

# EMEP monitoring strategy, 2020-2029

United Nations

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**Economic and Social Council**

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# Timeline:

**Continuous communication with funding agencies, measurement community and data users**

## Technical requirements

- Consultations with EMEP Steering Body/EMEP TFMM
- Internal workshop at NILU
- Draft1 sent to MSC-W and MSC-E
- Draft2 for TFMM May 3rd, 2018, special session at TFMM
- Written input and comments by June 2018
- Draft3 available August 2018
- Draft4 available for TFMM May 2019

## Strategy text

- First draft prepared by EMEP-CCC, available August 2018
- Second draft, available March 2019
- 3rd draft presented at TFMM May 2019, revised again late May.

Clarifies typical questions/comments received on previous strategies

Updated to reflect status of external frameworks

Ambitious in scope, but with relaxations wrt implementation

# EMEP levels shortly explained:

- **Level 1**, Basic monitoring, largely engages governmental agencies and institutes and is based on long-term funding. Standardized methods and data products. QAQC internal, partly overlap with EU-Directives based monitoring. Data reported to EMEP.
- **Level 2**, More advanced or costly observations, generally by research organizations, close links to RI-initiatives. Standardized methods and data products, external QAQC may occur. Data reported to EMEP.
- **Level 3**, typically research oriented. Often no standard methods or QAQC systems in place. Often no permanent long-term commitment. Also other locations and «representativeness» than at Level 1 and level 2. Data reported or made available to EMEP (eg. special chapters in EMEP reports).

*Level 1 - "variables to be measured at all basic EMEP sites"*

*Recommended  
temporal resolution*

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Inorganic compounds in precipitation	$\text{SO}_4^{2-}$ , $\text{NO}_3^-$ , $\text{NH}_4^+$ , $\text{H}^+$ (pH), $\text{Na}^+$ , $\text{K}^+$ , $\text{Ca}^{2+}$ , $\text{Mg}^{2+}$ , $\text{Cl}^-$ , precipitation amount	24 hours
Inorganic compounds in air	$\text{SO}_2$ , $\text{SO}_4^{2-}$ , $\text{NO}_3^-$ , $\text{HNO}_3$ , $\text{NH}_4^+$ , $\text{NH}_3$ , ( $\text{sNO}_3$ , $\text{sNH}_4$ ), $\text{HCl}$ , $\text{Na}^+$ , $\text{K}^+$ , $\text{Ca}^{2+}$ , $\text{Mg}^{2+}$	24 hours
Elemental and Organic Carbon	EC and OC in $\text{PM}_{2.5}$	24 hours /7 days
Nitrogen dioxide	$\text{NO}_2$	1 hour/24 hours
Ozone	$\text{O}_3$	1 hour
PM mass concentration	$\text{PM}_{2.5}$ , $\text{PM}_{10}$	24 hours
Heavy metals in precipitation	Cd, Pb (1st priority), Cu, Zn, As, Cr, Ni (2nd priority)	7 days
Meteorology	Precipitation amount (RR), temperature (T), wind direction (dd), wind speed (ff), relative humidity (rh), atmospheric pressure (pr)	24 hours (RR), others 1 hour

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*Level 2 - "additional variables to be measured at a subset of sites - EMEP level 2 sites"* *Recommended temporal resolution*

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**Oxidant precursors and gaseous short-lived climate pollutants**

Nitrogen oxide	NO	1 hour
Light hydrocarbons	C <sub>2</sub> –C <sub>5</sub> , BTEX (Benzene, Toluene, Ethylbenzene and Xylene)	1 hour/grab sample once or twice per week
OVOCS	Aldehydes and ketones	Absorbing Solution tube, once or twice per week
Hydrocarbons	C <sub>6</sub> –C <sub>12</sub>	1 hour/ABS tube, once or twice per week
Methane	CH <sub>4</sub>	1 hour
Carbon Monoxide	CO	1 hour

Level 2 - "additional variables to be measured at a subset of sites - EMEP level 2 sites" Recommended temporal resolution

**Particulate matter (PM) observations contribute to the assessment of particulate matter and its source apportionment**

PM mass	PM <sub>1</sub>	1 hour	
Elemental and Organic Carbon in air	EC and OC in PM <sub>10</sub>	24 hours/7 days	
Mineral dust in PM <sub>10</sub>	Si, Al, Fe, Ca	24 hours/7 days	
Particle light absorption/equivalent black carbon	Light absorption coefficient, eBC	1 hour	
Particle number concentration	dp >10nm	1 hour	<10nm
Particle number size distribution	dN/dlogDp, (sub/supermicrometer)	1 hour	
Particle light-scattering coefficients	Light-scattering coefficient, Light backscatter coefficients (multi-wavelengths)	1 hour	<i>Naming updated according to ACTRIS/GAW</i>
Particle chemistry speciation	Non-refractory organic and inorganic composition (ACSM, AMS)	1 hour	
Aerosol Optical Depth	AOD at 550 nm	1 hour	

