KLEON

Korean Lake Ecological Observatory Network

- Data viewer and management -

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- Goal & Organization
- Installed sensors
- Data management of KLEON
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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&
- 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

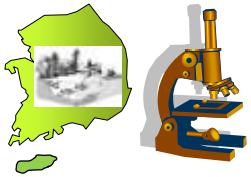
- the data acquisition to understand the lake ecology such as high accuracy sensors
- the data manager to handle the various kinds of lake ecological observation
- the data analysis & prediction tools to estimate the ecological health assessment in lakes and reservoirs
- the international community to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



Supporting Global Joint Ecology Research Environment

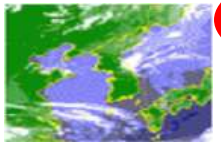
-Global Joint Research
-Environment/Ecology analysis

Summary, Analysis and Prediction of Observation

KLEON (Web)

Using Result for Environment Preservation Policy /Teaching Resource

Sharing Ecology Observation/ Information



Construction of Observation Infrastructure

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

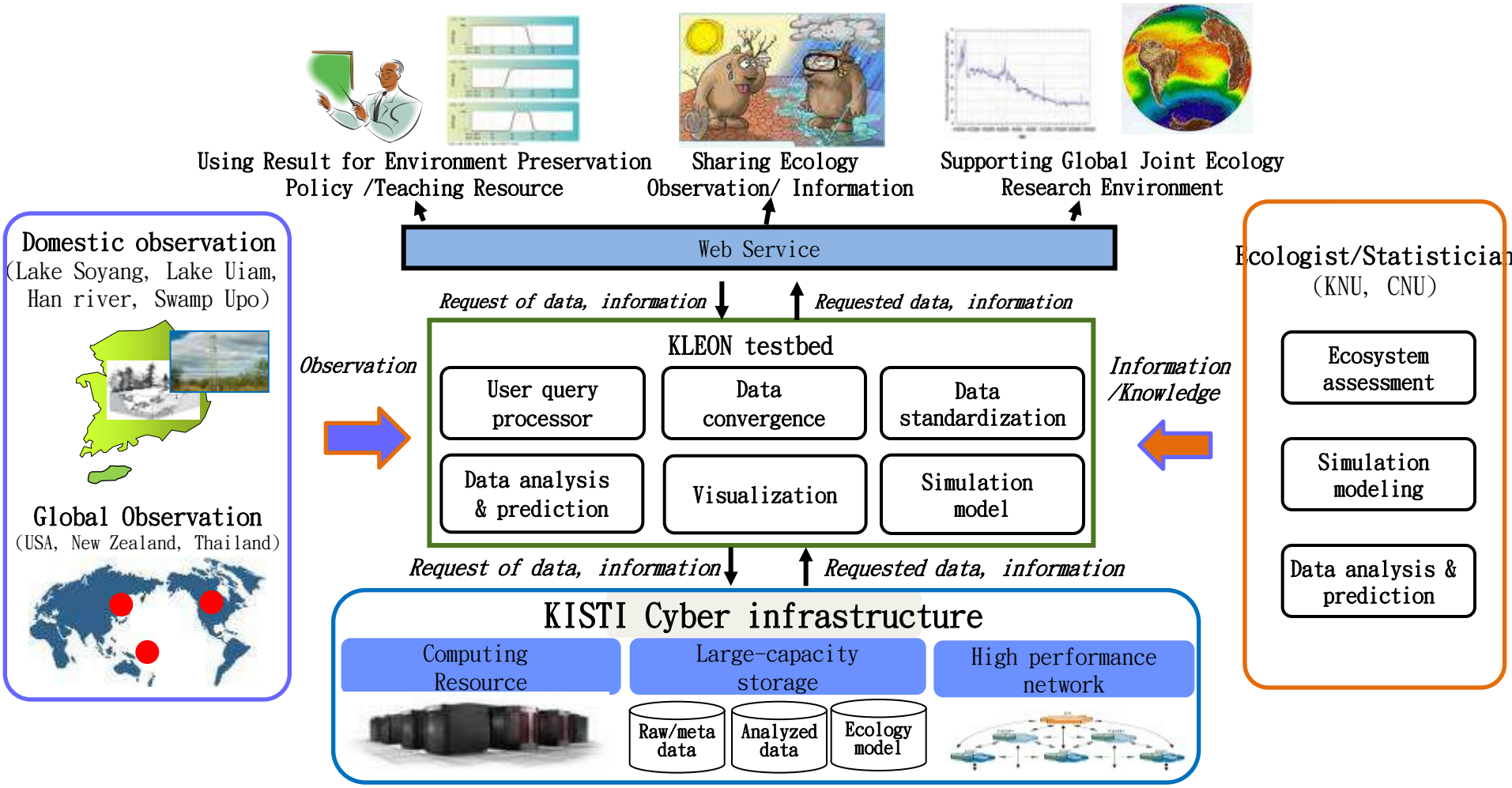
Data Standardization | Data Convergence | Visualization | Simulation Model

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

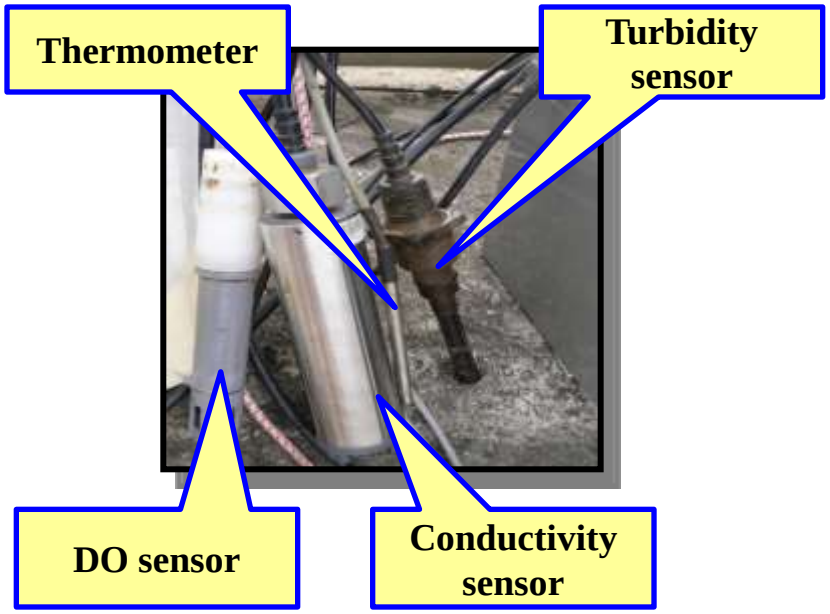
Table 1. Sensor type, Data collection method, and Analysis

