

Supplementary file

Table S1. List of stop-words for data pre-processing in dynamic topic modeling.

Stage	Type	Stop-words
First stage	Python NLTK stopwords	English stop-words provided by NLTK
Second stage	Verb	determine, indicate, melt, occupy, associate, reveal, suggest, investigate, find, compare, occur, follow, examine, observe, give, cause, represent, influence, derive, analyze, provide, require, make, identify, exist, contribute, consider, explore, could, integrate, limit, lead, support, create, discover, produce, discuss, obtain, improve, propose, combine, bind, describe, elevate, grow, reflect, archive, begin, underlie, alter, enhance, conduct, correlate, relate, induce, distinguish, promote, present, particulate, affect, characterize, need, inundate, shift, drive, mean, demonstrate, manage, search, play, highlight
	Adjective	important, able, respective, variable, better, significant, great, major, coldest, main, particular, total, many, relative, lower, similar, potential, emergent, adjacent, several, common, various, highest
	Noun	index, indices, role, level, efficiency, sequestration, methods, incorporation, field, addition, particles, model, year, evidence, regime, regimes, saturation, generation, regression, literature, project, assessment, properties, period, date, part, analysis, sheet
	Numeral	first, three, four
	Conjunctions and Adverbs	although, even, previously, likely, along, within, however, especially, particularly, among, mainly, since, across, relatively, less, highly, around, intensively, generally, therefore, probably, agreeably, thus, conversely, according, finally, however, overall, early, respectively, toward

Table S2. Representative papers with high probability appearing in each topic calculated by dynamic topic modeling in peatland research.

Topic	Title	Author (Year)
1 (Geomorphology)	Holocene avulsion styles and sedimentation patterns of the Saskatchewan River, Cumberland Marshes, Canada	Morozova and Smith (2000)
	Effects of peat on the shapes of alluvial channels: examples from the Cumberland Marshes, Saskatchewan, Canada	Smith and Pérez-Arlucea (2004)
	Electrical resistivity and Ground Penetrating Radar for the characterization of the internal architecture of Quaternary sediments in the Midlands of Ireland	Pellicer and Gibson (2011)
	Late Quaternary stratigraphy in the Gwent Levels (southeast Wales): the subsurface evidence	Allen (2001)
	Late Quaternary stratigraphy, radiocarbon chronology, and glacial history at Cape Shpindler, southern Kara Sea, Arctic Russia	Manley et al. (2001)
	Near surface geophysical analysis of the Navamuño depression (Sierra de Béjar, Iberian Central System): Geometry, sedimentary infill and genetic implications of tectonic and glacial footprint	Carrasco et al. (2018)
	Late Holocene coastal-plain evolution of the Netherlands: the role of natural preconditions in human-induced sea incursions	Pierik et al. (2017)
	The hydraulic geometry of narrow and deep channels; evidence for flow optimization and controlled peatland growth	Nanson et al. (2010)
	Geomorphic, sedimentary, and potential palaeoenvironmental significance of peat blocks in alluvial river systems	Warburton and Evans (2011)
	Headwater peatland channels in south-eastern Australia; the attainment of equilibrium	Nanson et al. (2014)
2 (Land use & Land cover)	Model-based prediction error uncertainty estimation for k-nn method	Kim and Tomppo (2006)
	Data and resolution requirements in mapping vegetation in spatially heterogeneous landscapes	Räsänen and Virtanen (2019)
	A monitoring protocol for vegetation change on Irish peatland and heath	O'connell et al. (2014)
	Soil type mapping using the generalised linear geostatistical model: A case study in a Dutch cultivated peatland	Kempen et al. (2012)
	Selecting estimation parameters for the Finnish multisource National Forest Inventory	Katila and Tomppo (2001)
	Monitoring peatland water table depth with optical and radar satellite imagery	Räsänen et al. (2022)
	Temporal optimisation of image acquisition for land cover classification with Random Forest and MODIS time-series	Nitze et al. (2015)
	Evaluation of phenospectral dynamics with Sentinel-2A using a bottom-up approach in a northern ombrotrophic peatland	Arroyo-Mora et al. (2018)
	The fragmented nature of tundra landscape	Virtanen and Ek (2014)
	Modelling the extent of northern peat soil and its uncertainty with Sentinel: Scotland as example of highly cloudy region	Poggio et al. (2019)
3 (Production)	Utilization of palm oil and its by-products in bio-asphalt and bio-concrete mixtures: A review	Al-Sabaei et al. (2022)
	Life cycle assessment of palm biodiesel: Revealing facts and benefits for sustainability	Yee et al. (2009)
	The effect of paper sludge and biochar addition on brown peat and coir based growing media properties	Méndez et al. (2015)
	Occupational exposure to fungi on recyclable paper pots and growing media and associated health effects – A review of the literature	Madsen and Crook (2021)

