

KLEON

Korean Lake Ecological Observatory Network

- Data viewer and management -

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Content

- Motivation
- Goal & Organization
- Installed sensors
- Data management of KLEON
- Expected Effect
- Pictures



KISTI

Korea
Institute of
Science and
Technology
Information

www.kisti.re.kr



Major Research

SuperComputing

❖ Advancement of Supercomputing Infrastructure

: Strategic establishment of state-of-the art CI environment by using diversified information resources in the existing systems including supercomputers

Performance

- Creating a World Class Cyber-infrastructure
 - Purchasing the 4th supercomputer (360.6TFlops), to be one of world top 10 supercomputers
 - Establishing the supercomputing utilization system in Korea (SNU, BNU, and KIST)
- Developing National Science & Technology Research Network
 - Linking with 14 networks in Korea and 100 networks in 70 other countries
 - Managing domestic and international high-performance research networks for S&T
- Developing of E-science Research Environment
 - Establishing the cyber research environment beyond time & space
 - Developing the research environment for e-Science, high energy physics group, to be able to analyze Switzerland CERN data and U.S. Fermi data
- Supporting SMEs' technology development with Supercomputers
 - Creating and managing effective technology support systems tailed to SMEs
- Providing 24 hours Information Security Services for 38 domestic research institutes
 - Establishing web-based security monitoring systems



Motivation

1) Limnologists and Ecologists need

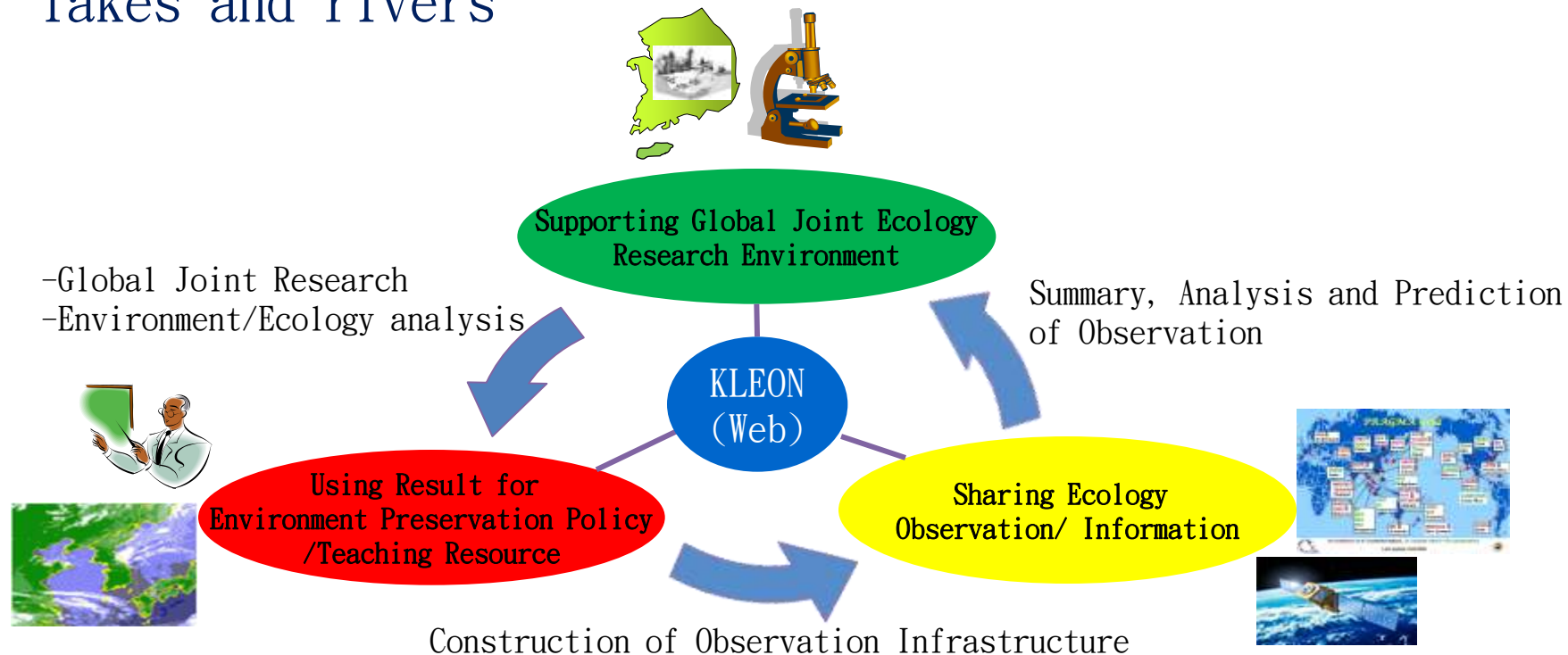
- the data acquisition to understand the lake ecology such as high accuracy sensors
- the data manager to handle the various kinds of lake ecological observation
- the data analysis & prediction tools to estimate the ecological health assessment in lakes and reservoirs
- the international community to discuss their research

2) The goal of KLEON is to support

- the lake ecological research environment to share the observations and to discuss their opinion with international cooperation
- the ecosystem education to spread the ecological information
- the environment preservation policy such as the green development and the pollution prevention

Goal of KLEON

- Establishment of ecological observatory network in lakes and rivers



Construction of KLEON (Korean Lake/Reservoir Ecological Observation Network)

