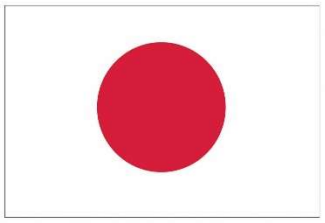

Manual

Telemetry for Irrigation Water Management

Equipment, System, Data analysis, Operation and Maintenance

September, 2024

Vietnam Academy for Water Resources

with the full support of ADCA

Agricultural Development Consultants Association, Japan

Manual

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Contents

Ⅰ. Telemetry for Irrigation Water Management

1. Telemetry System

- Telemetry system (TM) is vital for appropriate irrigation water management in measuring and monitoring various data such as water level, rainfall and water quality.
- Recent development of information and communication technology (ICT) has allowed users to install the system at remote areas and at low cost with satisfying reliability.
- Cloud server and/or physical data server have allowed users to monitor and check real time data on smartphones and PC tablets.

TM system measures various parameters such as water level, water quality and rainfall, and sends data to a server via mobile phone networks. Information and technology development has made it possible to measure necessary data at remote areas with low cost. Measured data are processed using a manufacturer developed software and/or specifically developed programs. Users can check and monitor the real-time data with smartphones and PCs for water management.

TM system (Water level. Nghi Quan gate in Vietnam)

TM system (Water quality. Bangpra Lake in Thailand)

TM system (Water level and precipitation. Sinthe dam in Myanmar)

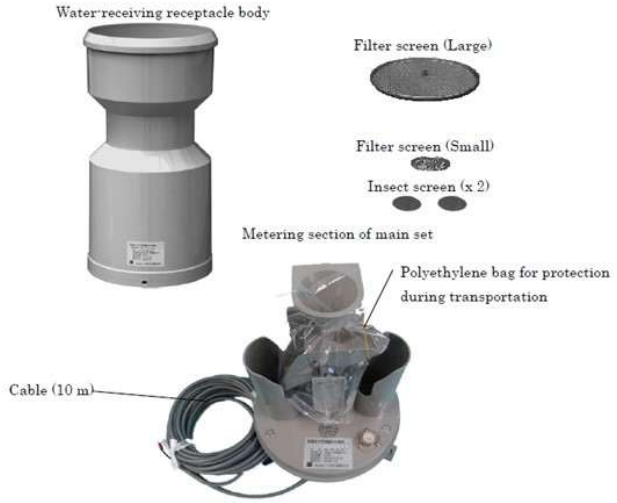
TM system (Water level. Bang Than Tong River in Thailand)

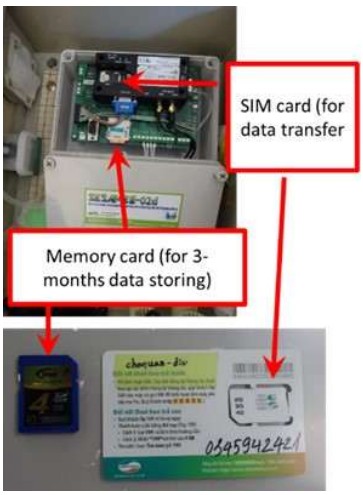
2. Components of TM system

- TM system mainly consists of a data logger that controls the measurement and data transmission, sensors and a battery.
- Sensors for water level, rainfall, electric conductivity and water quality can be employed depending on the need of users.
- A SIM card, installed within the data logger, must be prepared as the data are transferred using mobile communication network.

A typical TM system consists of a logger box, sensors and a power supply. There are many manufacturers of these devices and the followings are shown as examples. Users need to select suitable equipment and its combination depending on the needs, location and environment.