	Synthesis and evaluation of pyrolysis waste peat char supported catalyst for steam reforming of toluene	Gu et al. (2020)
	Recycling pyrolyzed organic waste from plant nurseries, rice production and shrimp industry as peat substitute in potting substrates	Nocentini et al. (2021)
	Novel seedling substrate made by different types of biogas residues: Feasibility, carbon emission reduction and economic benefit potential	Meng et al. (2022)
	Role of Biogas and Biochar Palm Oil Residues for Reduction of Greenhouse Gas Emissions in the Biodiesel Production	Harsono et al. (2015)
	Grow – Store – Steam – Re-peat: Reuse of spent growing media for circular cultivation of Chrysanthemum	Vandecasteele et al. (2020)
	Agronomic performance, essential oils and hydrodistillation wastewaters of <i>Lavandula angustifolia</i> grown on biochar-based substrates	Fascella et al. (2020)
4 (Green-house gas)	Warming reduces the increase in N ₂ O emission under nitrogen fertilization in a boreal peatland	Gong et al. (2019)
	Temporal shifts in controls over methane emissions from a boreal bog	Wang et al. (2018)
	Nitrogen addition (NH ₄ NO ₃) mitigates the positive effect of warming on methane fluxes in a coastal bog	Gong et al. (2021)
	Global nitrogen input on wetland ecosystem : The driving mechanism of soil labile carbon and nitrogen on greenhouse gas emissions	Chen et al. (2020)
	Long-term enhanced nitrogen deposition increases ecosystem respiration and carbon loss from a <i>Sphagnum</i> bog in the Scottish Borders	Kivimäki et al. (2013)
	Respiration and CH ₄ fluxes in Tibetan peatlands are influenced by vegetation degradation	Ma et al. (2020)
	Environmental controls on methane fluxes in a cool temperate bog	Ueyama et al. (2020)
	How do increasing background concentrations of tropospheric ozone affect peatland plant growth and carbon gas exchange?	Williamson et al. (2016)
	Soil carbon dioxide emissions due to oxidative peat decomposition in an oil palm plantation on tropical peat	Ishikura et al. (20218)
	Temperature response of ex-situ greenhouse gas emissions from tropical peatlands: Interactions between forest type and peat moisture conditions	Sjögersten et al. (2018)
5 (Habitat)	Displacement of dunlin <i>Calidris alpina schinzii</i> by forestry in the Flow Country and an estimate of the value of moorland adjacent to plantations	Lavers and Haines-Young (1997)
	Biodiversity of the ground-dwelling spider fauna of afforestation habitats	Oxbrough et al. (2007)
	Habitat occupancy patterns and activity rate of native mammals in tropical fragmented peat swamp reserves in Peninsular Malaysia	Sasidhran et al. (2016)
	Values and perceptions of landowners within remaining breeding territories of Eurasian Curlew <i>Numenius arquata</i> in Ireland	Sheridan et al. (2022)
	Mapping and predicting forest loss in a Sumatran tiger landscape from 2002 to 2050	Poor et al. (2019)
	Changes on the heathlands in Dorset, England, between 1986 and 1996	Rose et al. (2000)
	Substantial decline of Northern European peatland bird populations: Consequences of drainage	Fraixedas et al. (2017)
	More wilderness for Germany: Implementing an important objective of Germany's National Strategy on Biological Diversity	Schumacher et al. (2018)
	Soil degradation in oil palm and rubber plantations under land resource scarcity	Guillaume et al. (2016)
	Is 15% restoration sufficient to safeguard the habitats of boreal red-listed mire plant species?	Tolvanen et al. (2020)
6	The role of peat on permafrost thaw based on field observations	Du et al. (2022)