Data Standardization

Data Convergence

Visualization

Simulation Model

KISTI Cyber Infrastructure

Computing Resource

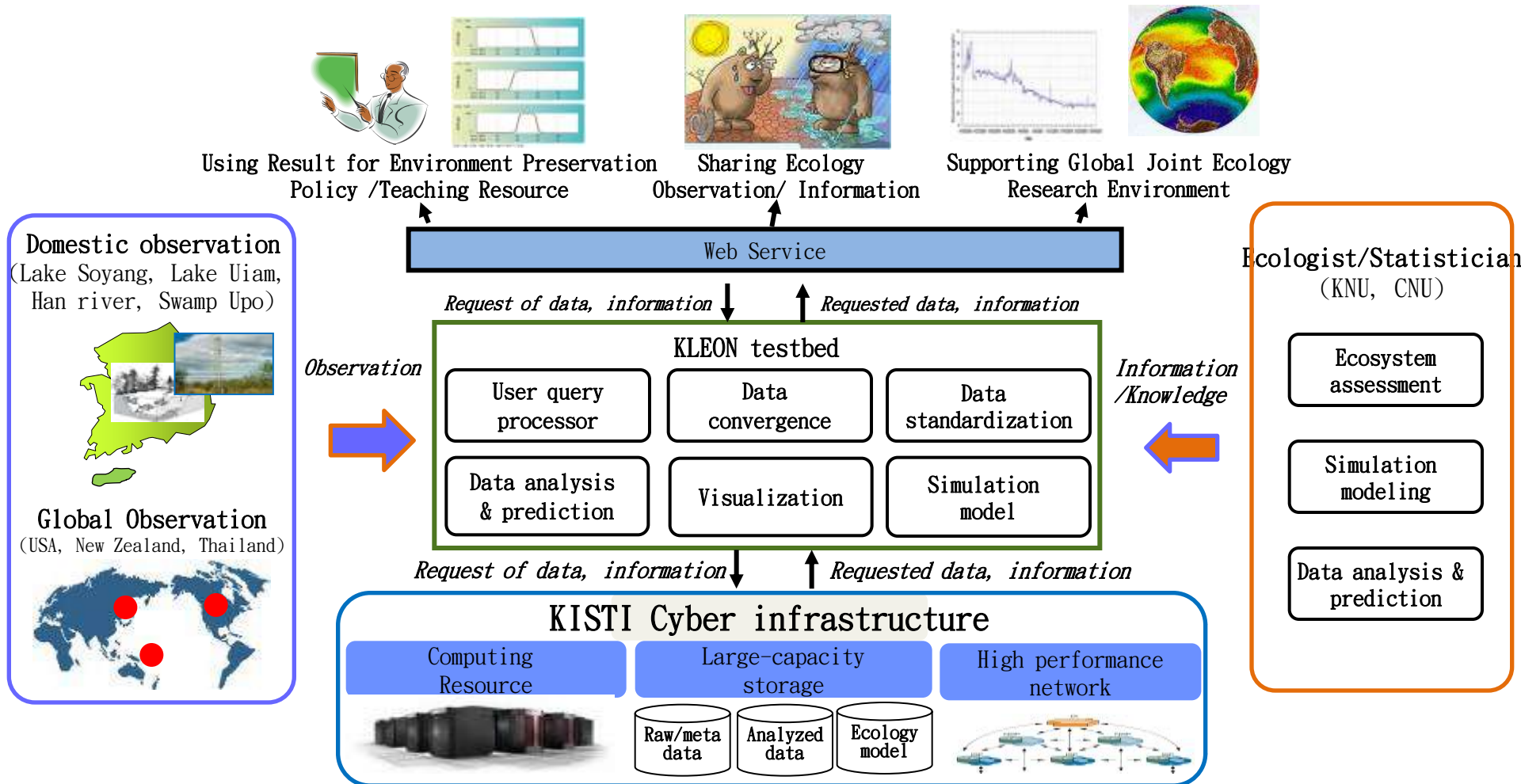
High performance Network

large-capacity Storage



Organization of KLEON

- Collection of Global Lake/Reservoir Observation Data
- Construction of Global Joint Research Network
 - With Global e-Science Gateway



Goal for 2010

1) KISTI

- IT support
 - Ecological sampling data management
 - Sensor information management with SensorML
 - Google earth based user interface
- International cooperation (GLEON)

2) KNU

- Construction of Sensor Network (Data collection)
- Lake ecosystem health assessment with water quality models
- Building Web service
- International cooperation (GLEON)

Domestic Observation

Table 1. Sensor type, Data collection method, and Analysis

Target Place	Sensor type	Data collection method	Analysis
① Lake Soyang	Troll multiprobe (Water temperature, DO, Electrical Conductivity)	Real time data transmission RF-modem	Eutrophication Evaluation
② Lake Euiam	combination sensor (Water temperature, DO, Electrical Conductivity, Turbidity)	Real time data transmission RF-modem	Eutrophication Evaluation, Turbid water evaluation
③ Anyang River	Troll multiprobe (Water temperature, DO, pH, Electrical Conductivity)	Real time data transmission CDMA modem	Analysis of causes of Fish Kill by Oxygen deficit
④ Swamp Upo	Hydrolab (Water temperature, DO, Electrical Conductivity)	Regular download	Eutrophication Evaluation
⑤ Soyang River	Hydrolab (Water temperature, Electrical Conductivity, Turbidity)	Regular download	Turbid water evaluation
⑥ Han River	Hydrolab (Water temperature, Electrical Conductivity)	Regular download	Long term Ecological Research, Climate Change, Eutrophication Evaluation,
⑦ Gapyeong River	Hydrolab (Water temperature, Electrical Conductivity)	Regular download	Long term Ecological Research, Climate Change

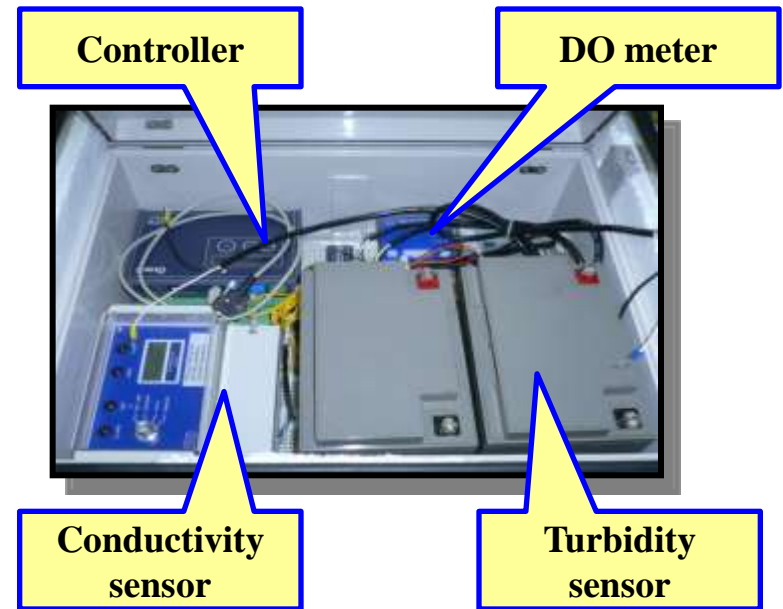
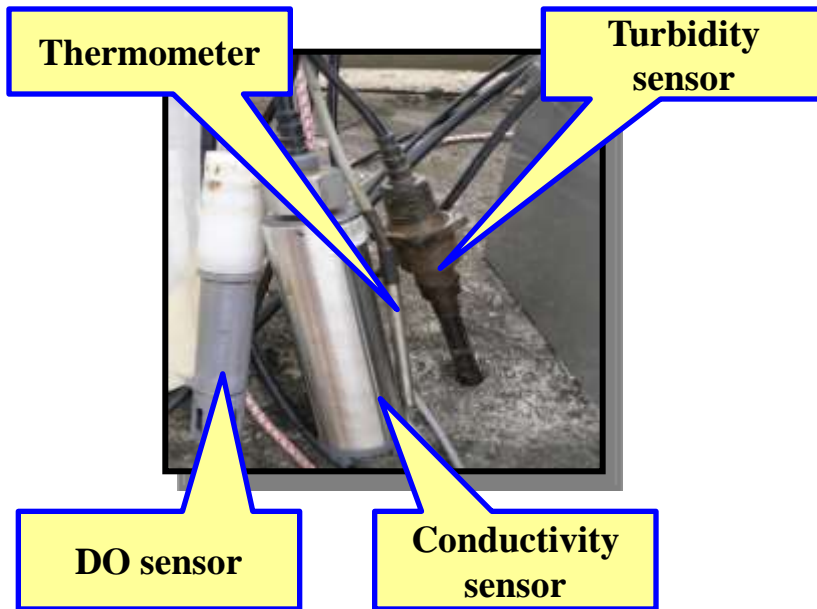
Installed sensors