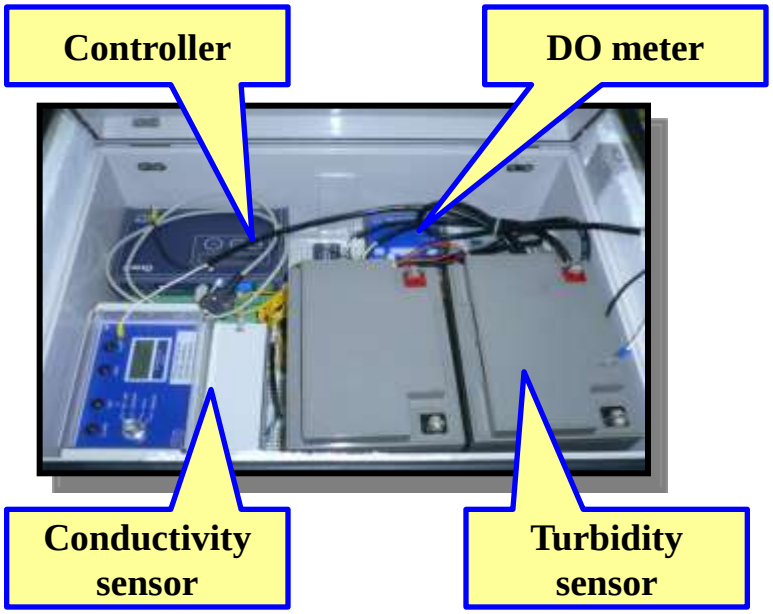
Target Place	Sensor type	Data collection method	Analysis
1 Lake Soyang	Troll multiprobe (Water temperature, DO, Electrical Conductivity)	Real time data transmission RF-modem	Eutrophication Evaluation
2 Lake Euiam	combination sensor (Water temperature, DO, Electrical Conductivity, Turbidity)	Real time 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

❶ **Buoy in Lake Soyang**

❷ **Sensors in Lake Euiam**





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

Sensor information management

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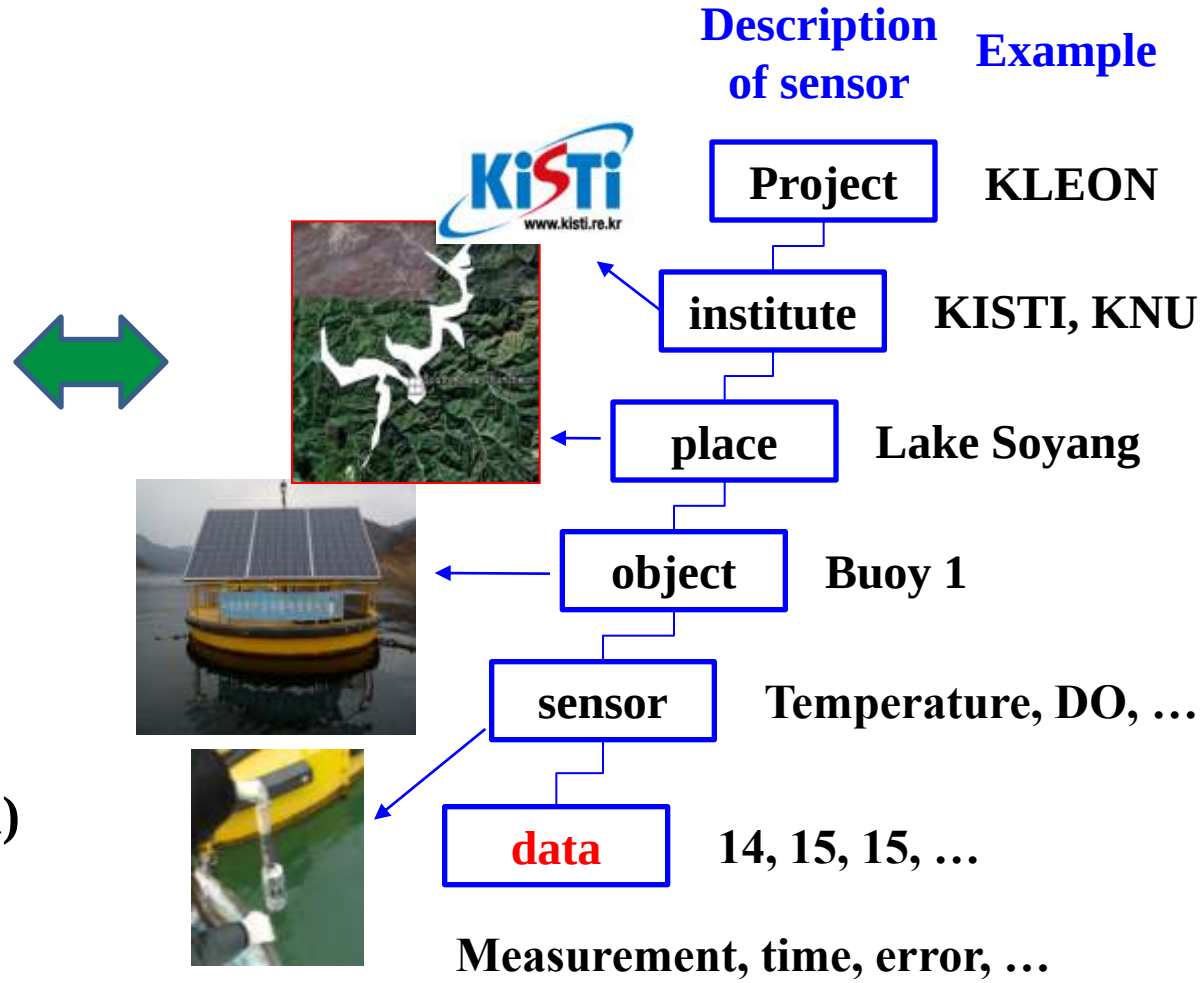
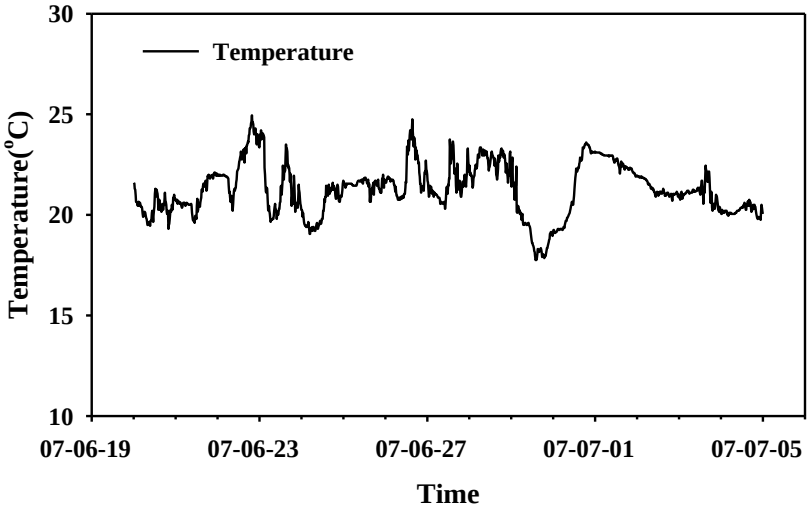
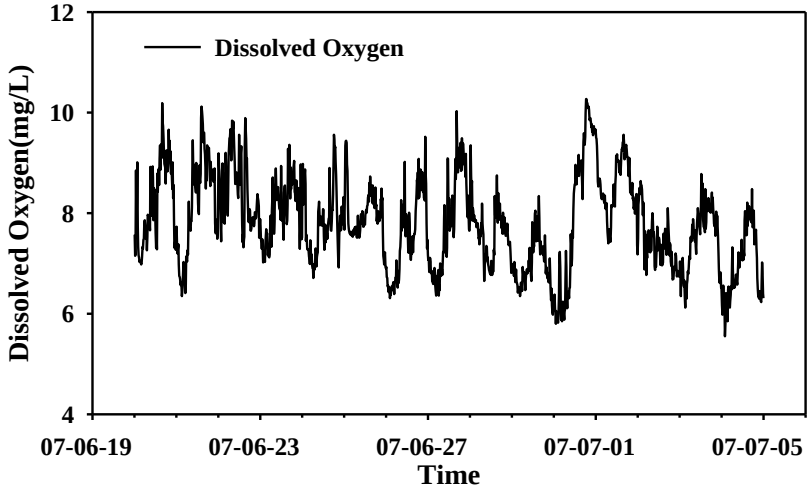
Sensor ML
(Open Geospatial Consortium)