(Permafrost)	Hydro-thermal processes and thermal offsets of peat soils in the active layer in an alpine permafrost region, NE Qinghai-Tibet plateau	Wang et al. (2017)
	Contemporary sand wedge development in seasonally frozen ground and paleoenvironmental implications	Wolfe et al. (2018)
	Flow path oscillations in transient ground-water simulations of large peatland systems	Reeve et al. (2006)
	Thaw-induced impacts on land and water in discontinuous permafrost: A review of the Taiga Plains and Taiga Shield, northwestern Canada	Wright et al. (2022)
	Hydrologic function of a moderate-rich fen watershed in the Athabasca Oil Sands Region of the Western Boreal Plain, northern Alberta	Elmes and Price (2019)
	Groundwater flow patterns in a large peatland	Fraser et al. (2001)
	Groundwater-surface water interaction between an esker aquifer and a drained fen	Rossi et al. (2012)
	Permafrost thaw and climate warming may decrease the CO ₂ , carbon, and metal concentration in peat soil waters of the Western Siberia Lowland	Raudina et al. (2018)
	Groundwater Flow with Energy Transport and Water-Ice Phase Change: Numerical Simulations, Benchmarks, and Application to Freezing in Peat Bogs	Mckenzie et al. (2007)
7 (Management)	Deliberative engagement and REDD+ in Indonesia	Boer (2019)
	Evaluation of policy instruments for supporting greenhouse gas mitigation efforts in agricultural and urban land use	Kärkkäinen et al. (2020)
	Empower Eco multiactor HUB: A triple helix ‘academia-industry-authority’ approach to creating and sharing potentially disruptive tools for addressing novel and emerging new Green Deal opportunities under a United Nations Sustainable Development Goals framework	Rowan and Casey (2021)
	Synergies and trade-offs between nature conservation and climate policy: Insights from the “Natural Capital Germany – TEEB DE” study	Wüstemann et al. (2017)
	Conflicting rationalities, knowledge and values in scarred landscapes	Collier and Scott (2009)
	An Empirical Analysis of Institutional Demand for Valuation Knowledge	Primmer et al. (2018)
	Multimethod valuation of peatland ecosystem services: Combining choice experiment, multicriteria decision analysis and deliberative valuation	Saarikoski et al. (2022)
	More data, more problems? Incompatible uncertainty in Indonesia’s climate change mitigation projects	Goldstein (2022)
	Assigning value to cultural ecosystem services: The significance of memory and imagination in the conservation of Irish peatlands	Flood et al. (2021)
Supporting collaborative policy processes with a multi-criteria discussion of costs and benefits: The case of soil subsidence in Dutch peatlands	van Hardeveld et al. (2018)	
8 (Deposit)	A short-term establishment of forest fen habitat during Pliocene lignite formation in the Ptolemais Basin, NW Macedonia, Greece	Kalaitzidis et al. (2004)
	Geochemical, petrographic and palynologic characteristics of two late middle Pennsylvanian (Asturian) coal-to-shale sequences in the eastern Interior Basin, USA	Eble and Greb (2018)
	Microfacies and depositional environment of Tertiary Tanjung Enim low rank coal, South Sumatra Basin, Indonesia	Amijaya and Littke (2005)
	Pliocene lignites from Apofysis mine, Amynteo basin, Northwestern Greece: petrographical characteristics and depositional environment	Iordanidis and Georgakopoulos (2003)
	Coal deposition in the Barito Basin (Southeast Borneo): The Eocene Tanjung Formation compared to the Miocene Warukin Formation	Fikri et al. (2022)
	The origin of pale and dark layers in Pliocene lignite deposits from	Liu et al. (2018)

