

Introduction to Acid Deposition Monitoring (4) Inland Aquatic Environment (IAE)

ADORC

Monitoring Sites for IAE

Lakes, Springs, Headwaters and Rivers

- Lakes are better
- If there are no appropriate lakes, springs and headwaters, rivers should be selected in this order.

Collection of Information on Sites

The monitoring sites (lakes) should be selected from the inventory of lakes
(e.g. water area larger than 1 h)

The information of the selected sites and their watersheds should be collected as much as possible

Siting Criteria...

Lakes

- Harmonic lakes are recommended
- Average Depth of 10m or less
- Water retention time of 1 yr. or less
- Water area of 1 hector or more
- Low alkalinity or low electric conductivity (EC)
- Minimal anthropogenic water pollution

Harmonic lakes are recommended

1. Fundamentally eutrophic and hypereutrophic lakes should not be selected. Oligotrophic or extreme oligotrophic lakes are desirable for a monitoring site, but if difficult, mesotrophic lakes could also be selected.
2. If there are no such lakes, slight eutrophic lakes may be selected.
3. Lakes such as an acidic lakes around a volcano, iron-based eutrophic lakes, alkaline-based eutrophic lakes should not be selected.

Water depth of 10 m or less

1. Average water depth of 10 m or less is a guiding indicator to find a lake with water circulation of once or twice in a year. If this condition is met, deeper water depth could be allowed.
2. Average water depth of artificial lakes frequently exceeds 10 m. In such cases, retention time, water area, vertical water mixing, rather than average water depth should be considered in selecting a site.

Retention time of 1 year or less

1. Retention time should be considered as an indicator that must not be strictly complied with, because it is very difficult to precisely estimate the retention time.
2. It should be interpreted that retention time could be equal or less than a year, not around a year.
3. It should be noted that retention time is quite important to consider modeling. It should be carefully examined when detailed impact survey is undertaken, even though it may not be so important just for long-term monitoring.

Water area of 1 hector or more

1. It is a guiding indicator since it is difficult to obtain generic features, if the lake is too small.
2. It is not recommended to select complex shape of lakes, or too big lakes, from the viewpoint of representativeness.
3. In general, water area could be several dozens of hectors, and not more than 100 hectors.

Low alkalinity (0.05 meq/L) or low EC

1. In principle, alkalinity is a better indicator than EC.
2. Since it is rather difficult in East Asia to find lakes with alkalinity of less than 0.05 meq/L, it should be considered that lakes with alkalinity of approximately less than 0.2 meq/L should be considered acceptable.
3. If there are no data on alkalinity, EC could be used as a supplementary indicator. For the time being, acceptable EC values could be considered as equal or less than 10mS/m.

Minimal anthropogenic water pollution

1. It should be comprehensively judged with various indicators, such as population in the catchment area, effluent from industries, household waste water, agricultural and pasturage activities.
2. Water pollution indicators such as chemical oxygen demand (COD) could also factors to be considered. Information on living creatures such as aquatic plants may also be taken into account.
3. It is desirable to select as clean lakes as possible. Appropriate judgment should be made, taking into account the situation of the area.

Siting Criteria...

Springs, headwaters & Rivers

- With minimum pollution
- Higher priority on Springs than rivers
- Upper stream point of a river or first order streams
- Keep monitoring at same one point

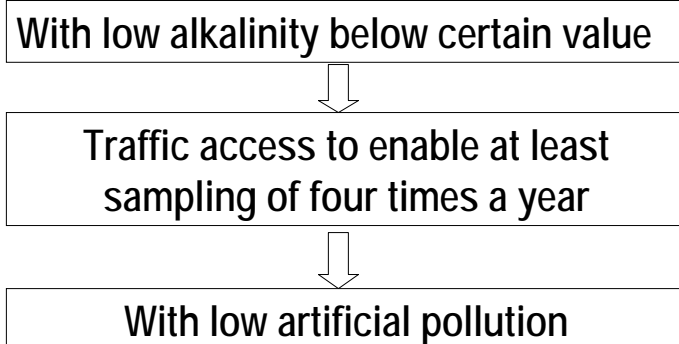
Higher priority on springs than rivers

Springs and headwaters (upper reach of a stream/river) should have higher priority on site selection than rivers, to minimize the influence of anthropogenic pollution.