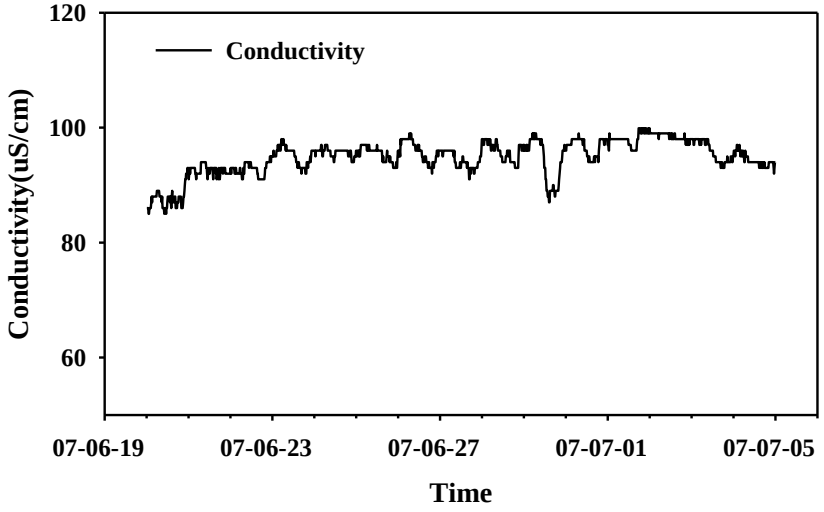
< The relation information of the sensor >

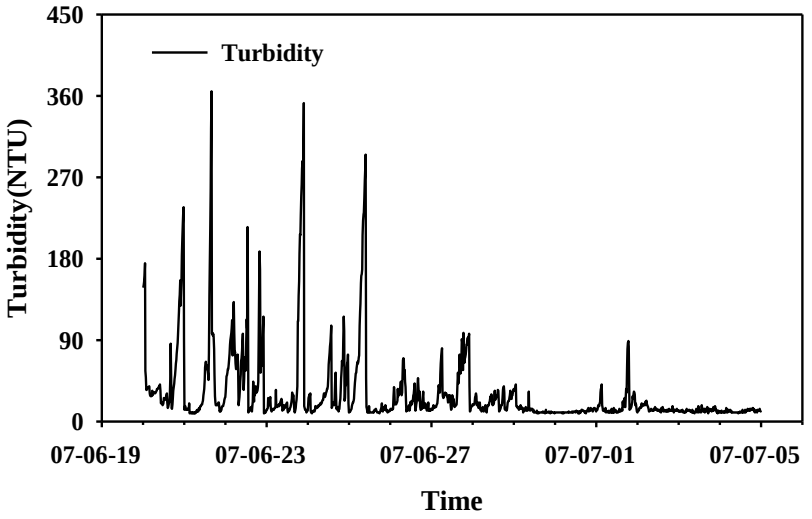


Observation









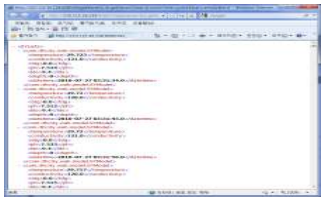
Data management

Sensor Model Language

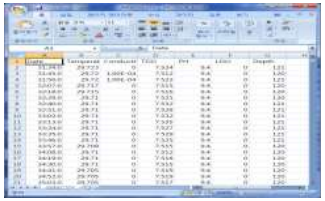
Sensor Info. Management

Source
(Lake, River, Wet land)

(a) The graph of sensor observation



(b) XML

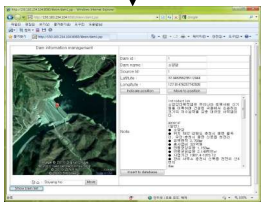


(c) CSV file

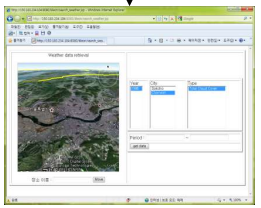
< Sensor Data Viewer >

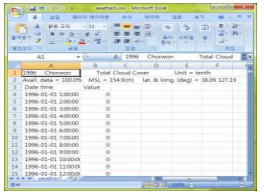
Sensor
Info.