	Yunnan Province, Southwest China, based on coal petrological and organic geochemical analyses	
	Comparing maceral ratios from tropical peatlands with assumptions from coal studies: do classic coal petrographic interpretation methods have to be discarded?	Wüst et al. (2001)
	Composition of lipids from the First Lusatian lignite seam of the Konin Basin (Poland): Relationships with vegetation, climate and carbon cycling during the mid-Miocene Climatic Optimum	Bechtel et al. (2019)
	Scanidium in the coals of Northern Asia (<i>Siberia, the Russian Far East, Mongolia, and Kazakhstan</i>)	Arbuzov et al. (2014)
	Cryptic abundance of long-chain <i>iso</i> and <i>anteiso</i> alkanes in the Dajiuhu peat deposit, central China	Huang et al. (2014)
9 (Fire)	Comparative study of the temporal evolution of atmospheric lead deposition in Scotland and eastern Canada using blanket peat bogs	Weiss et al. (2002)
	Local and transboundary factors' impacts on trace gases and aerosol during haze episode in 2015 El Niño in Malaysia	Samsuddin et al. (2018)
	Quantitative assessment of source contributions to PM _{2.5} on the west coast of Peninsular Malaysia to determine the burden of Indonesian peatland fire	Fujii et al. (2017)
	Characteristics of carbonaceous aerosols emitted from peatland fire in Riau, Sumatra, Indonesia	Fujii et al. (2014)
	Peat-fire-related air pollution in Central Kalimantan, Indonesia	Hayasaka et al. (2014)
	A multi-year and high-resolution inventory of biomass burning emissions in tropical continents from 2001-2017 based on satellite observations	Shi et al. (2020)
	Analysis of source regions for smoke events in Singapore for the 2009 El Niño burning season	Atwood et al. (2013)
	Impacts of peat-forest smoke on urban PM _{2.5} in the Maritime Continent during 2012-2015: Carbonaceous profiles and indicators	Tham et al. (2019)
	Characterization of carbonaceous compounds emitted from Indonesian surface and sub surface peat burning	Lestari et al. (2020)
	Peat-forest burning smoke in Maritime Continent: Impacts on receptor PM _{2.5} and implications at emission sources	Lan et al. (2021)
10 (Soil organic matter)	Biodegradation of norflurazon in a bog soil	Savin and Amador (1998)
	Physical protection and biochemical quality of organic matter in Mediterranean calcareous forest soils: a density fractionation approach	Rovira and Vallejo (2003)
	Different effects of peat degradation on dissolved organic carbon and nitrogen	Kalbitz and Geyer (2002)
	Geochemistry of three contrasting British peatlands: Complex patterns of cation availability and implications for microbial metabolism	Gogo et al. (2010)
	The effect of afforestation on the soil organic carbon (SOC) of a peaty gley soil using on-line thermally assisted hydrolysis and methylation (THM) in the presence of ¹³ C-labelled tetramethylammonium hydroxide (TMAH)	Mason et al. (2009)
	Adsorption of organic matter on clay minerals in the Dajiuhu peat soil chronosequence, South China	Hong et al. (2019)
	Impact of siltation on the stability of organic matter in drained peatlands	Kalisz et al. (2021)
	Influence of source vegetation and redox conditions on lignin-based decomposition proxies in graminoid-dominated ombrotrophic peat (Penido Vello, NW Spain)	Schellekens et al. (2015)
Morphology, chemical properties, and radiocarbon dating of eutrophic peat in Turkey	Cayci et al. (2011)	

