CNR Water Research Institute, Verbania Pallanza, Italy

Michela Rogora and the NEC Italy working group

NEC Directive in Italy: implementation steps, with a focus on freshwaters

Joint 27th ICP IM and 35th ICP Waters Task Force Meeting, Helsinki, Finland, 4-6 June 2019

NED Directive: approval and application process in Italy

National Emissions Ceilings (NEC) Directive 2016/2284/EU

Legislative decree n. 81/2018 of the President of the Italian Republic
Transposition of the ***Directive 2016/2284/EU***

Decree 26 november 2018 by the Ministry for Environment, Land and Sea (MATTM)
Sites and criteria for the execution of the monitoring of air pollution impact on ecosystems, including timing and procedure for data provision

2-year cooperation agreement between MATTM and Carabinieri–CUFA (*Command Unit for forest, agri-food and environmental protection; formerly National Forest Service*) for the the NECD monitoring in Italy

MATTM

Ministry for Environment, Land and Sea General Directorate for Waste and Pollution

CUFA

Carabinieri Command for the Protection of Biodiversity and Parks

CNR - National Research Council of Italy

IPSP *Ozone*

IRSA *Atmospheric dep. chemistry*
Freshwater

IRET/ISAFOM *Foliar nutrients*

CREA - Council for Agricultural Research and Economics

Meteorology
Vegetation growth

University of Florence

Soil solution

University of Camerino

Vegetation biodiversity

Sites identified for the NECD implementation in Italy

De Marco et al., Envir. Internat. 2019

The network currently includes
6 sites for terrestrial ecosystem,
4 for freshwater and
11 for ozone impact monitoring

NEC Italy - Terrestrial ecosystems
Solid phase

National code	Name	Network	Localization		Monitored parameters	Sampling frequency
			Latitude	Longitude		
ABR1	Selva Piana	CONECOFOR-ICP Forests/LTER/MOTTLES	41,8497	13,5885	I. Soil base saturation, pH, C/N ratio	I. Every 10 years
CAL1	Piano Limina	CONECOFOR-ICP Forests	38,4167	16,1667	II. Foliar nutrient balance (N,P, K, Mg, Ca, S, C, - cg/g)	II. Every 2 years
EMI1	Carrega	CONECOFOR-ICP Forests/MOTTLES	44,7194	10,2034	III. Vegetation growth (%)	III. Every 5 years
LAZ1	Monterufeno	CONECOFOR-ICP Forests/LTER/MOTTLES	42,8274	11,8981	IV. Foliar damage (% trees def>25%, % trees def>60%,mortality)	IV. annual
PIE1	Val Sessera	CONECOFOR-ICP Forests/MOTTLES	45,6837	8,0699	V. Biodiversity: species density (presence/abundance), community structure (ecological indicators, alien species, etc.)	V. annual
VEN1	Pian di Cansiglio	CONECOFOR-ICP Forests/MOTTLES	46,0579	12,3821		

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NEC Italy - Terrestrial ecosystems
Liquid phase

National code	Name	Network	Localization		Monitored parameters	Sampling frequency
			Latitude	Longitude		
ABR1	Selva Piana	CONECOFOR-ICP Forests/LTER/MOTTLES	41,8497	13,5885	I. Deposition: pH, cond.,Ca, Mg, Na, K, NH_4-N, NO_3-N,SO_4-S, Cl, P, alkalinity, total N, DOC	I. Weekly
CAL1	Piano Limina	CONECOFOR-ICP Forests	38,4167	16,1667		
EMI1	Carrega	CONECOFOR-ICP Forests/MOTTLES	44,7194	10,2034		
LAZ1	Monterufeno	CONECOFOR-ICP Forests/LTER/MOTTLES	42,8274	11,8981	II. Soil solution: pH, cond., Ca, Mg, Na, K,NH_4-N, NO_3-N, SO_4-S, Cl, total N, NO_3 and base cations leaching from soil	II. Every 2 weeks
PIE1	Val Sessera	CONECOFOR-ICP Forests/MOTTLES	45,6837	8,0699		
VEN1	Pian di Cansiglio	CONECOFOR-ICP Forests/MOTTLES	46,0579	12,3821		