① Buoy in Lake Soyang



② Sensors in Lake Euam



Utilized sensors : Temperature (Air, Water), Thermometer, Dissolved Oxygen (YSI 55), Turbidity, Conductivity (miniCHEM), Data logger,

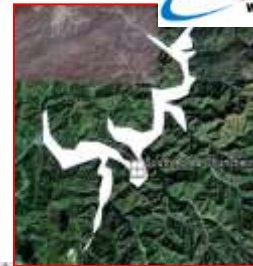
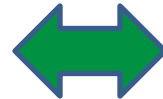
Sensor information management

< The relation information of the sensor >

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      <swe:DataRecord>
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            <swe:value>128</swe:value>
          </swe:Quantity>
        </swe:field>
        <swe:field name="diameter">
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          </swe:Quantity>
        </swe:field>
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            <swe:uom xlink:href="urn:ogc:unit:mm"/>
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          </swe:Quantity>
        </swe:field>
      </swe:DataRecord>
    </swe:field>
  </swe:DataRecord>
</characteristics>
```

Sensor ML

(Open Geospatial Consortium)



**Description
of sensor**

Example

Project

KLEON

institute

KISTI, KNU

place

Lake Soyang

object

Buoy 1

sensor

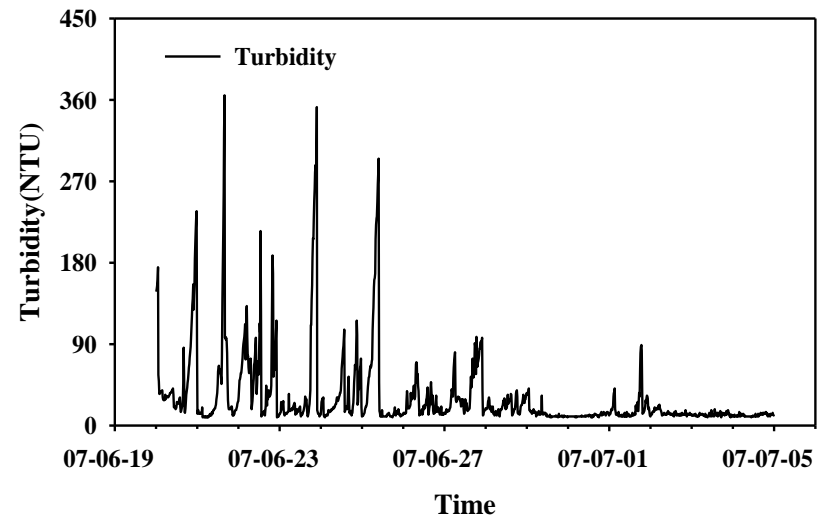
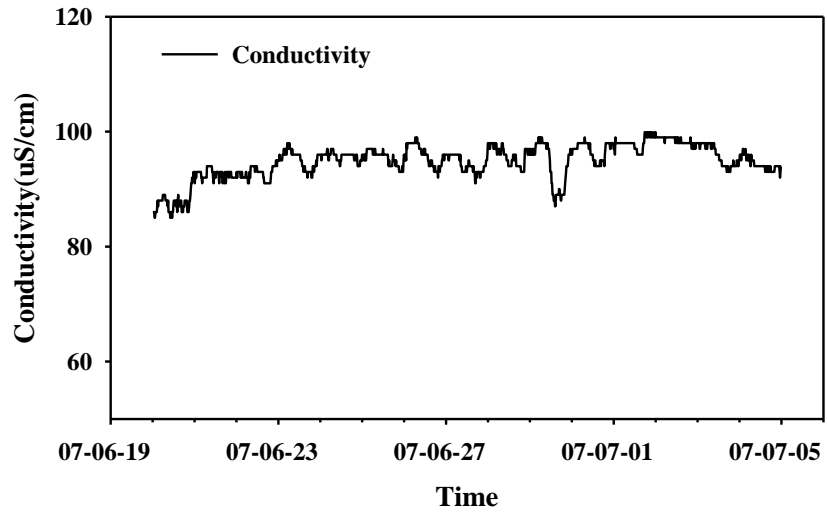
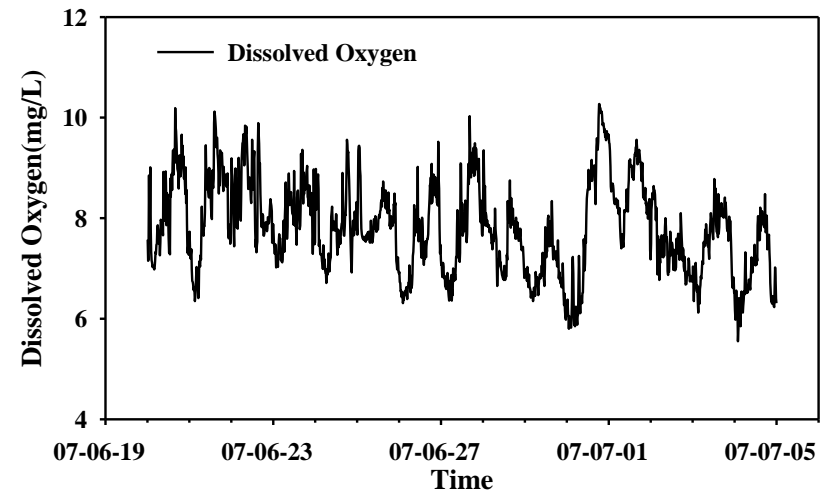
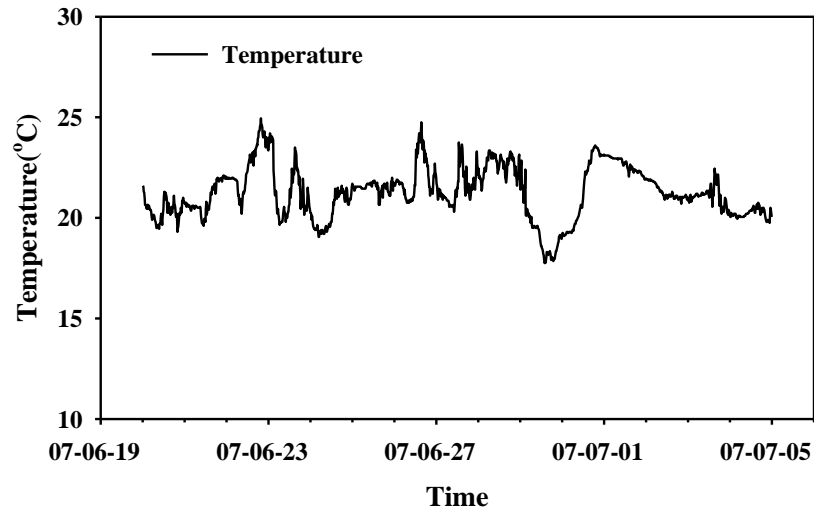
Temperature, DO, ...

data

14, 15, 15, ...

Measurement, time, error, ...

Observation



Data management



Sensor Model Language

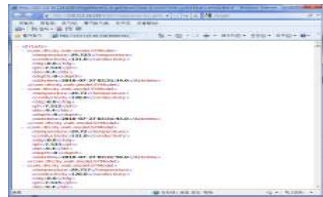
Sensor Info. Management



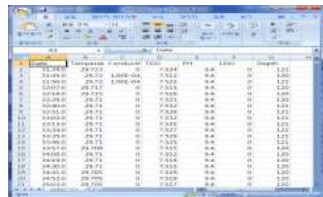
Source
(Lake, River, Wet land)



