AIR QUALITY MONITORING AND INFORMATION DISSEMINATION IN ARMENIA

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35th Task Force Meeting of the International Cooperative Programme on Assessment and Monitoring of Air Pollution on Rivers and Lakes , Helsinki, Finland from June4th to 6st 2019

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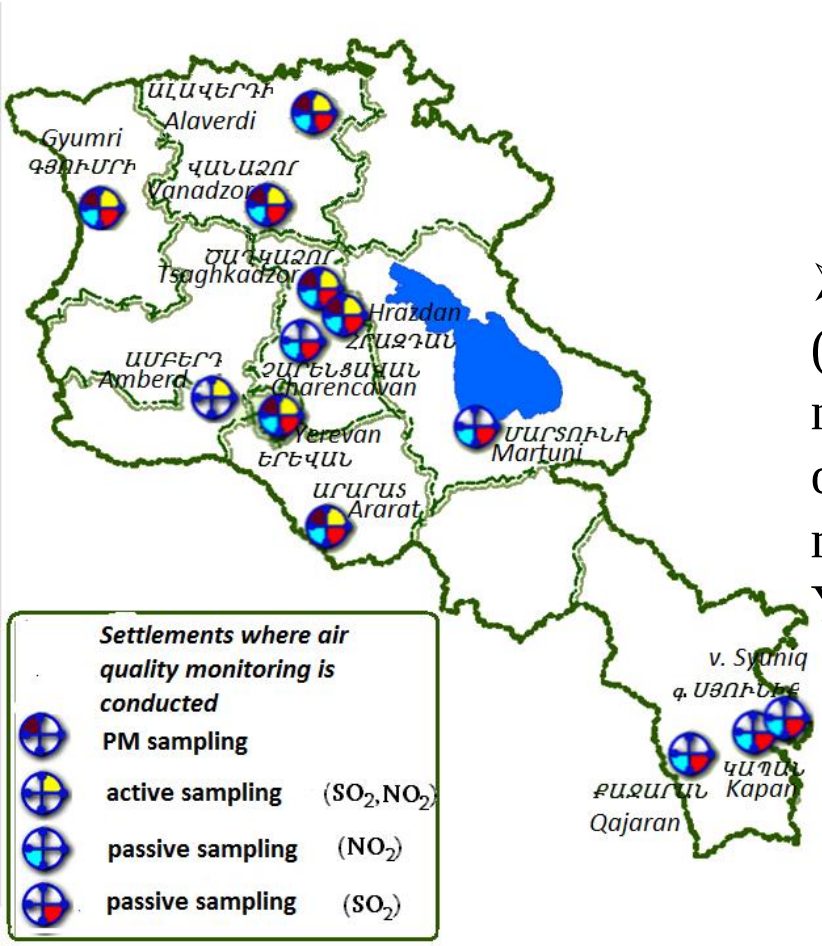
Introduction of organization, work & responsibilities

Main responsibilities:

- Environmental Monitoring
- Air quality monitoring (including Long-range transboundary air pollution monitoring)
- Precipitations
- Surface water quality monitoring,
- Groundwater quality and quantity monitoring,
- Soil pollution monitoring,

Ambient Air Quality Monitoring Program



- Number of Settlements: **11**

- Total number of pollutants measured: **26** (Total dust (PM), sulfur dioxide (SO2), nitrogen oxides (NO2 & NO), ozone (O3), carbon monoxide (CO), heavy metals (Cd,Pb,Zn,Cu..) in dust samples in Yerevan)

Analytical methods

Sampling methods	Parameters	Sampling Frequency	Analytical Methods
Passive Sampling	**NO_2, SO_2**	**Weekly**	***Spectrophotometric,methods/Griess,Thorin***
Active Sampling	**NO_2, SO_2, O_3 PM**	**Daily**	***Spectrophotometric, methods/Griess, Thorin, Gravimetric***
Automated Analyzers	**NO_x, SO_2, O_3, CO**	**Hourly**	**UV-monitor**

Transboundary Air Quality Monitoring

Study Area

EMEP station is located at the representative area, on the slope of Mount Aragats, the highest point in the country, in accordance with general guidelines of EMEP for monitoring background concentrations of air pollutants in Armenia. The station is in operation since September 2008.

