cm removed <2cm ground and included with rest Live roots > 2 mm removed	Different size fractions used in chemical analyses?  And in final pool estimated?
Mineral soil samples	Sieved 2 mm	Sieved 2 mm	Sieved 2 mm	
Lab analyses	pH, total C, N, exchangeable elements, total acidity, total geochem parent material, heavy metals	C concentration, other?	C,N concentratoin (carbonates removed on subset)	Differences (different mandate and pupose) – diffent quality control measured possible?
Soil texture	Field classification	no	Laser difraction	Variable method
other	DNA sequencing	-	In 2008 pH	



IV+V: GENERAL, PRACTICAL	Sweden	Lithuania	Denmark	Differences
Field crew inter-calibration	Systematic over time 1 week course annually Reference field crews	? Communication with experts	Some, systematic over time? 1 day course, field manual	Likely different focus
Laboratory inter-calibration	Yes, is/has been done	Yes, is/has been done, accredited lab	?	Likely different focus
Sample transport to lab	cool	fast	Mineral soil cool or frozen	
Sample reception Storage prior to pretreatment	Registration system Drying rooms 2-4 months	No registration system Cool, dry	No registration system Cool if not dried immediately	

- Questions not specifically for harmonization
- Which differences are important ? (and for what?)
- Harmonization vs. standardizing?
- The questionnaire with the detailed questions and answers is available for further work in NorForSoil



THANK YOU!