(a) The graph of sensor observation



(b) XML



(c) CSV file

Sensor Info.



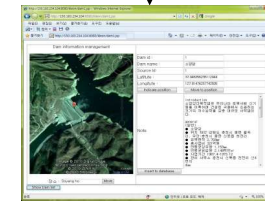
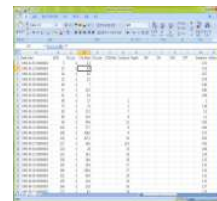
Observation Site



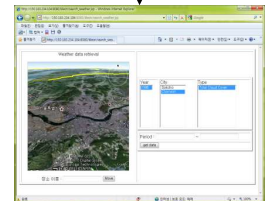
Plankton



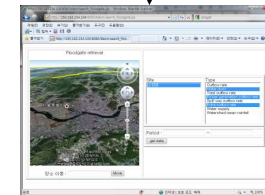
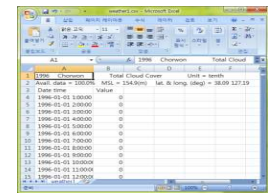
Water Quality



Dam



Weather



Floodgate



< Sensor Data Viewer >

< Sampling Data Viewer >

Data management - Lake

Lake Soyang

Move to Soyang ho

Lake list

Lake position

Move to Selected lake

Insert to database

Edit

Delete

<Lake Info. Management>

- **Function : management of lake information**
 - Lake selection for lake ecosystem health assessment
 - attributes :
 - Name, position, extent, maximum depth, mean depth, maximum length, etc.

Data management - Site

Move to

Site position

Move to Selected site

Insert to database

Edit

Delete

Site list

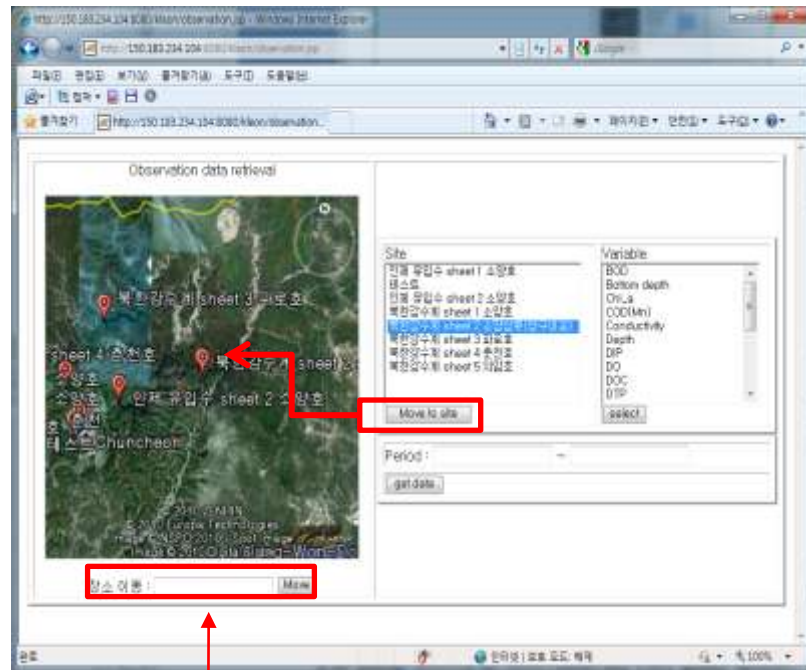
Lake Soyang

Site Information Management

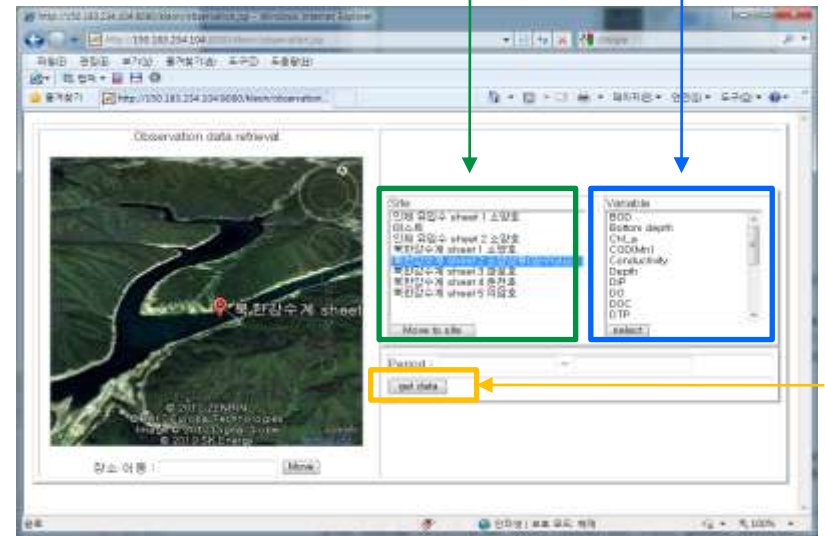
Id	Site name	Source id	Latitude	Longitude	Project id	Bottom depth	Country	Observation type	Period from	Period to	Note
1	Sampling 1	1	37.9433485646227	127.821647930474	1	300	South Korea	Sensor	2010-05-06	2010-10-06	현재 유입수 sheet 1 소양호
2	Sensor 1	2	37.875462518153	127.692719695206	1	200	South Korea	Sampling	2010-05-06	2010-10-06	대소트
3	Sampling 1	1	37.9433485646227	127.821647930474	1	300	South Korea	Sensor	2010-05-06	2010-10-06	현재 유입수 sheet 2 소양호

- Function : management of site information
 - Site selection for getting water to analyze water quality
 - Site types: sampling and buoy (sensors)