Latitude ***40°23'04.0"N***
Longitude ***44 °15'38.1"E***
Altitude ***2080m***

Precipitation

Precipitation observations are conducted in two background stations for basic constitutes (at Amberd and Tsaghkadzor sites). In each sample around 36 indicators are determined (pH, conductivity, major anions and cations, metals).

Matrix	Parameters	Sampling	Sampling frequency	Analytical Methods
Air	SO_2, HNO_3	KOH-impregnated Whatman 40 filter 20÷25 m^3/day (Filterpack)	Daily	***Ion chromatography*** (Dionex 1000)
	NO_2,	NaI-impregnated glass sinters, 0.6 m^3/day	Daily	***Spectrophotometric, Griess method*** (Shimadzu, UV 1650)
	NH_3	Oxalic acid-impregnated Whatman 40 filter, 20÷25 m^3/day (Filterpack)	Daily	***Spectrophotometric, with Nessler's reagent*** (Shimadzu, UV 1650)
	O_3	UV-monitor	Hourly	***UV-absorption*** (Analyzer Model 400E)
Aerosols	CI^-, NO_3^-, SO_4^{2}	Teflon filter, Pall Zefluor 2 µm, 47 mm diameter, 20÷25 m^3/day (Filterpack)	Daily	***Ion chromatography*** (Dionex 1000)
	NH_4^+	Teflon filter, Pall Zefluor 2 µm, 47 mm diameter, 20÷25 m^3/day (Filterpack)	Daily	***Spectrophotometric, with Nessler's reagent*** (Shimadzu, UV 1650)
	Na^+, K^+, Mg^{2+}, Ca^{2+}	Teflon filter, Pall Zefluor 2 µm, 47 mm diameter, 20÷25 m^3/day (Filterpack)	Daily	***ICP-MS*** (Elan 9000)
Precipitation	Amount	Meteorological station, official gauge	Every event	***By volume***
	Na^+, K^+, Mg^{2+}, Ca^{2+}	Wet-only	Every event	***ICP-MS*** (Elan 9000)
	NH_4^+	Wet-only	Every event	***Spectrophotometric, with Nessler's reagent*** (Shimadzu, UV 1650)
	CI^-, NO_3^-, SO_4^{2}	Wet-only	Every event	***Ion chromatography*** (Dionex 1000)
	pH, conductivity	Wet-only	Every event	***pH- and conducto-meter***
Meteorology	Meteorology	Wind speed and Direction, Temperature, Relative Humidity, Pressure	Hourly	***Whether Transmission Equipment***

Quality Control and Assurance (QC/QA)

- Regular calibration of analytical methods and their verification by quality control charts.

- Precipitation data quality is checked by using ionic balance and comparing the values of measured and specific conductivity.

- Participation in inter-comparison studies conducted under the scope of European Monitoing and Evaluation Program (EMEP) and Global, Atmosphere Watch (GAW).

Quality Control and Assurance (QC/QA)

EMEP-33 inter-calibration results 2017

	Expected values, (mg/l)	Measured values, (mg/l)	Deviation from Expected Values, %	Expected values, (mg/l)	Measured values, (mg/l)	Deviation from Expected Values, %	Expected values, (mg/l)	Measured values, (mg/l)	Deviation from Expected Values, %	Expected values, (mg/l)	Measured values, (mg/l)	Deviation from Expected Values, %
	G1			G2			G3			G4		
Na	*0.527*	0.561	***6.5***	*0.355*	0.380	***7.0***	*0.893*	0.956	***7.1***	*0.713*	0.764	***7.2***
K^+	*0.294*	0.319	***8.5***	*0.198*	0.209	***5.6***	*0.501*	0,537	***7.2***	*0,399*	0,423	***6.0***
Mg^{2+}	0.153	0.162	***5,9***	0.09	0.098	***8.9***	0.205	0,217	***5,9***	0,206	0,217	***5,3***
Ca^{2+}	*0.191*	0.205	***7,3***	*0,116*	0,121	***4,3***	*0,254*	0,270	***6.3***	*0,252*	0,266	***5,6***
Cl^-	*0,337*	0,341	***1,2***	*0,231*	0,230	***-0.4***	*0,57*	0,574	***0,7***	*0,457*	0,459	***0,4***
NO_3^-_N	*0,544*	0,549	***0,9***	*0,363*	0,372	***2,5***	*0,*918	*0.921*	***0,3***	*0,938*	0,954	***1,7***
SO_4^{2-}_S	*1,342*	1,420	***5,8***	*0,876*	0,935	***6,7***	*2,108*	2,218	***5,2***	*2,231*	2,365	***6***
NH_4^+_N	*0,241*	0,146	***-39,4***	*0,161*	0,022	***-86.3***	*0,404*	0,334	***-17.3***	*0,537*	0,458	***-14.7***
pH	*4,283*	4,383	***0,1***	*4,431*	4,446	***0,015***	*4,035*	4,100	***0,065***	*3,999*	4,067	***0,068***
Cond	*34,44*	31,9	***-7,4***	*23,141*	22,9	***-1,3***	*56,924*	56,0	***-1,7***	*59,644*	57,2	***-4,1***