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MINISTERO DELL'AMBIENTE

NEC Italy – Ozone damage and meteorology

National code	Name	Network	Localization		Monitored parameters	Sampling frequency
			Latitude	Longitude		
ABR1	Selva Piana	CONECOFOR-ICP Forests/LTER/MOTTLES	41,8497	13,5885	I. Precipitation and soil water content (10 cm and 2 m)	I. Measured every minute and registered every hour
CAL1	Piano Limina	CONECOFOR-ICP Forests	38,4167	16,1667		
CPZ1	Castelporziano	MOTTLES / ICOS	41,7042	12,3571	II. Solar radiation, temperaure, humidity, air pressure, wind speed and direction, O_3 concentration	II. Measured every 10 sec. And registered as mean hourly values
CPZ2	Castelporziano	MOTTLES /CREA-FL	41,7042	12,3573		
CPZ3	Castelporziano	MOTTLES /CREA-FL	41,6806	12,3908	III. Visible foliar damage produced by O_3 (presence/absence and % of damaged leaves)	III. Annual
EMI1	Carrega	CONECOFOR-ICP Forests/MOTTLES	44,7194	10,2034		
LAZ1	Monterufeno	CONECOFOR-ICP Forests/LTER/MOTTLES	42,8274	11,8981	IV. O3 fluxes and critical level exceedance (DOSE model)	IV. Annual
INTERREG1	Demonte/Valloriate	INTERREG ALCOTRA MITIMPACT 1671	44,3458	7,3121		
PIE1	Val Sessera	CONECOFOR-ICP Forests/MOTTLES	45,6837	8,0699	V. (only for CPZ1) C and O3 fluxes, evapotranspiration of the whole ecosystem	V. Half-hourly
TRE1	Passo Lavazè	CONECOFOR-ICP Forests/MOTTLES	46,3595	11,4931		
VEN1	Pian di Cansiglio	CONECOFOR-ICP Forests/MOTTLES	46,0579	12,3821		

NEC Italy - Freshwaters

National code	Name	Network	Localization		Monitored parameters	Sampling frequency
			Latitude	Longitude		
IT01	Lago Paione inferiore	ICP WATERS/ LTER	46,1669	8,1897	Temp., Alk., SO_4, NO_3-N, Cl, TOC, pH, Ca, Mg, Na, K, NH_4-N, tot Al, Cond. 25°C, P-PO_4, PT, NT, Rsi, ANC	Every 6 months
IT02	Lago di Mergozzo	ICP WATERS	45,9556	8,4667	Temp., Alk., SO_4, NO_3-N, Cl, TOC, pH, Ca, Mg, Na, K, NH_4-N, tot Al, Cond. 25°C, P-PO_4, PT, NT, Rsi, ANC, transparency, dissolved O_2	Every 6 months
IT03	Lago Paione superiore	ICP WATERS/ LTER	46,1739	8,1908	Temp., Alk., SO_4, NO_3-N, Cl, TOC, pH, Ca, Mg, Na, K, NH_4-N, tot Al, Cond. 25°C, P-PO_4, PT, NT, Rsi, ANC	Every 6 months
IT04	Torrente Cannobino	ICP WATERS	46,0681	8,6949	Temp., Alk., SO_4, NO_3-N, Cl, TOC, pH, Ca, Mg, Na, K, NH_4-N, tot Al, Cond. 25°C, P-PO_4, PT, NT, Rsi, ANC	Monthly

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NEC Directive: insights from Italy

Alessandra de Marco

Environment International
Volume 125, April 2019, Pages 320-333

ELSEVIER

Impacts of air pollution on human and ecosystem health, and implications for the National Emission Ceilings Directive: Insights from Italy

Alessandra De Marco [a] [1] ✉, Chiara Proietti [b, 1], Alessandro Anav [a], Luisella Ciancarella [c], Ilaria D'Elia [c], Silvano Fares [d], Maria Francesca Fornasier [b], Lina Fusaro [e], Maurizio Gualtieri [c], Fausto Manes [e], Aldo Marchetto [f], Mihaela Mircea [c], Elena Paoletti [g], Antonio Piersanti [c], Michela Rogora [f], Luca Salvati [d], Elisabetta Salvatori [e], Augusto Screpanti [h] ... Cristina Leonardi [i, j]