	Iron and silicon isotope behavior accompanying weathering in Icelandic soils, and the implications for iron export from peatlands	Opfergelt et al. (2017)
	Electron accepting capacity of dissolved and particulate organic matter control CO ₂ and CH ₄ formation in peat soils	Gao et al. (2019)
11 (Peatland formation)	Field-scale compression of Sphagnum moss to improve water retention in a restored bog	Gauthier et al. (2022)
	Water table dynamics in undisturbed, drained and restored blanket peat	Holden et al. (2011)
	Soil moisture, water tension, and water table relationships in a managed cutover bog	Price (1997)
	Peatland water repellency: Importance of soil water content, moss species, and burn severity	Moore et al. (2017)
	The hydrology of the Bois-des-Bel bog peatland restoration: 10 years post-restoration	McCarter et al. (2013)
	The effects of long-term drainage and subsequent restoration on water table level and pore water chemistry in boreal peatlands	Haapalehto et al. (2014)
	Effect of stockpiling time on donor-peat hydrophysical properties: Implications for peatland restoration	Lehan et al. (2022)
	Historical peat loss explains limited short-term response of drained blanket bogs to rewetting	Williamson et al. (2017)
	Burned and unburned peat water repellency: Implications for peatland evaporation following wildfire	Kettridge et al. (2014)
	Decreased summer water table depth affects peatland vegetation	Breeuwer et al. (2009)
12 (Forest)	Effect of fertilization on the biomass production of coppiced mixed birch and willow stands on a cut-away peatland	Hytönen and Kaunisto (1999)
	Performance of planted and naturally regenerated seedlings in Picea abies-dominated shelterwood stands and clearcuts in Sweden	Holgén and Hånell (2000)
	Effect of wood ash on the biomass production and nutrient status of young silver birch (<i>Betula pendula Roth</i>) trees on cutaway peatlands in Estonia	Kikamägi et al. (2013)
	Long-term biomass production and nutrient uptake of birch, alder and willow plantations on cut-away peatland	Hytönen and Saarsalmi (2009)
	Effects of stabilized wood ash on nutrient status and growth of Scots pine – Comparison between uplands and peatlands	Moilanen et al. (2013)
	Ash-fertilization improves germination and early establishment of birch (<i>Betula pubescens Ehrh.</i>) seedlings on a cut-away peatland	Huotari et al. (2008)
	Needle litter response of peatland tamarack and black spruce to fertilization of minerotrophic peatland sites	Mugasha et al. (1996)
	Recovery of understory vegetation after stem-only and whole-tree harvesting in drained peatland forests	Hamberg et al. (2019)
	Effects of fertilization on seasonal patterns of foliar mass and nutrients of tamarack and black spruce on undrained and drained minerotrophic peatland sites	Mugasha a et al. (1999)
	Influence of harvest time and frequency on light interception and biomass yield of festulolium and tall fescue cultivated on a peatland	Kandel et al. (2016)
13 (Past environmental change)	Inverse phase oscillations between the East Asian and Indian Ocean summer monsoons during the last 12000 years and paleo-El Niño	Hong et al. (2005)
	Vegetation responses to the last glacial and early Holocene environmental changes in the northern Leizhou Peninsula, south China	Xue et al. (2015)
	High-frequency vegetation and climatic changes during the Lateglacial inferred from the Lapsou pollen record (Cantal, southern Massif Central, France)	Dupart-Oualid et al. (2022)
	A continuous record of vegetation and climate change over the past 50,000 years in the Fujian Province of eastern subtropical China	Yue et al. (2012)