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*Level 2 - "additional variables to be measured at a subset of sites - EMEP level 2 sites" Recommended temporal resolution*

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**Acidification and eutrophication observations contribute to the assessment of nitrogen chemistry, influence by local emissions and dry deposition fluxes**

Gas particle ratio of N-species	NH <sub>3</sub> /NH <sub>4</sub> <sup>+</sup> , HNO <sub>3</sub> /NO <sub>3</sub> - (artefact-free methods)	1 hour/24 hours
Gas particle ratios of N-species	NH <sub>3</sub> , NH <sub>4</sub> <sup>+</sup> , HNO <sub>3</sub> , NO <sub>3</sub> <sup>-</sup> (HCl) (complementing the filter pack sampling)	1 month

«moved from level 1»



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*Level 2 - "additional variables to be measured at a subset of sites - EMEP level 2 sites"* *Recommended temporal resolution*

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**Heavy metals observations contribute to the assessment of mercury and heavy metals fluxes**

Mercury in precipitation	Hg	7 days
Mercury in air	Hg (TGM)	1 hour/24 hours/7 days
Heavy metals in air	Cd, Pb (1st priority), Cu, Zn, As, Cr, Ni (2nd priority)	7 days

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*Level 2 - "additional variables to be measured at a subset of sites - EMEP level 2 sites"* *Recommended temporal resolution*

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**Persistent organic pollutants (POPs) observations contribute to the assessment of persistent organic pollutants**

POPs in precipitation	PAHs, PCBs, HCB, chlordanes, HCHs, DDT/DDE	7 days
POPs in air	PAHs, PCBs, HCB, chlordanes, HCHs, DDT/DDE	24 hours/7 days/24 hours or 48 hours once or twice per week (depending on sampling with respect to artefact problems)

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*Level 2 - "additional variables to be measured at a subset of sites - EMEP level 2 sites" Recommended temporal resolution*

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**Tracers observations contributes to the assessment of individual long-range transport events and their source apportionment**

Halocarbons CFCs, HCFCs, HFCs, PFCs, SF<sub>6</sub> 1 hour

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*Level 3 – Research-based and voluntary measurements, preferably, but not limited to EMEP level 1/2 sites. May also include both campaign and long-term observations. Observations contribute to the understanding of processes relevant to long-range transport of air pollutants and support model development and validation*

*Recommended temporal resolution*

NO <sub>y</sub> chemistry	HNO <sub>2</sub> , NO <sub>3</sub> , N <sub>2</sub> O <sub>5</sub> , PAN, organic nitrates	1 hour
Ammonia in emission areas (optional)	NH <sub>3</sub>	1 month
Vertical profiles	O <sub>3</sub> soundings, aerosol LiDAR	1 hour
Organic tracers, OC fractionation	Levoglucosan, others, Water soluble and water insoluble OC (WSOC/WINSOC)	24 hours/7 days
Organic tracers	Levoglucosan, others	24 hours/7 days
Isotopic information	OC, EC, VOCs, CH <sub>4</sub> , CO <sub>2</sub> , Hg	24 hours/7 days
Greenhouse gases	CO <sub>2</sub> , N <sub>2</sub> O	1 hour
Hydrogen	H <sub>2</sub>	1 hour
Hydroxyl radical	OH-	1 hour
Hydroperoxide	H <sub>2</sub> O <sub>2</sub>	1 hour
OVOC Alcohols	Methanol, Ethanol	ABS tube, once or twice per week

Major inorganics in PM <sub>2.5</sub> and PM <sub>10</sub>	SO <sub>4</sub> <sup>2-</sup> , NO <sub>3</sub> <sup>-</sup> , NH <sub>4</sub> <sup>+</sup> , Na <sup>+</sup> , K <sup>+</sup> , Ca <sub>2</sub> <sup>+</sup> , Mg <sup>+</sup> (Cl <sup>-</sup> )	7 days
Mercury speciation	RGM and TPM	1 hour/24 hours/7 days
POPs passive sampling at higher spatial resolution	For example, PAHs, PCBs, HCB, chlordane, HCHs, DDT/DDE	1 month
POPs other than those listed above, as well as organic contaminants of emerging concern	For example, PBDEs, PFAS, SCCPs	As considered appropriate
Dry deposition flux	nitrogen species, O <sub>3</sub> , VOCs, particles, other	1 hour

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# Levels and site densities

- No change suggested to «level-approach»
- Regionally representative sites (rural/remote)
- Target site densities
- «Implementation index» will remain an «in-official» measure