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✓1) to assess what is available in Italy in term of monitoring network for air pollution impacts; 2) to summarize what has been done to control air pollution and its effects on human and ecosystem health; 3) to evaluate opportunities from the implementation of Art. 9 of the NECD in the Italian context

✓ Italy as an interesting case study for the application of the NECD Article 9, because of the high level of functional biodiversity, wide variety of environmental, landscape and climatic conditions

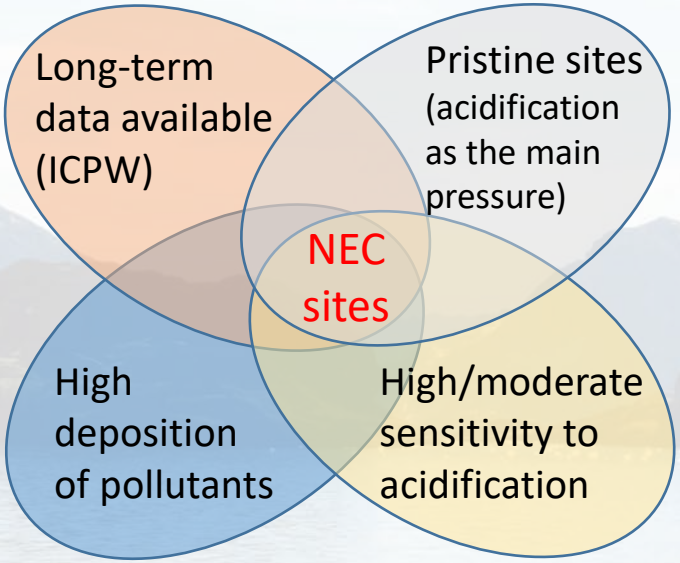
✓The attainment of the NEC ceilings in Italy could not guarantee the compliance with EU air quality limits (e.g. for daily PM10, annual PM2.5 and daily maxima of 8-h running mean of O_3)

Integrated and effective strategies are needed to allow the compliance of both emission ceilings and health and environmental protection

✓Much work is required, for instance, to estimate the interaction of air pollutants with climate change, or to include other environmental impacts on ecosystems not covered by the NECD (e.g. materials, cultural heritage) and for the integration of experimental and modelled data

Freshwater sites

No monitoring under the WFD for acidification



✓ 4 ICP WATERS sites (1 subalpine lake, 1 stream, 2 alpine lakes) + 6 additional sites (high altitude lakes)

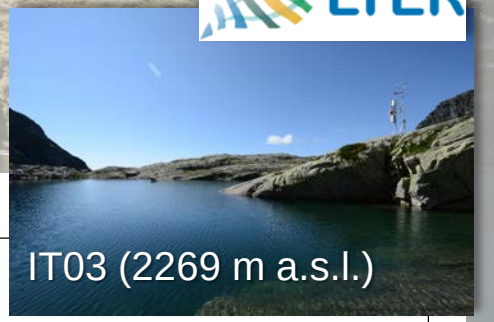
✓ Long-term chemical data (since the 1980s), sparse biological data