NH_4^+ between ± 10 and 20%

NH4+ more than ± 25%

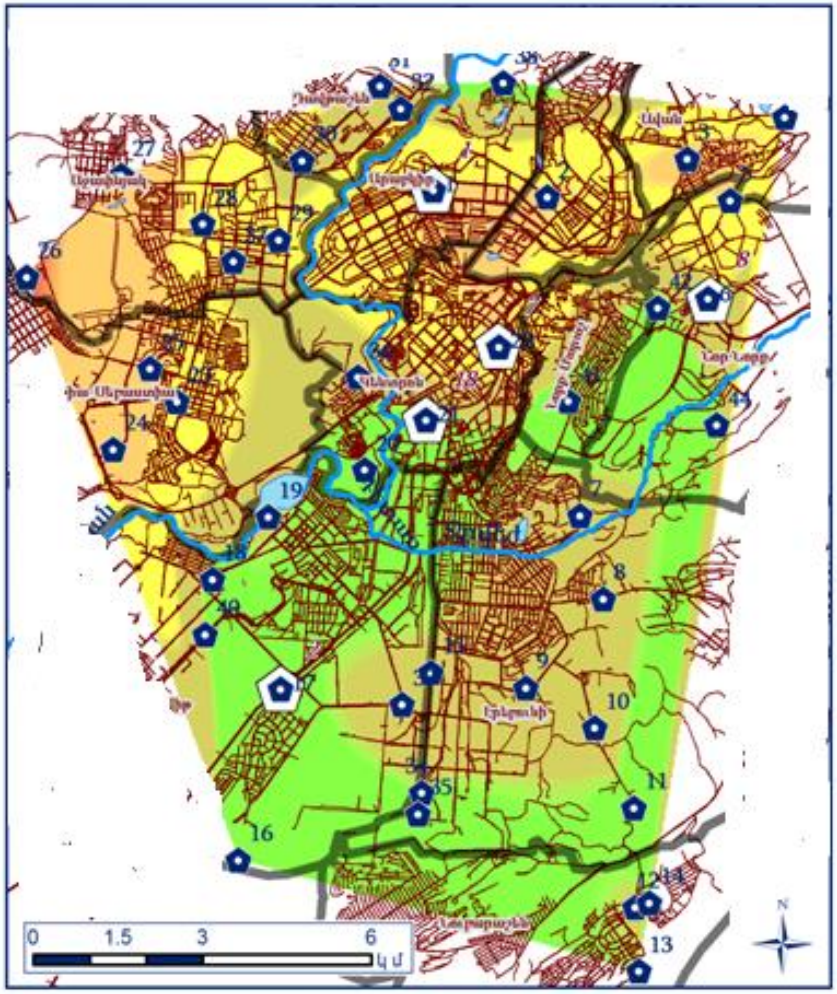
Data dissemination and availability

- *Ministry of Nature Protection (MNP) (http://www.mnp.am/)*
- *Environmental Impact Monitoring Center (EIMC) (http://www.armmonitoring.am/)*
- *National Statistical Service of the Republic of Armenia (http://armstat.am/en/) or (http://armstatbank.am/)*