 - attributes :
 - Name, position, Project id, bottom depth, period, note, etc.

Data viewer - Sampling data



Move to



Search data

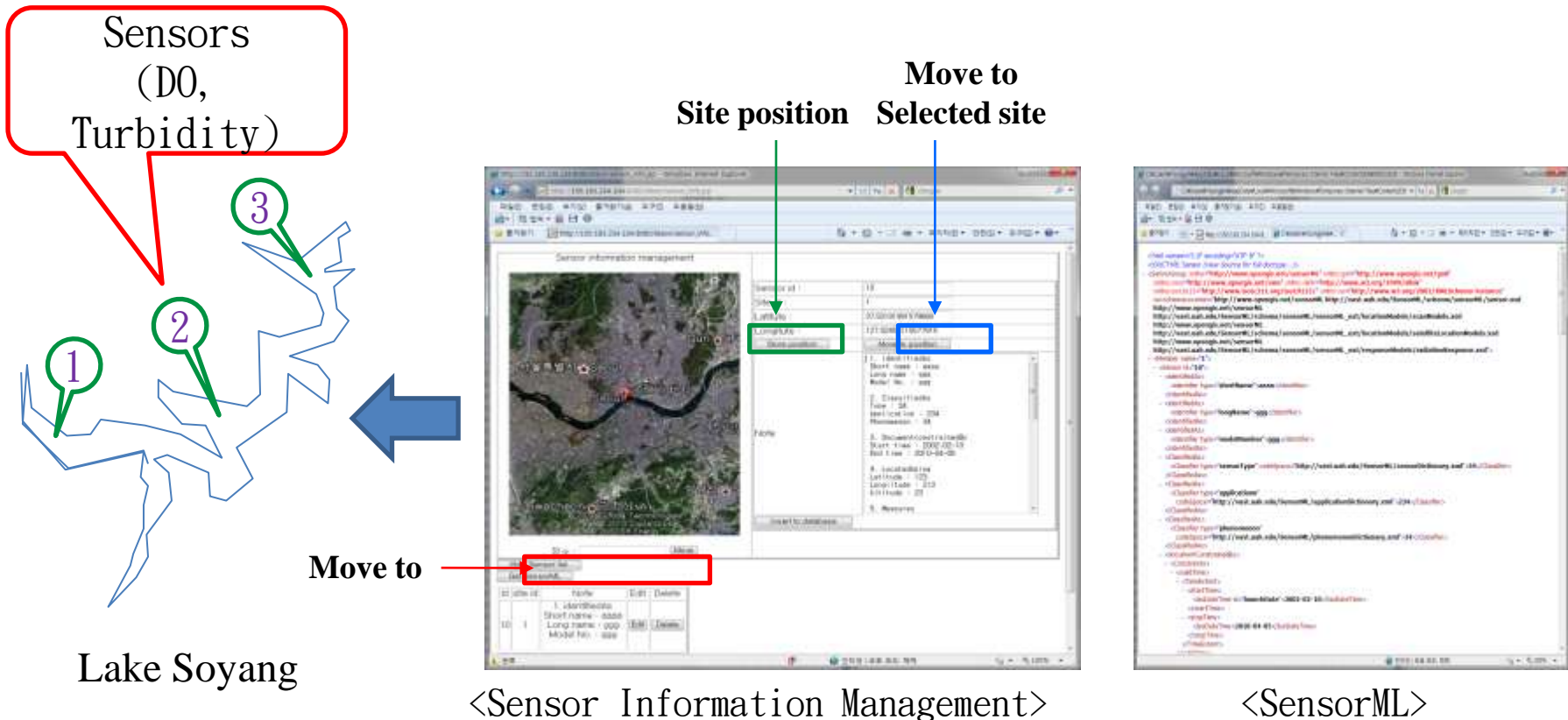


Graph for observation

CSV

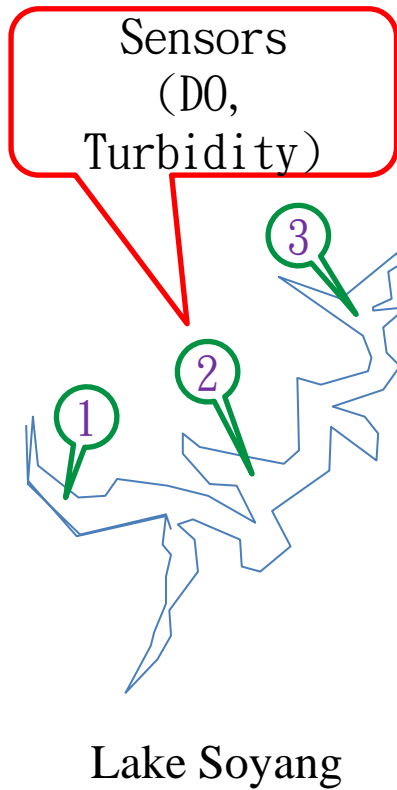
- Function : search and download sampling data
 - Download sampling data (CSV file) from the selected site
 - 34 types of observations (DO, BOD, COD, Turbidity, Conductivity, etc.)
 - Graph for observation

Data management – Sensor

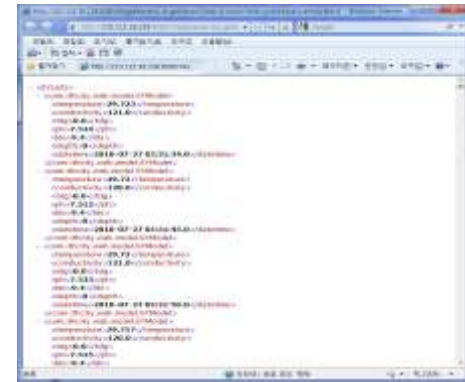


- Function : management of sensor information
 - Sensor selection for getting sensor data
 - Download sensorML (Sensor Model Language)
 - attributes :
 - Model no. name, sampling interval, error rate, etc.

Data viewer – Sensor data



(a) The graph of Sensor observation



(b) XML

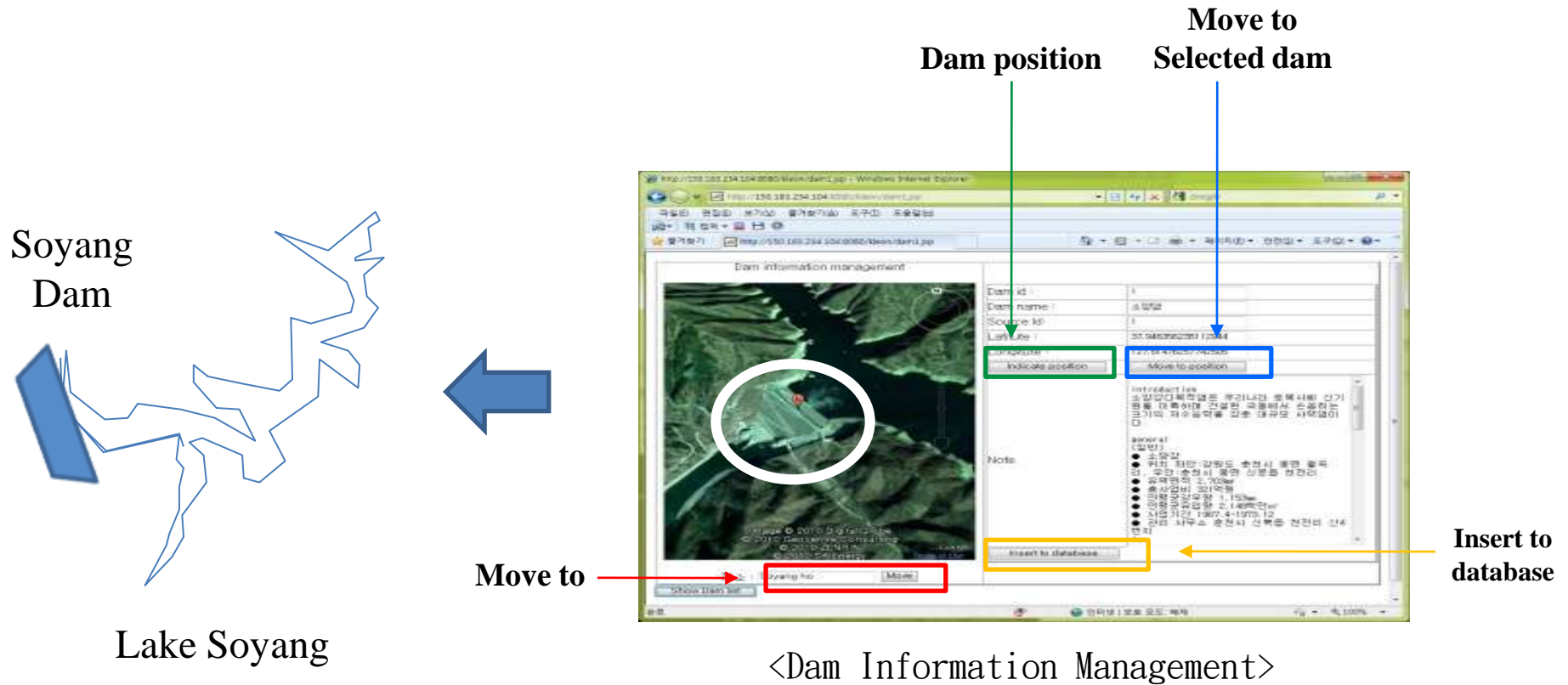
Date	Time	Location	Sensor Data
2018-07-27	09:00	1	1.20
2018-07-27	09:10	1	1.20
2018-07-27	09:20	1	1.20
2018-07-27	09:30	1	1.20
2018-07-27	09:40	1	1.20
2018-07-27	09:50	1	1.20
2018-07-27	10:00	1	1.20
2018-07-27	10:10	1	1.20
2018-07-27	10:20	1	1.20
2018-07-27	10:30	1	1.20
2018-07-27	10:40	1	1.20
2018-07-27	10:50	1	1.20
2018-07-27	11:00	1	1.20
2018-07-27	11:10	1	1.20
2018-07-27	11:20	1	1.20
2018-07-27	11:30	1	1.20
2018-07-27	11:40	1	1.20
2018-07-27	11:50	1	1.20
2018-07-27	12:00	1	1.20
2018-07-27	12:10	1	1.20
2018-07-27	12:20	1	1.20
2018-07-27	12:30	1	1.20
2018-07-27	12:40	1	1.20
2018-07-27	12:50	1	1.20
2018-07-27	13:00	1	1.20
2018-07-27	13:10	1	1.20
2018-07-27	13:20	1	1.20
2018-07-27	13:30	1	1.20
2018-07-27	13:40	1	1.20
2018-07-27	13:50	1	1.20