Observation Site

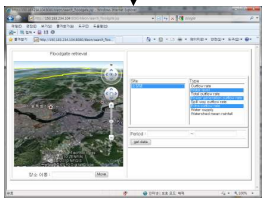


Dam



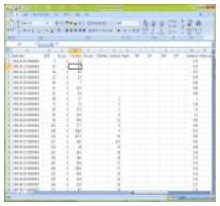


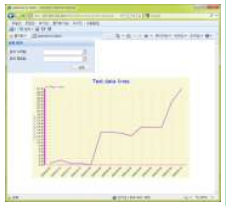
Weather



Floodgate

Plankton

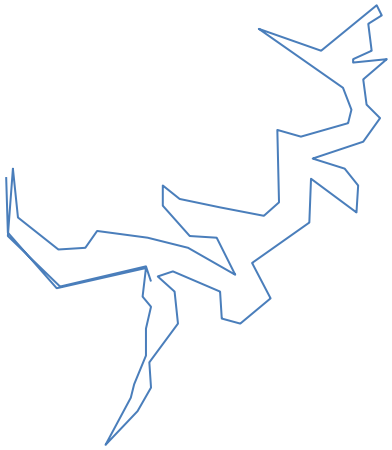




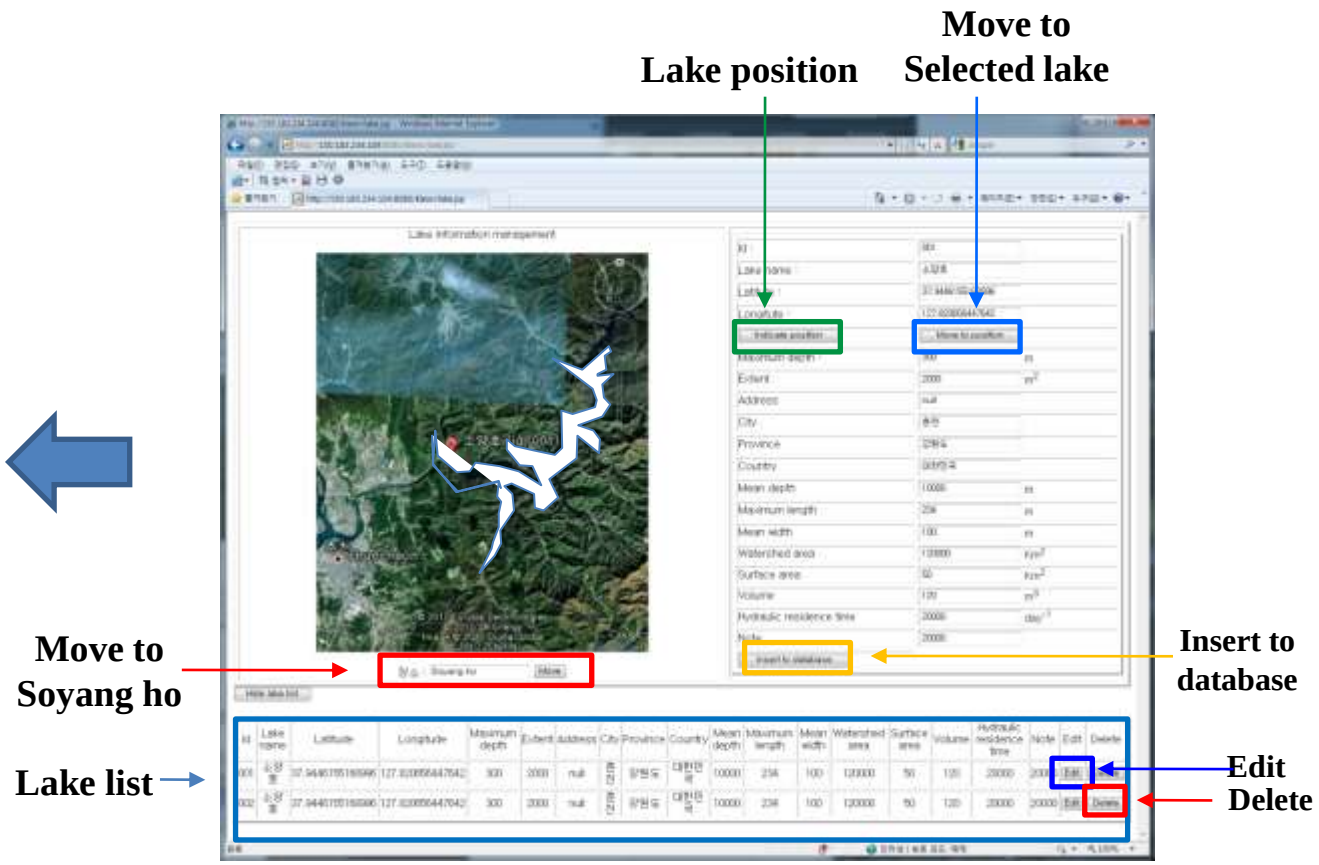
Water Quality

< Sampling Data Viewer >

Data management - Lake



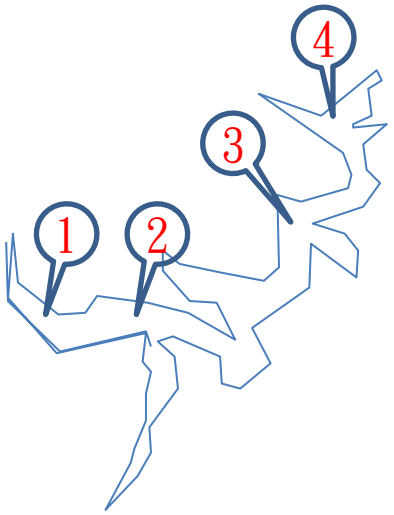
Lake Soyang



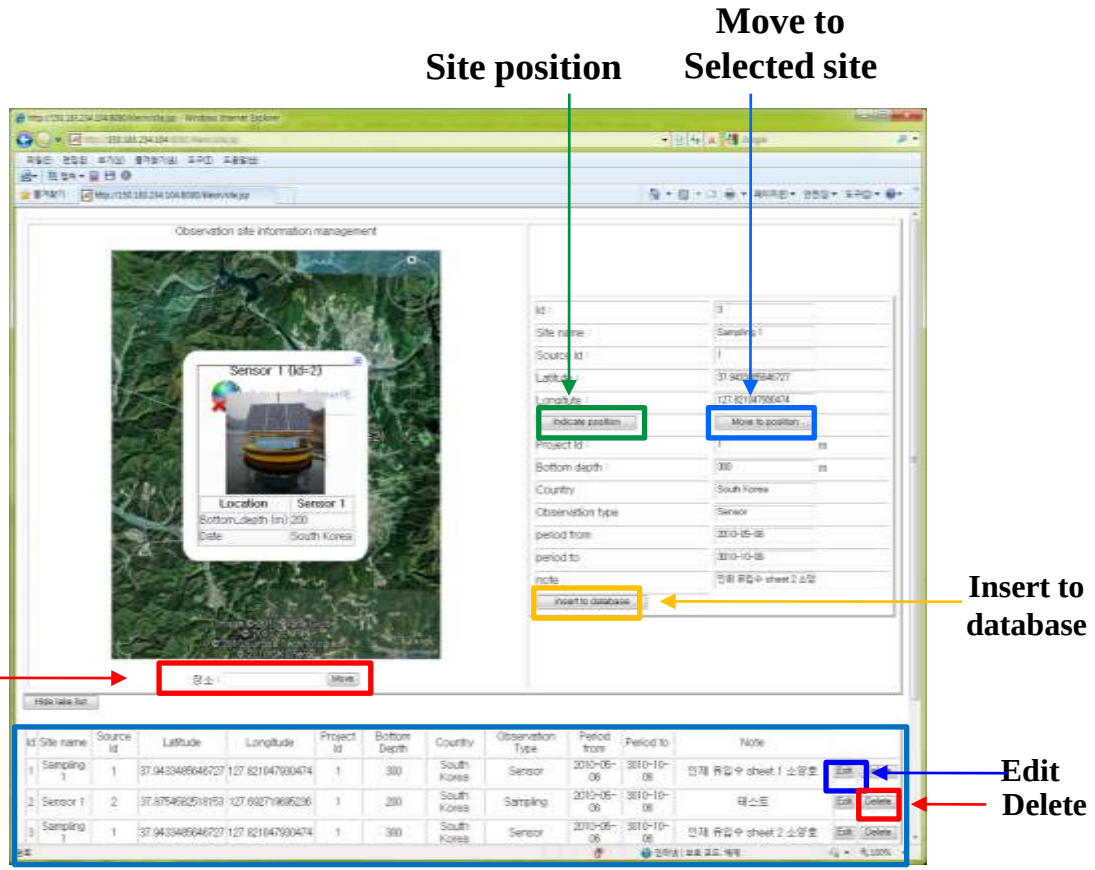
<Lake Info. Management>

- 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



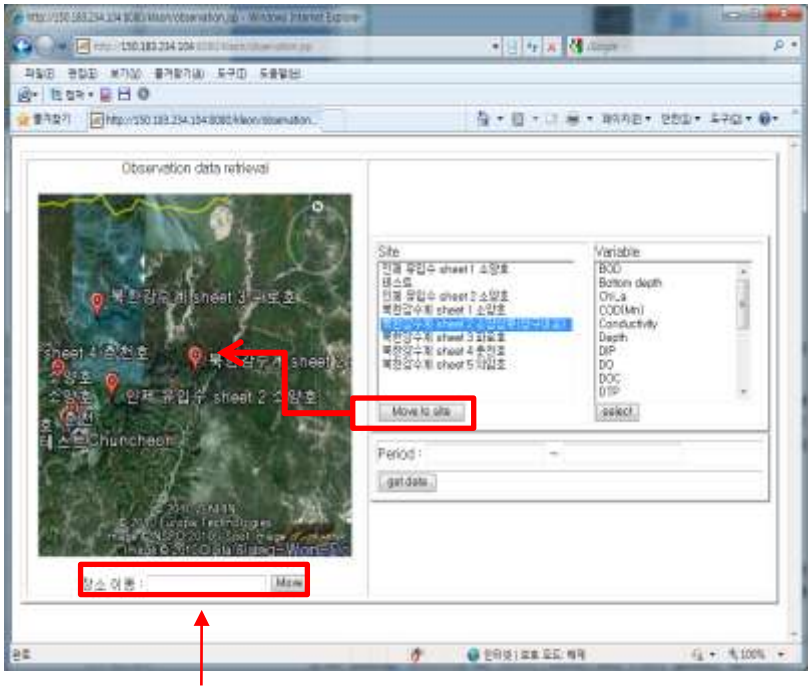
Lake Soyang



<Site Information Management>