Data dissemination and availability

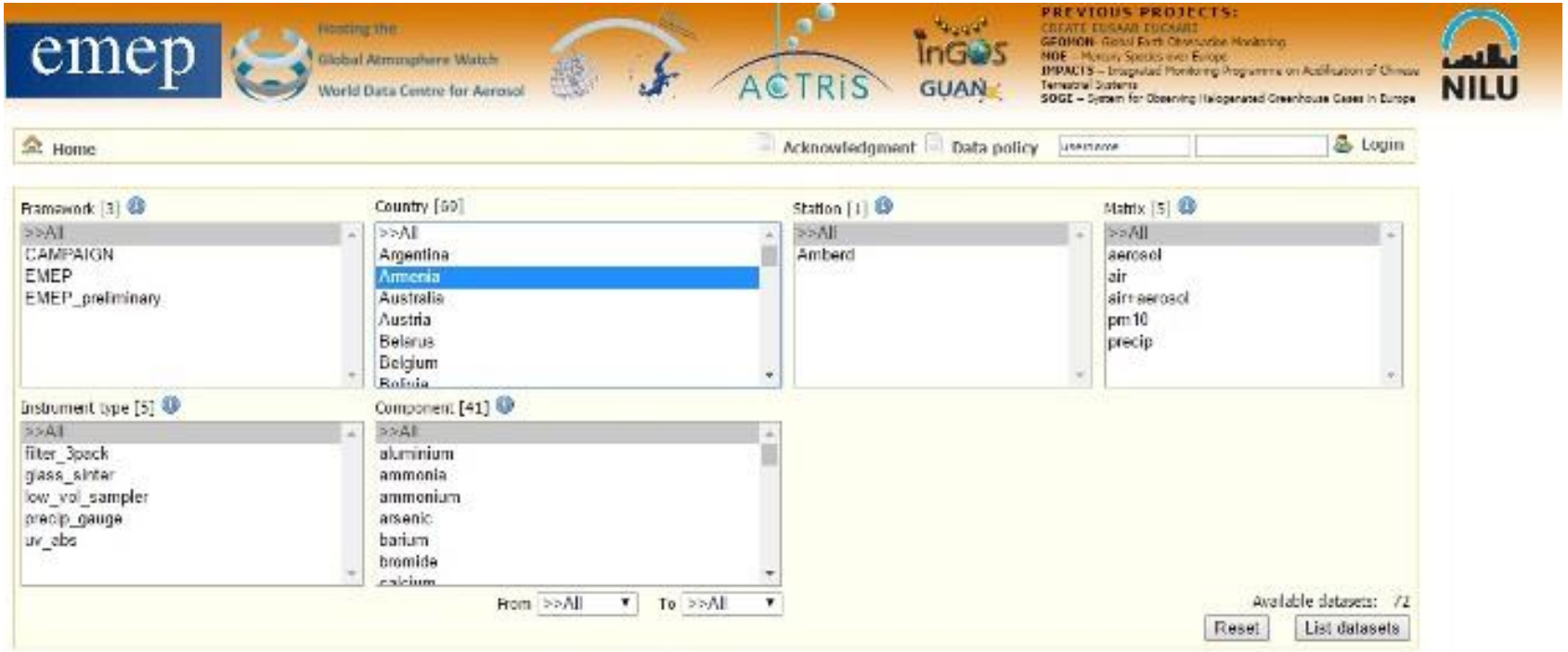
Information uploaded of both (MNP and EMIC) web sites are in the format of quarterly and annual reports in Armenian language prepared by the EMIC. In the available reports, atmospheric and precipitation monitoring results are illustrated by **graphical comparisons** with the established standards and **quality visualization** by **tables** and **maps.**

However, nowadays there is no online monitoring database available for data users in the aforementioned webs and monitoring data can only be provided upon user's written request.