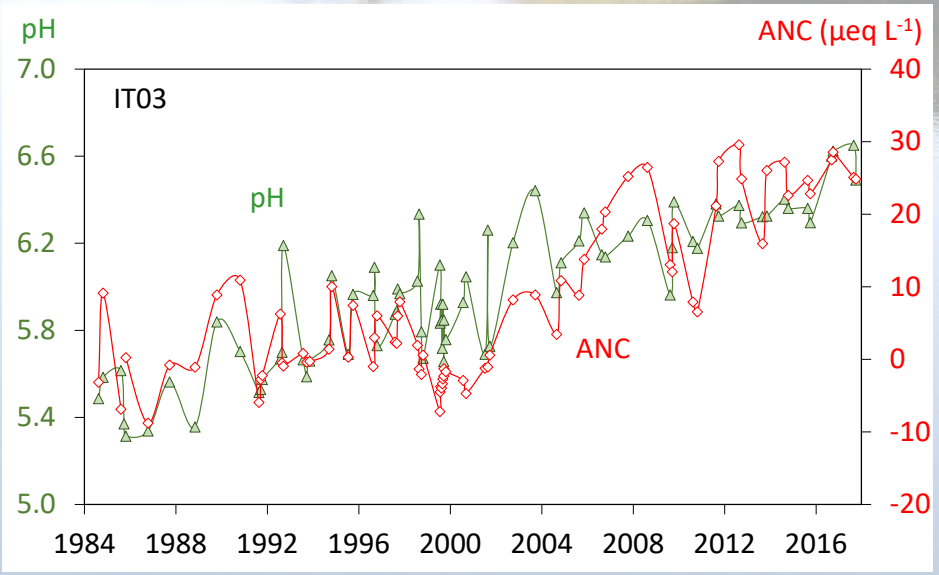
✓ Varying degree of sensitivity to acidification (ANC: 18-270 µeq L^{-1})

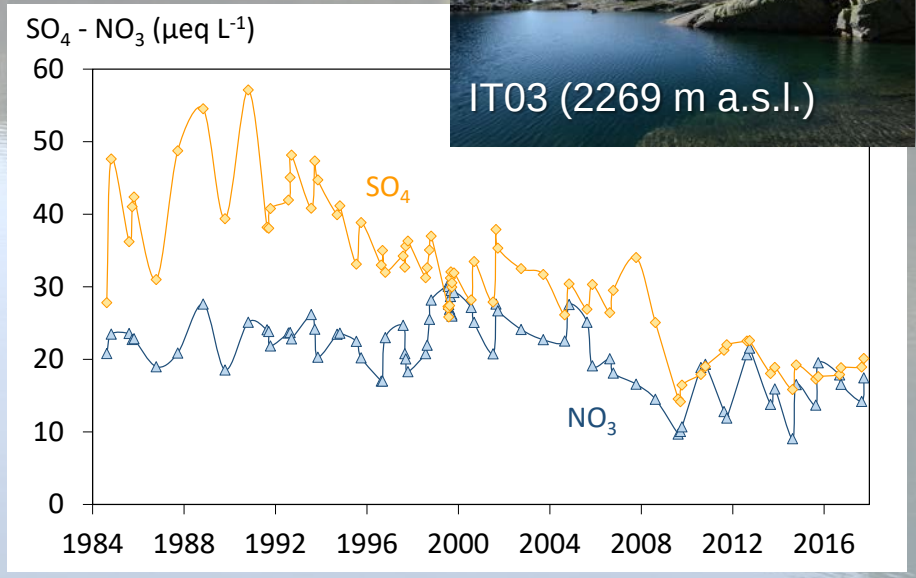
✓ Still affected by medium-high N deposition (10-20 kg N ha^{-1} y^{-1})

Chemical data

- ✓ Within NEC Italy activities, time series of chemical data for ICPW sites will be updated
- ✓ The number of sites will be extended including 6 additional high altitude lake sites
- ✓ All the NEC Art. 9 suggested parameters/indicators will be included
- ✓ Sampling and chemical analysis according to the ICPW Manual
- ✓ Data quality check by internal and external QA/QC - regular participation of the lab to NIVA intercomparisons