(1) Logger box	 Midori Engineering Co., Ltd. (MEL) Dotsu Building 8th floor, North 5-west 6-chome 1-23, Chuo-ku, Sapporo-shi, Hokkaido 060-0005, Japan TEL: +81(0)11 555 5000, FAX: +81(0)11 555 3000 URL: https://midori-eng.com/
(2) Water level sensor (Pressure type)	 STS Sensor Technik Sirnach AG Rütihofstrasse 8 · 8370 Sirnach · Switzerland TEL: +41 (0)71 969 49 29, Fax: +41 (0)71 969 49 20 URL: www.stssensors.com

(3) Electrical conductivity (EC) sensor	 
(4) Rain gauge	 Ota Keiki Seisakusho Co., Ltd. 5-22-1, Kamisuna-cyo, Tachikawa-shi, Tokyo 190-0032, Japan TEL +81(0)42 538 2611, FAX +81(0)42 535 0066 URL http://www.otakeiki.com E-Mail sales@otakeiki.com
(5) Water quality sensor	  HORIBA. Ltd. 2, Miyanohigashi-cho, Kisshoin Minami-Ku Kyoto 601-8510 Japan TEL: +81 (0)75 313 8121, FAX: +81 (0)75 321 8312 **URL** https://www.horiba.com/
(6) Solar panel	

(7) SIM card and memory card		TM requires 1(one) SIM card for each system. Select SIMs of suitable company considering the strength of the wave signals at TM installation points. Communication cost for data transfer is quite small but the SIM requires regular top ups of charges. It is suggested to check the easiness and frequency of topping up procedures prior to the SIM purchase. Also take a photo and record the SIM number. Memory card is set in the logger box and holds 3-month data in case of MEL equipment.

Ⅱ. Installation of TM Equipment

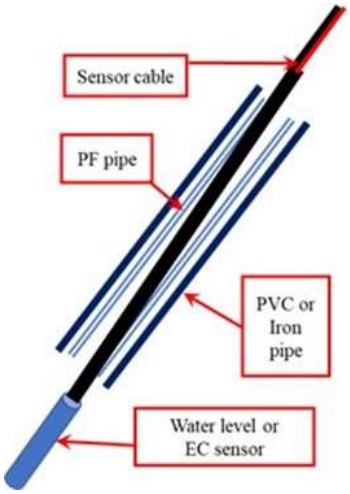
1. Necessary materials for the installation of TM equipment

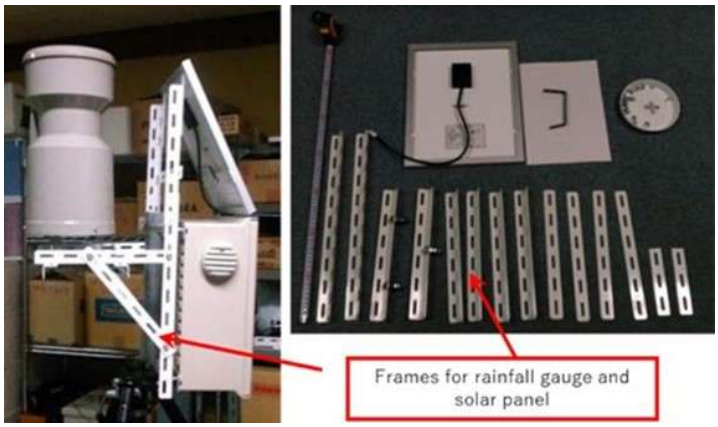
- A main pipe holds a logger box, a solar panel and a rainfall gauge when applicable. Sensors are installed at measuring points and connected to the logger box with cables. The cables must be protected properly.
- Various kinds of pipes are used to hold the logger box and cables connecting the sensors and the box for protecting the cables.
- As the TM system is usually installed at remote areas, check security condition around the installation area and communication condition for selecting SIM cards.

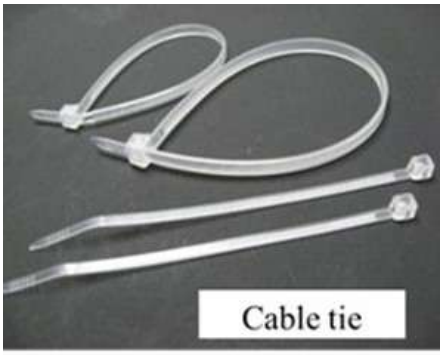
Following explains necessary materials for the installation of the TM system. Users are advised to check the manufacturer of the logger box and sensors what materials are provided.