2018-07-27	14:00	1	1.20
2018-07-27	14:10	1	1.20
2018-07-27	14:20	1	1.20
2018-07-27	14:30	1	1.20
2018-07-27	14:40	1	1.20
2018-07-27	14:50	1	1.20
2018-07-27	15:00	1	1.20
2018-07-27	15:10	1	1.20
2018-07-27	15:20	1	1.20
2018-07-27	15:30	1	1.20
2018-07-27	15:40	1	1.20
2018-07-27	15:50	1	1.20
2018-07-27	16:00	1	1.20
2018-07-27	16:10	1	1.20
2018-07-27	16:20	1	1.20
2018-07-27	16:30	1	1.20
2018-07-27	16:40	1	1.20
2018-07-27	16:50	1	1.20
2018-07-27	17:00	1	1.20
2018-07-27	17:10	1	1.20
2018-07-27	17:20	1	1.20
2018-07-27	17:30	1	1.20
2018-07-27	17:40	1	1.20
2018-07-27	17:50	1	1.20
2018-07-27	18:00	1	1.20
2018-07-27	18:10	1	1.20
2018-07-27	18:20	1	1.20
2018-07-27	18:30	1	1.20
2018-07-27	18:40	1	1.20
2018-07-27	18:50	1	1.20
2018-07-27	19:00	1	1.20
2018-07-27	19:10	1	1.20
2018-07-27	19:20	1	1.20
2018-07-27	19:30	1	1.20
2018-07-27	19:40	1	1.20
2018-07-27	19:50	1	1.20
2018-07-27	20:00	1	1.20
2018-07-27	20:10	1	1.20
2018-07-27	20:20	1	1.20
2018-07-27	20:30	1	1.20
2018-07-27	20:40	1	1.20
2018-07-27	20:50	1	1.20
2018-07-27	21:00	1	1.20
2018-07-27	21:10	1	1.20
2018-07-27	21:20	1	1.20
2018-07-27	21:30	1	1.20
2018-07-27	21:40	1	1.20
2018-07-27	21:50	1	1.20
2018-07-27	22:00	1	1.20
2018-07-27	22:10	1	1.20
2018-07-27	22:20	1	1.20
2018-07-27	22:30	1	1.20
2018-07-27	22:40	1	1.20
2018-07-27	22:50	1	1.20
2018-07-27	23:00	1	1.20
2018-07-27	23:10	1	1.20
2018-07-27	23:20	1	1.20
2018-07-27	23:30	1	1.20
2018-07-27	23:40	1	1.20
2018-07-27	23:50	1	1.20
2018-07-27	00:00	1	1.20

(c) CSV file

<Sensor data viewer>

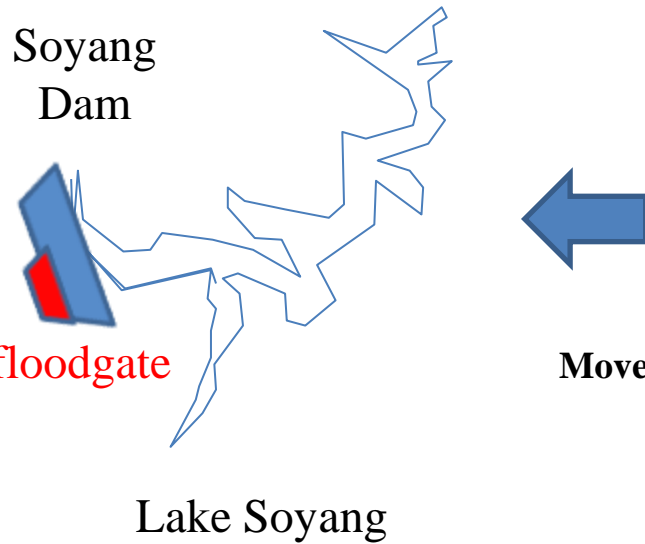
- Function : search and download sensor data