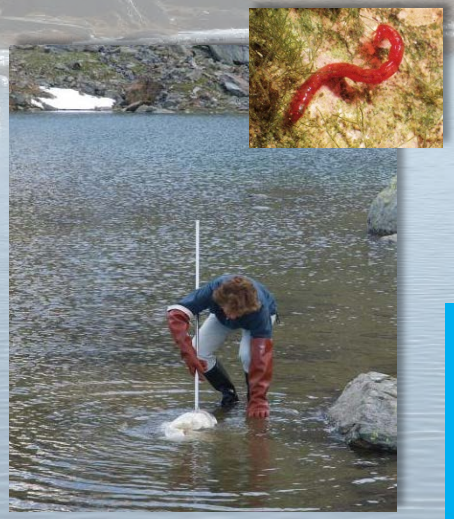




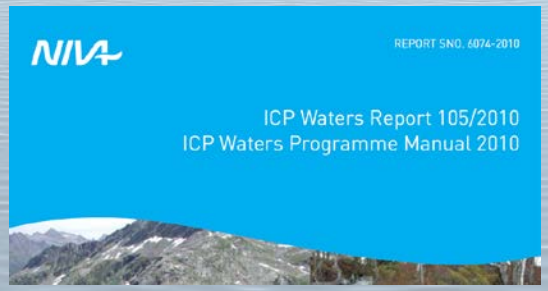


Biological parameters and indicators

Beside sampling for chemical analysis, samples will be collected for macroinvertebrates and diatoms (only for high altitude lake sites, n=8)



littoral handle netting (macroinvertebrates)



No specific indicators have been identified and indicated in the NEC template reporting at this step

identification and counting **at species level**

direct stone brushing (diatoms)

Aldo Marchetto

Simona Musazzi

Angela Boggero

Andrea Lami

Macroinvertebrates

Can we use macroinvertebrates as indicators of acidification of high-altitude Alpine lakes?

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Italian Journal of Zoology, 2014, 1–12
http://dx.doi.org/10.1080/11250003.2014.965230
Taylor & Francis

Oligochaete assemblages of Swiss Alpine lakes

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IRSA CNR Journal of Limnology
CNR – Water Research Institute (IRSA) – Verbania Pallanza – Italy

Biodiversity of mountain Alpine lakes

Environmental factors as drivers for macroinvertebrate and diatom diversity in Alpine lakes: New insights from the Stelvio National Park (Italy)

Angela BOGGERO,[1*] Silvia ZAUPA,[1] Simona MUSAZZI,[1] Michela ROGORA,[1] Elzbieta DUMNICKA,[2] Andrea LAMI[1]

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✓ In general, macroinvertebrates from lake outlets are better indicators for acidity than from lake littorals

✓In lake outlets, the following **metrics** increased significantly with pH:

- total N° of taxa
- N° of taxa and families and relative abundance of Ephemeroctera
- number of taxa of Plecoptera
- N° of taxa and families of the sum of Ephemeroctera/Plecoptera/Thricoptera
- N° of taxa and relative abundance of oligochaetes
- N° of taxa of chironomids
- N° of acid sensitive species

✓Necessary to apply metrics to a much higher number of sites to assess the effects of other environmental parameters than pH

Diatoms

Sampling following a European wide standardized protocol, through direct stones brushing

MOLAR Mountain Lake Research

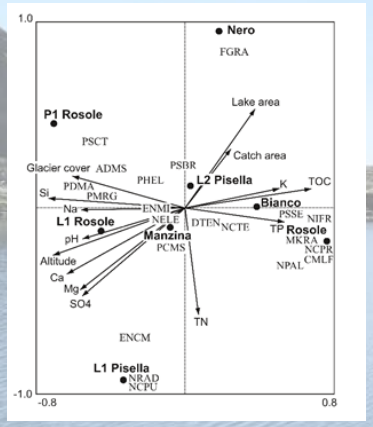
ICP WATERS

Euro-limpacs

EMERGE

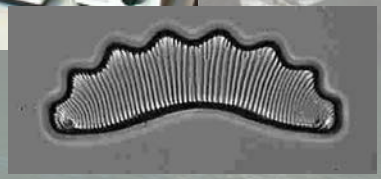
Digestion

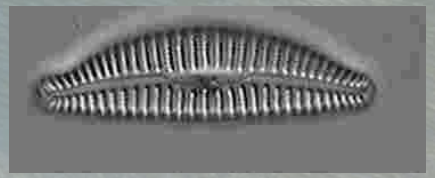
Identification and counting



✓Detecting possible trend in the response to changing acidity by comparison with previous data

✓Assess relationships with environmental variables (not only pH)





Diatom taxon list
Preference groups
Diatom inferred pH

Numerical Analysis

NEC Italy working group

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E DELLA TUTELA DEL TERRITORIO E DEL MARE

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