- 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.

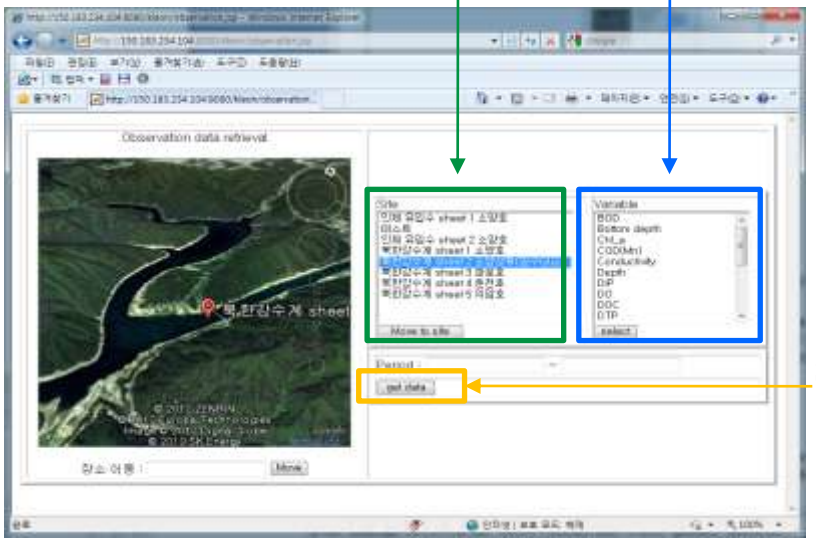
Data viewer - Sampling data



Move to

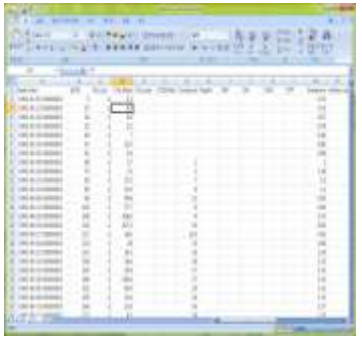
Site list

Variables per site



Search data

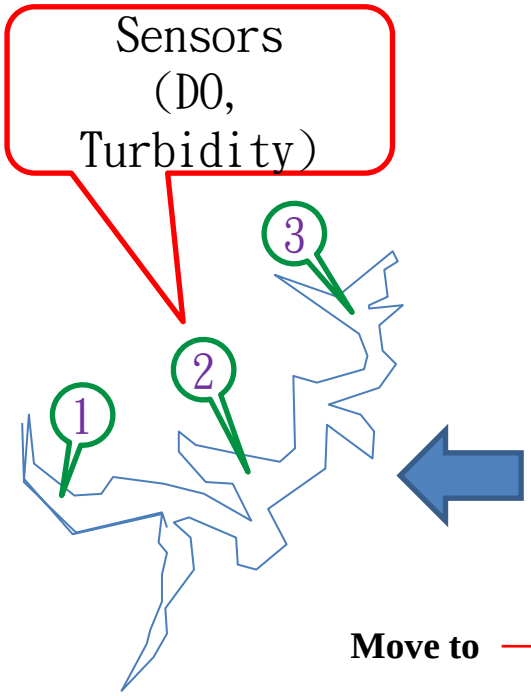
Graph for observation

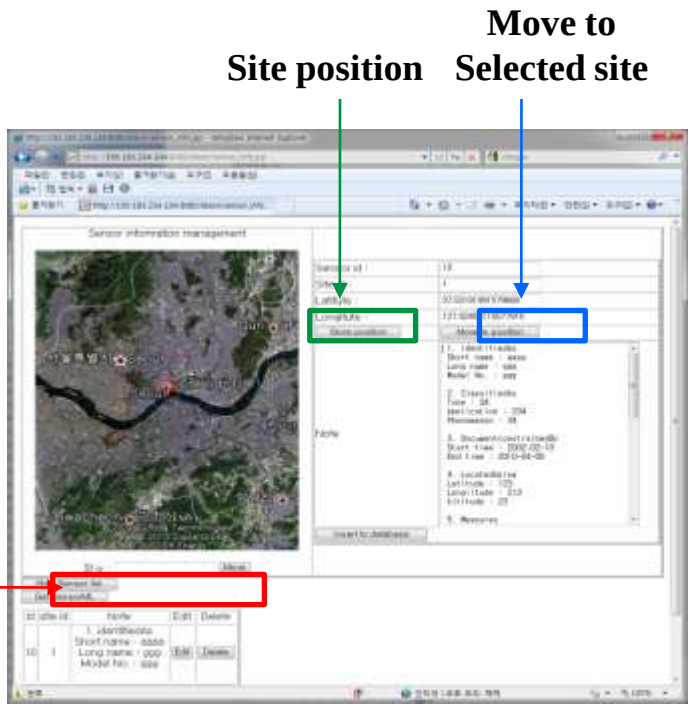


CSV

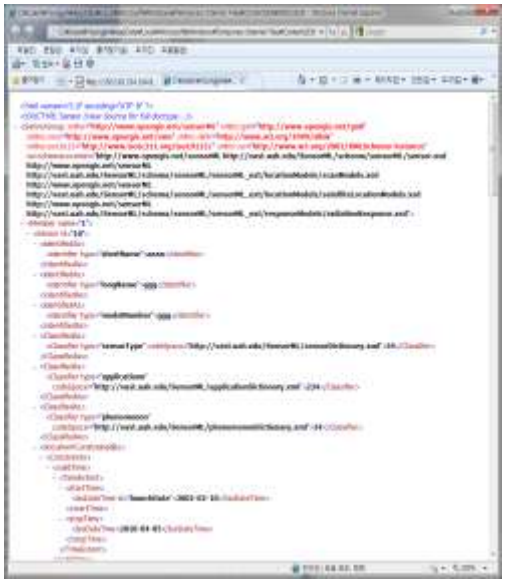
- Function : search and download sampling data
  - Download sampling data (CSV file) from the selected site
    - 34 types of observations (DO, BOD, COD, Turbidity, Conductivity, etc.)
  - Graph for observation