	Climate and vegetation history from a 14,000-year peatland record, Kenai Peninsula, Alaska	Jones et al. (2009)
	Holocene climate changes inferred from peat humification: A case study from the Daiyun Mountains, Southeast China	Ma et al. (2021)
	Moisture conditions during the Younger Dryas and 4.2 ka event as revealed from a subalpine peat record in the Luoxiao Mountains, southern China	Shuchun et al. (2022)
	Multi-proxy analyses of a peat bog on Isla de los Estados, easternmost Tierra del Fuego: a unique record of the variable Southern Hemisphere Westerlies since the last deglaciation	Björck et al. (2012)
	The Holocene paleoenvironmental history of central European Russia reconstructed from pollen, plant macrofossil, and testate amoeba analyses of the Klukva peatland, Tula region	Novenko et al. (2015)
	Holocene vegetation and climate variability in North Pre-Baikal region, East Siberia, Russia	Bezrukova et al. (2011)
14 (Microbe)	Using DNA-barcoding for sorting out protist species complexes: A case study of the <i>Nebela tinctoria-collaris-bohemica</i> group (Amoebozoa; Arcellinida, Hyalospheniidae)	Kosakyan et al. (2013)
	High-throughput sequencing reveals diverse oomycete communities in oligotrophic peat bog micro-habitat	Singer et al., (2016)
	Effects of rotifers, copepods and chironomid larvae on microbial communities in peatlands	Mieczan et al. (2015)
	Hydrology driven vertical distribution of prokaryotes and methane functional groups in a subtropical peatland	Wang et al. (2022)
	Differential detection of type II methanotrophic bacteria in acidic peatlands using newly developed 16S rRNA-targeted fluorescent oligonucleotide probes	Dedysh et al. (2003)
	<i>Arcella peruviana</i> sp. nov. (Amoebozoa: Arcellinida, Arcellidae), a new species from a tropical peatland in Amazonia	Reczuga et al. (2015)
	Microbial activity and community structure in two drained fen soils in the Ljubljana Marsh	Kraigher et al. (2006)
	The rhizosphere and PAH amendment mediate impacts on functional and structural bacterial diversity in sandy peat soil	Yrjälä et al. (2010)
	Isolation and characterization of oligotrophic acido-tolerant methanogenic consortia from a <i>Sphagnum</i> peat bog	Sizova et al. (2003)
	Detection of methanogenic <i>Archaea</i> in peat: comparison of PCR primers targeting the <i>mcrA</i> gene	Juottonen et al. (2006)
15 (Metal)	Geochemical modeling of Fe (II) binding to humic and fulvic acids	Catrouillet et al. (2014)
	Peatlands: a major sink of naturally formed organic chlorine	Keppler and Biester (2003)
	Human cell mutagenicity of chlorinated and unchlorinated water and the disinfection byproduct 3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX)	Woodruff et al. (2001)
	Chemical speciation of mercury, sulfur and iron in a dystrophic boreal lake sediment, as controlled by the formation of mackinawite and framboidal pyrite	Skyllberg et al. (2021)
	Coagulation of organo-mineral colloids and formation of low molecular weight organic and metal complexes in boreal humic river water under UV-irradiation	Drozdova et al. (2020)
	Biogeochemical influences on net methylmercury formation proxies along a peatland chronosequence	Wang et al. (2021)
	Copper (II) adsorption from aqueous solution by herbaceous peat	Gündoğan et al. (2004)
	Shifts in mercury methylation across a peatland chronosequence: From sulfate reduction to methanogenesis and syntrophy	Hu et al. (2020)

	The genesis and transformation of organo-mineral colloids in a drained peatland area	Couture et al. (1998)
	Opposing spatial trends in methylmercury and total mercury along a peatland chronosequence trophic gradient	Wang et al. (2020)
16 (Hydrology)	Trends in hydrometeorological conditions and stream water organic carbon in boreal forested catchments	Sarkkola et al. (2009)
	pH variability in catchment flows to estuaries – A South African perspective	Omarjee et al. (2021)
	Rainfall intensity and catchment size control storm runoff in a gullied blanket peatland	Edokpa et al. (2022)
	Ecohydrological determinants of seasonality and export of total organic carbon in Narew River with high peatland contribution (north-eastern Poland)	Górniak (2019)
	Nitrogen in river basins: Sources, retention in the surface waters and peatlands, and fluxes to estuaries in Finland	Lepistö et al. (2006)
	The effect of interactions between rainfall patterns and land-cover change on flood peaks in upland peatlands	Gao et al. (2018)
	The estuarine mixing behaviour of peatland derived dissolved organic carbon and its relationship to chromophoric dissolved organic matter in two North Sea estuaries (U.K.)	Spencer et al. (2007)
	Creation and functioning of a buffer zone in a blanket peat forested catchment	O’Driscoll et al. (2014)
	Generation and regulation of summer runoff in a boreal flat fen	Kværner et al. (2008)
	Elevated nutrient concentrations in headwaters affected by drained peatland	Marttila et al. (2018)