Upper streams of a river or first order streams

In the case of rivers, a monitoring site should be selected as upper stream as possible, and should not be selected at a river with branch stream on upper side.

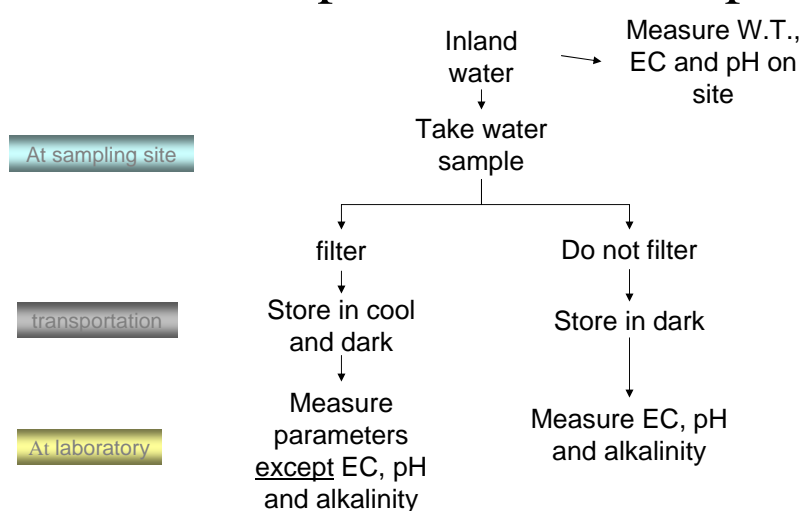
Order for siting selection



Mandatory parameters

Frequency	Mandatory parameters
4times/year	water temperature(W.T.), pH, electric conductivity (EC) , Alkalinity, SO_4^{2-} , NO_3^- , Cl^- , NH_4^+ , Na^+ , K^+ , Ca^{2+} , Mg^{2+}
Once/year	transparency, water color, DOC(if impossible, COD), NO_2^- , PO_4^{3-}

Treatment procedure of sample



As shown Fig.6.1, Page 151

Data Report 2002 on Inland Aquatic Environment

Network Center for EANET

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Outline of Inland Aquatic Environment Monitoring in 2002

Country	Location	Name of Lake	Interval
China	Chongqing	Jiayunshan Lake	4times/yr.
	Xi'an	Jiwozi River	3times/yr.
	Xiamen	Xiaoping Dam	4times/yr.
	Zhuhai	Zhuxiandong Reservoir	4times/yr.
Indonesia	Bandung	Petenggang Lake	3times/yr.
Japan	Gifu prefecture	Lake Ijira	4times/yr.
	Shimane prefecture	Lake Banryu	4times/yr.
Mongolia	Terelj	Terelj River	5times/yr.
Philippines	San Pablo City, Laguna	Lake Mojacap	5times/yr.
Russia	Listvyanka	River Krestvoka	12times/yr.
Thailand	Kanchanaburi Province	Vachiralongorn Dam	4times/yr.
Vietnam	Kunming Province	Hoa Binh Reservoir	4times/yr.

As shown Table 6.1, Page 150

Results

- R1 and R2 of the data at Xiaoping dam, Jiwozi river and Zhuxiandong reservoir(China) , Terelj river(Mongolia) and Vachiralongorn dam(Thailand) seemed to be over the allowable range. However it was not able to specify the main reasons.
- Alkalinities of Mojicap Lake in Philippines and Hoa Binh Reservoir in Vietnam seemed to be slightly high.

Evaluation

- All participating countries are requested to measure all “mandatory parameters” completely.
- All participating countries will submit the property of lakes or rivers to NC.
- Recommendation of duplicate or triplicate sampling
- Recommendation of site selection of harmonic lake, have low alkalinity(less than 0.2 meq/L) and low EC(less than 10 mS/m)