Data management - Sensor





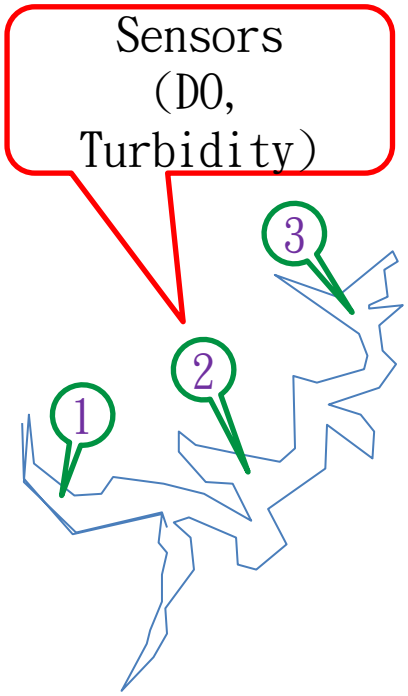
<Sensor Information Management>



<SensorML>

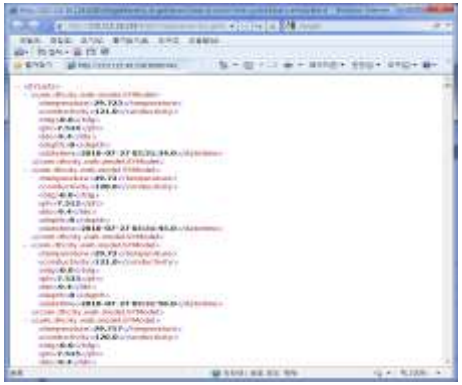
- Function : management of sensor information
  - Sensor selection for getting sensor data
  - Download sensorML (Sensor Model Language)
  - attributes :
    - Model no. name, sampling interval, error rate, etc.