 - Download sensor data (CSV file) from the selected site (buoy)
 - XML format to describe the observations
 - Graph for observation

Data management - Dam



- **Function : management of dam information**
 - Dam selection for getting floodgate data
 - attributes :
 - Name, position, extent , spill way, tailrace, power plant, etc.

Data management - Floodgate



Dam list

Variables per floodgate

Search data

Move to

Floodgate retrieval

Site

Type

Period

get data

장소 이름

Move

Outflow rate

Total outflow rate

Spill way outflow rate

Water supply

Watershed mean rainfall

Search data

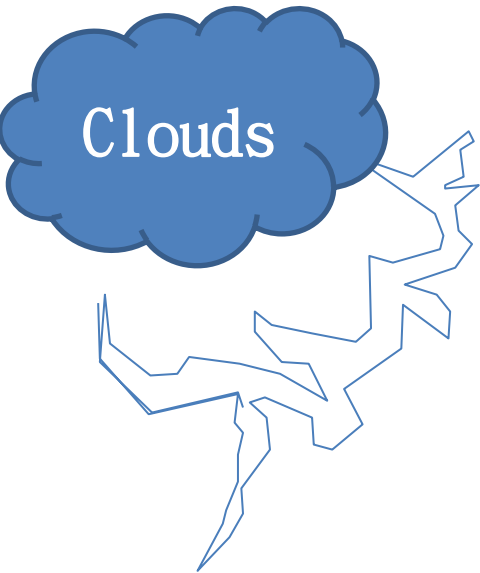
< Floodgate data download >

A screenshot of a CSV file showing floodgate data. The file contains multiple columns of data, including dates, times, and numerical values representing various floodgate attributes.

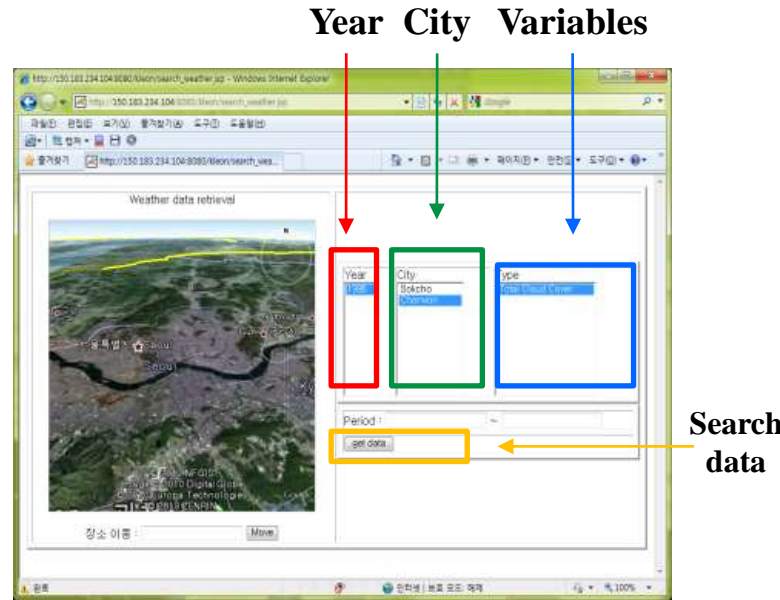
CSV

- Function : search and download floodgate data
 - Download floodgate data (CSV file) from the selected dam
 - Attributes : water level, inflow rate, power generation outflow rate, spill way outflow rate

Data management – Weather



Lake Soyang



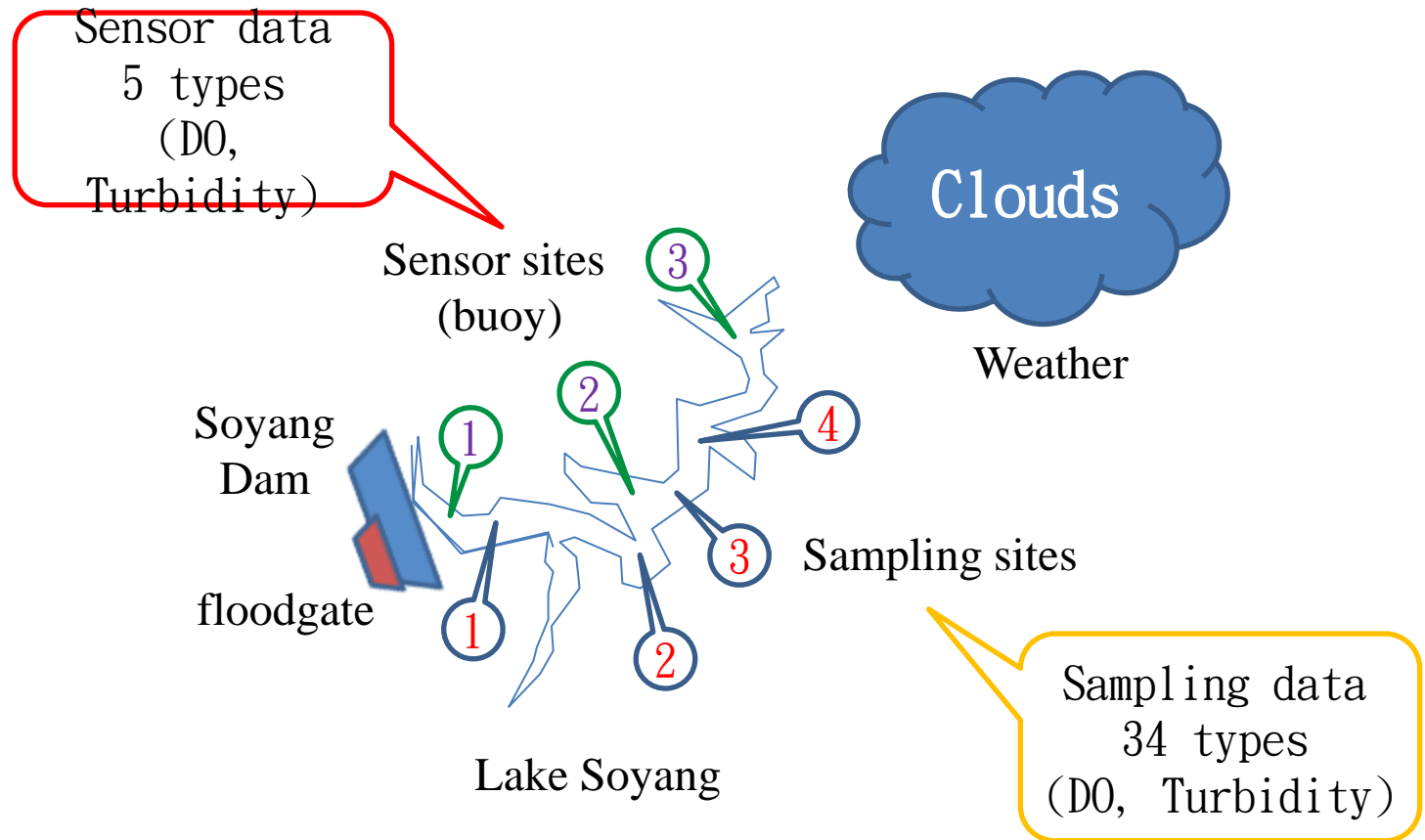
< Weather Data Search >

1996 Chorwon Total Cloud		Total Cloud Cover	Unit = tenth
1	1996 Chorwon		
2	Avail. data = 100.0%	MSL = 154.9(m)	lat. & long. (deg) = 38.09 127.19
3	Date time	Value	
4	1996-01-01 1:00:00	0	
5	1996-01-01 2:00:00	0	
6	1996-01-01 3:00:00	0	
7	1996-01-01 4:00:00	0	
8	1996-01-01 5:00:00	0	
9	1996-01-01 6:00:00	0	
10	1996-01-01 7:00:00	0	
11	1996-01-01 8:00:00	0	
12	1996-01-01 9:00:00	0	
13	1996-01-01 10:00:00	0	