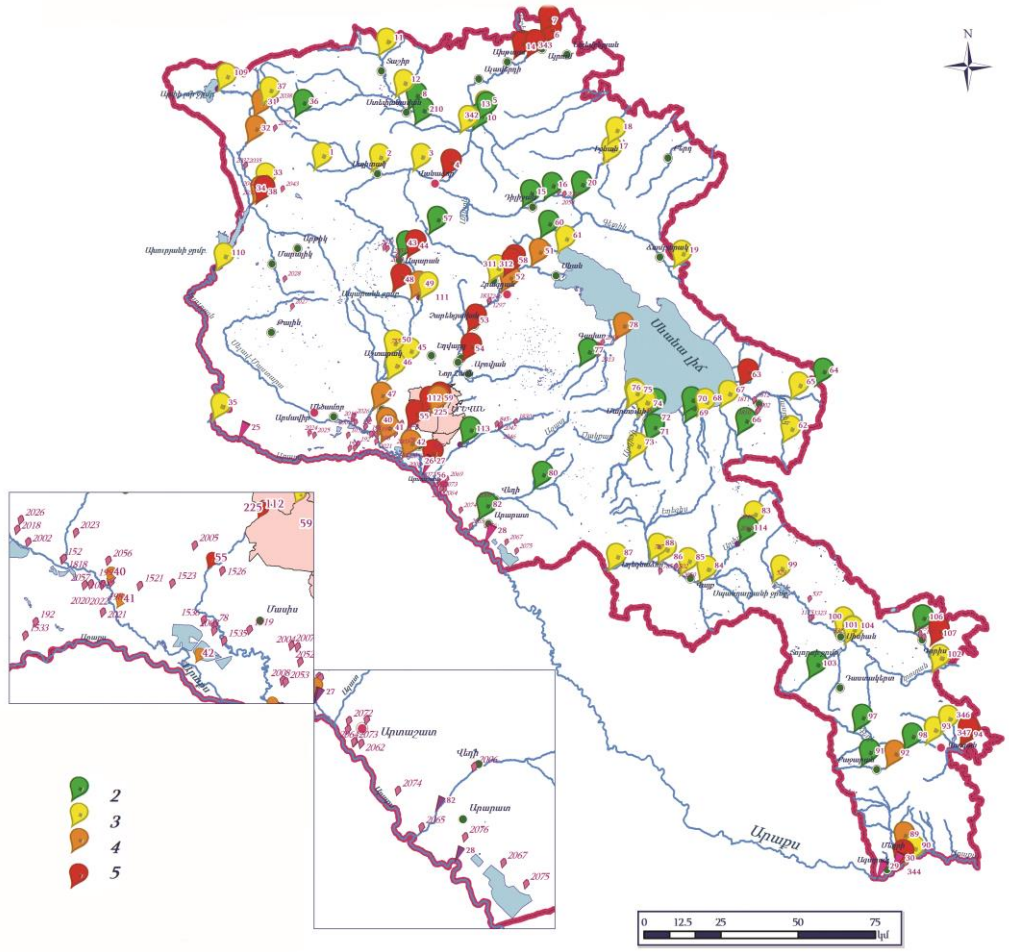


Data dissemination and availability

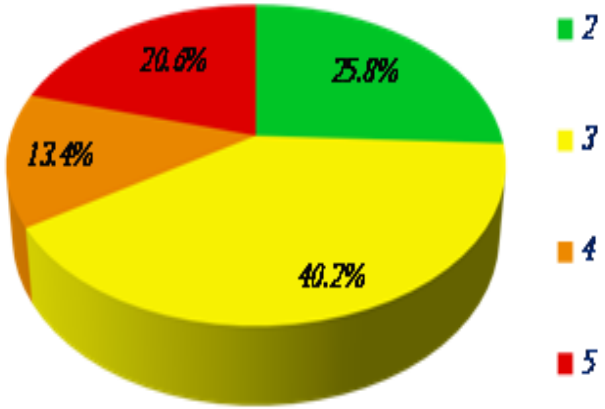
- EMEP data received from Amberd station are reported to the Norwegian Institutes for Air Research (NILU). The data are available through the electronic data base (http://ebas.nilu.no/)



Surface Water Quality 2018



Rivers' quality 2018



2	good
3	moderate
4	poor
5	bad

Air Polution Indx 2018

Current Issues

- Modernize existing air quality monitoring system in accordance to international requirements
- To provide real-time data to public
- Development of effective monitoring and management system of air quality in the Republic of Armenia
- Assessment and monitoring of air pollution on rivers and lakes

THANK YOU FOR YOUR ATTENTION !!