Data viewer - Sensor data

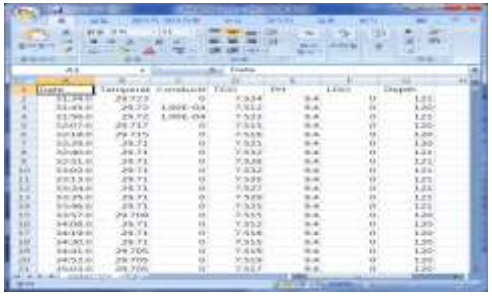


Lake Soyang

(a) The graph of Sensor observation



(b) XML

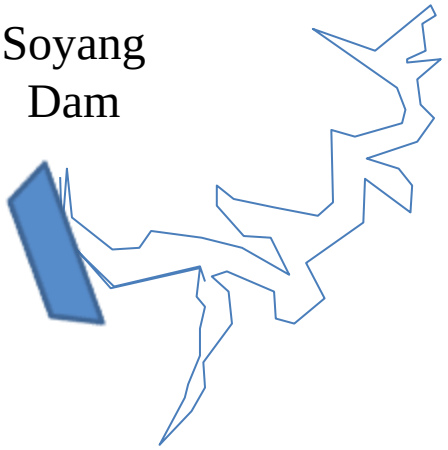


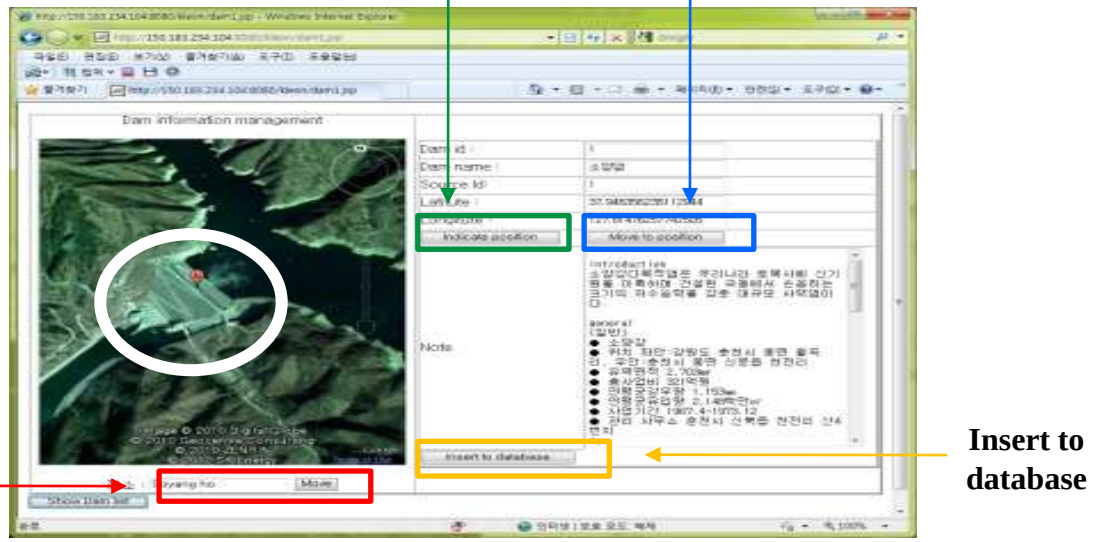
(c) CSV file

<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

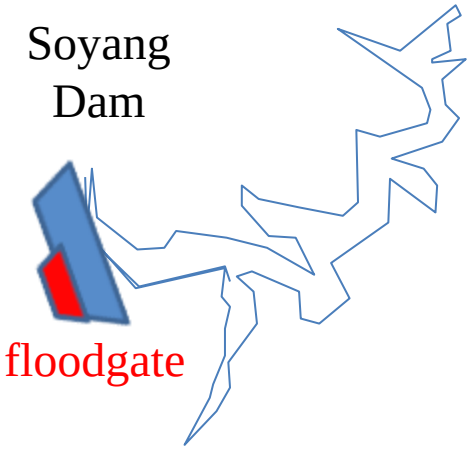


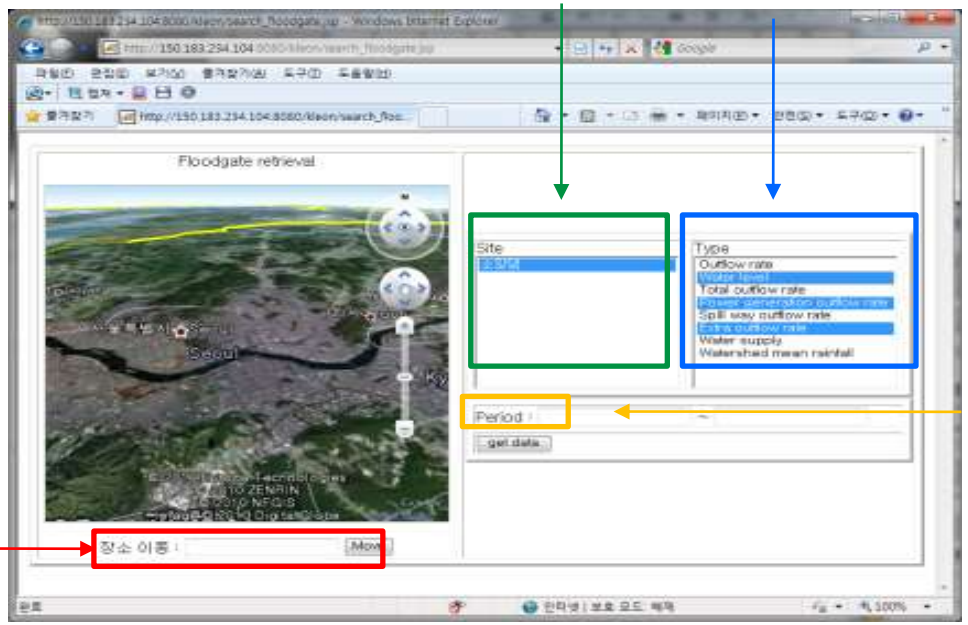


<Dam Information Management>

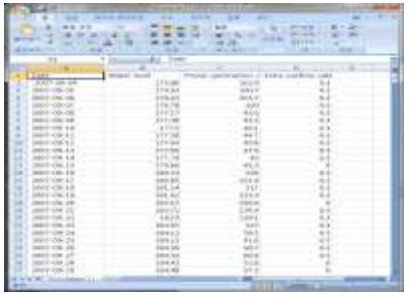
- Function : management of dam information
  - Dam selection for getting floodgate data
  - attributes :
    - Name, position, extent , spill way, tailrace, power plant, etc.