14	1996-01-01 11:00:00	0	
15	1996-01-01 12:00:00	0	

CSV file

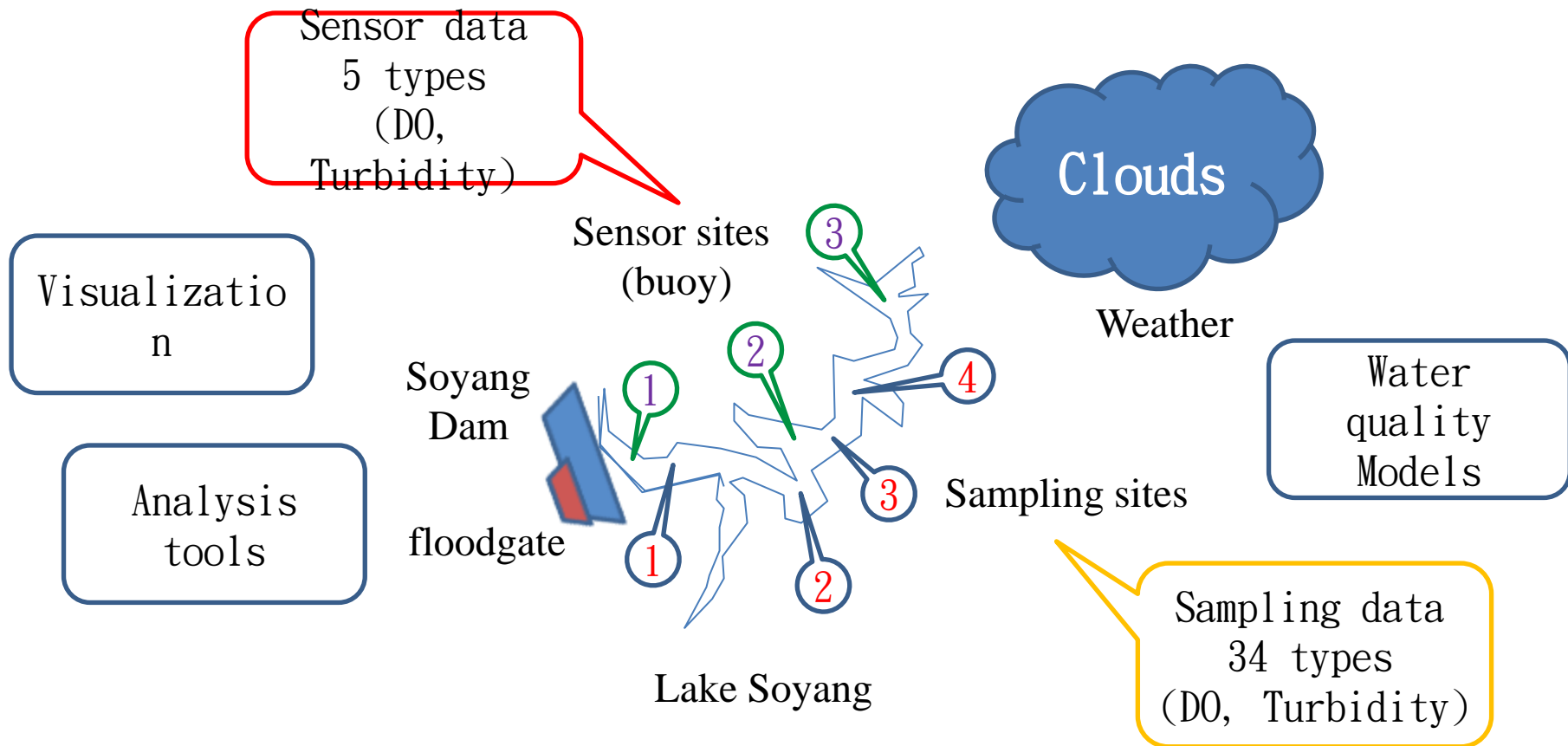
- **Function : search and download weather data**
 - Download floodgate data (CSV file) from the selected city
 - Attributes : total cloud cover, solar radiation, air temperature, dew point temperature, Wind speed and direction

Data management – 2010



- **Data management:**
 - Observation : Water quality (sampling and sensor data)
 - Observatory : dam, floodgate, weather, and sensors (sensorML)

Data management – 2011



- **Data management:**
 - Observation : Water quality (sampling and sensor data)
 - Observatory : dam, floodgate, weather, and sensors (sensorML)
 - Analysis tools : improvement of the accuracy of water quality model
 - Visualization : representation of pollution

7. Expected Effect

Community	National Policy
<ul style="list-style-type: none">▪ Global Cooperation & IT support<ul style="list-style-type: none">• Korea : KEON• Global: GLEON	<ul style="list-style-type: none">▪ Environment preservation policy▪ Green Development▪ Pollution prevention
Science	IT
<ul style="list-style-type: none">▪ Environment/Ecology Research development (data accumulation & modeling)▪ Improving the accuracy of water quality model▪ Teaching Resource	<ul style="list-style-type: none">▪ Real time data management for Ecological Research▪ Data standardization▪ Data integration with Climate data▪ Visualization & Simulation

Pictures

Buoy in Lake Soyang

- February 22, 2010



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creating the value for customers”

Thank you!