Data management - Floodgate





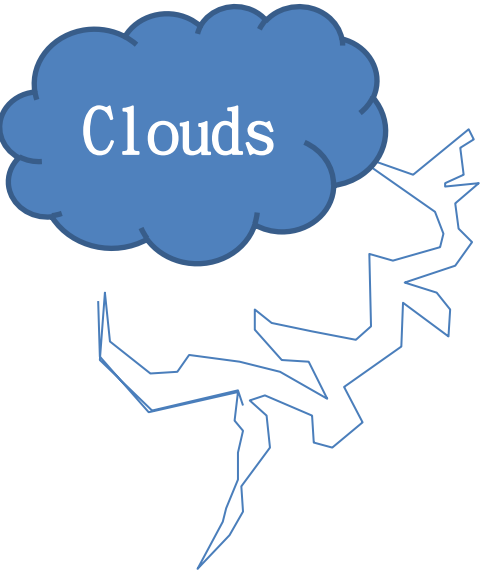
< Floodgate data download>



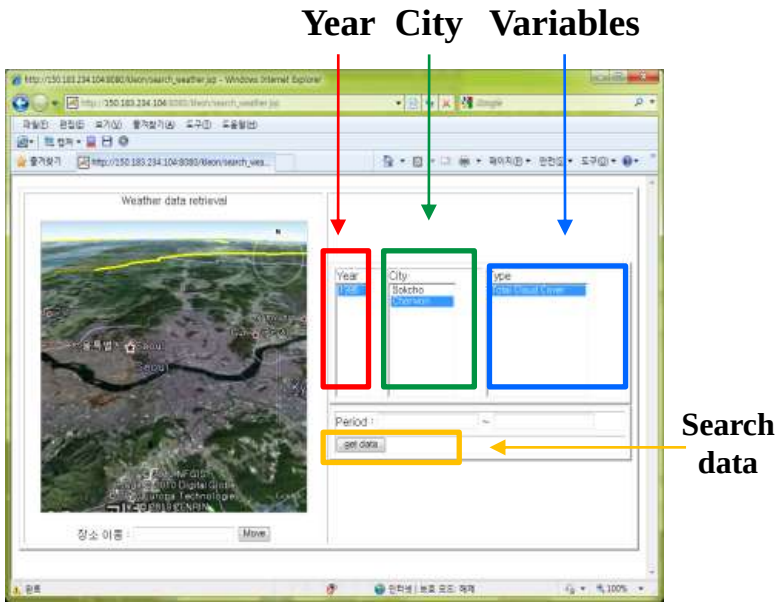
CSV

- 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

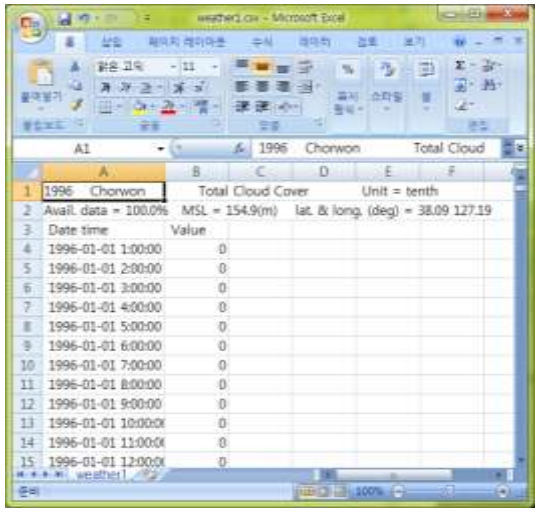
Data management - Weather



Lake Soyang



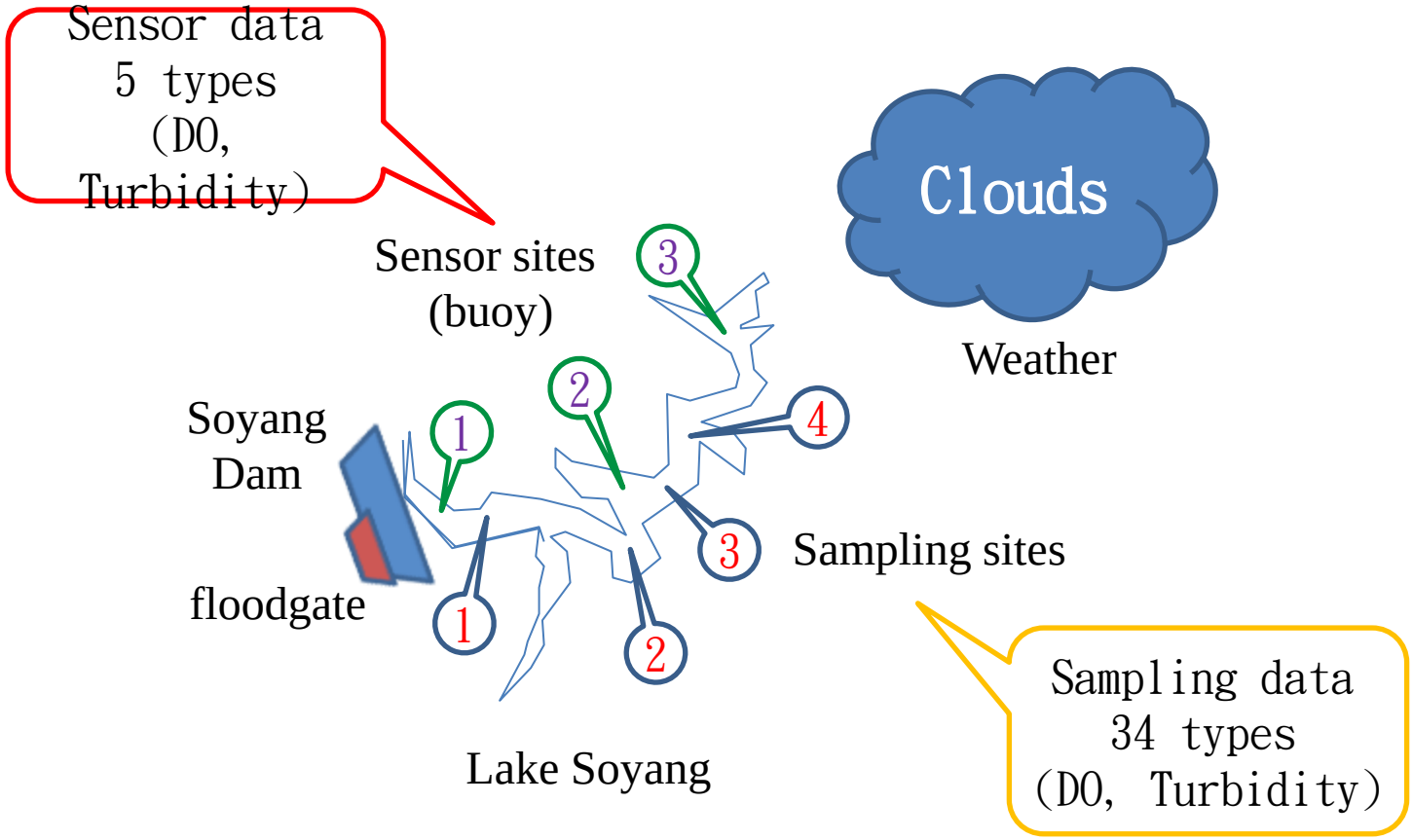
< Weather Data Search >



CSV file

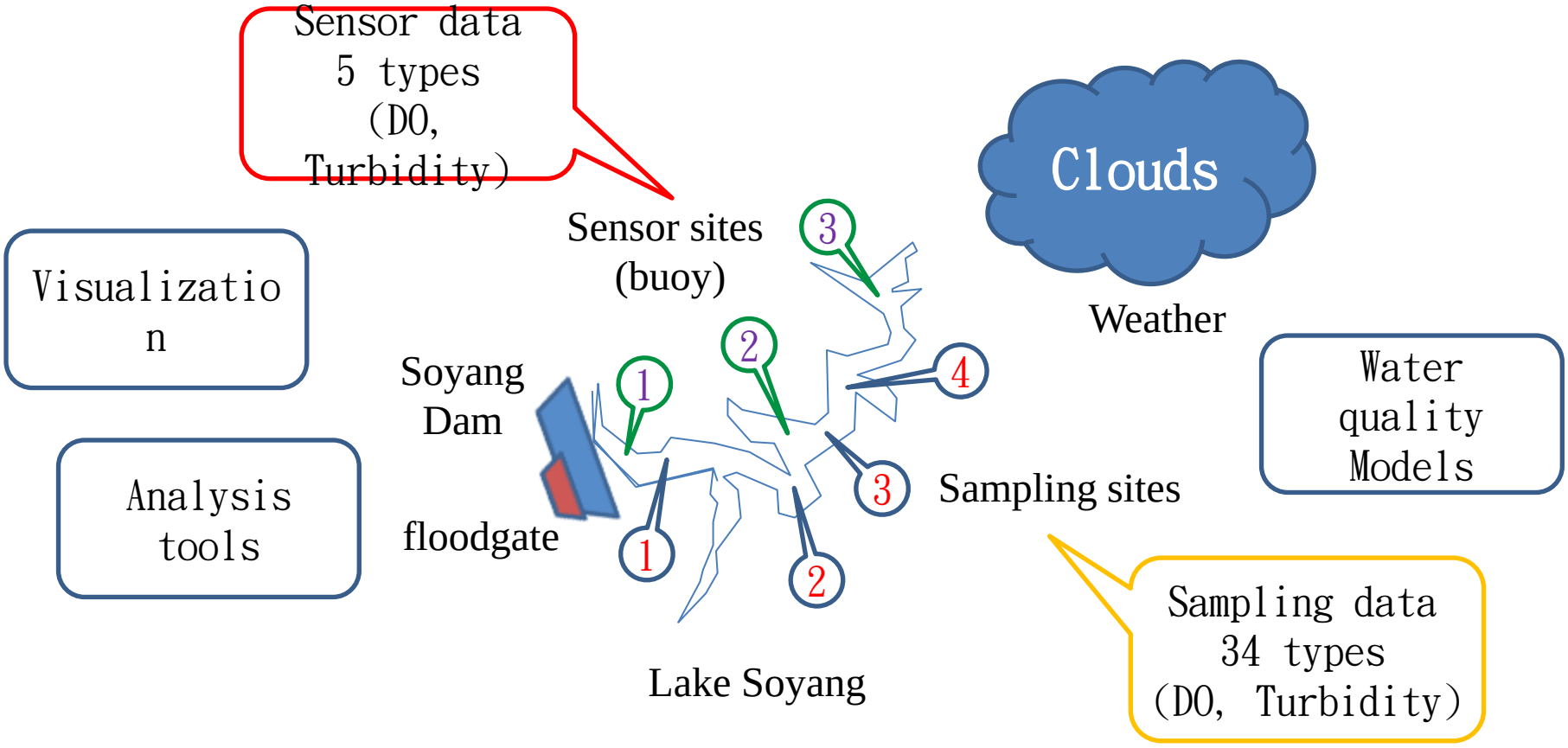
- Function : search and download weather data
  - Download floodgate data (CSV file) from the selected city
  - Attributes : total cloud cover, solar radiation, air temperature, dew point temperature, Wind speed and direction

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
▪ Global Cooperation & IT support • Korea : KEON • Global: GLEON	▪ Environment preservation policy ▪ Green Development ▪ Pollution prevention
Science	**IT**
▪ Environment/Ecology Research development (data accumulation & modeling) ▪ Improving the accuracy of water quality model ▪ Teaching Resource	▪ 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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