(1) View of general configuration of TM system	
(2) Imaging the completed TM system	 
	Completed image of TM system will help construction workers to prepare materials and tools and to engage in the construction works. Above examples have been made using the photo data and pre-designed object image. Different colors indicate different materials.

(3) Main pipe	 (a)  (b)  (c)  (d)
	The main pipe holds TM logger box, a solar panel and a rain gauge. A standard configuration of TM system, consisting of one water level sensor and a rain gauge, requires the main pipe of 150mm in diameter in minimum. A cap set at the top of the main pipe prevents rainfall from entering inside the pipe. When the system is installed at robbery-prone area, measures are needed as shown in the photos where the PVC pipe of 250mm in diameter filled with concrete and rebar is employed. More aggressive work is applied at other robbery-prone area as shown in (c) and (d) above.
(4) Flexible plastic (PF) pipe	 PF pipes protect sensor cables. Among various size of the PF pipes, φ16mm PF pipe is suitable for protecting cables of water level sensor, rain gauge and EC meter. PF pipes can be cut by cutter at site to a required length.

(5) Couplings for PF pipes	 Couplings are very useful for connecting PF pipes, logger boxes and handholes, and prevent insects and rainfall from intrusion into the logger box and sensor pipes. The size of the couplings should match with the PF pipes.
(6) Guide pipe	  It is not recommended to directly fix the PF pipes and sensor cables to walls or structures. A guide pipe of PVC and/or iron must be used. Use iron pipes when the sensor cable and PF pipe are burried underground. Also use strong PVC pipes (not iron pipes) where sea water intrudes.
(7) Cap and holes	  Set a cap with a hole at the bottom of the guide pipe and make holes on the guide pipe as shown so that water flows freely into the pipe to measure necessary parameters.
(8) Non-woven fabric bag	 

	Use non-woven fabric covering the bottom of the guide pipe. This helps prolong the life span of the sensors by reducing the unwanted accmulation of dust and rubbish to the guide pipe and the sensors.
(9) Metal plate	 Metal plates are to fix the logger box to the main pipe, and are supplied by the manufacturer of the logger box.
(10) Rain gauge stand	  Rain gauge stand is used for placing rain gauge and fixing it to main pipe.
(11) Frames	 Frames are used to fix the rain gauge and solar panel to the logger box and the main pipe. Note that some frames may not be necessary if the above rain gauge stand is used.

(12) Handhole	  Sensors require regular maintenance and replacement. Retrieving sensors needs rewinding cables. It is not feasible to disconnect the cable inside the logger box as the logger box is usually placed out of reach. Handholes are set at the bottom of the main pipe and where the slope of the guide pipe (sensor cable) changes. Select appropriate handholes so that the cable is properly stored inside and can be handled by hand.
(13) Stainless band	  Stainless band is useful to fix the logger box and handhole to the main pipe. Select durable and proper size band. Socket drivers or spanners are more efficient than minus drivers when fixing the band.
(14) Fixing materials	  Cable ties and saddle bands are very useful to fix pipes and cables. As there are many fixing spots, prepare enough number of ties and bands.

(15) Insects and ant repellent materials	 	There observed cases of ants and insects attacks and nest building in a TM logger box. Prepare anti-ant and anti-insects materials (boric acid) and set in the TM logger boxes.

2. Tools needed for the construction and installation

- Tools are key for the successful installation of the TM system. It is advised to bring some tools from Japan.
- Some tools are needed for the maintenance of the system. Consult with related offices for the proper maintenance works.

(1) Tools (drivers, wrenches, scissors, etc.)	 Typical tools are: (1) driver set, (2) ratchet driver set, (3) scissors, (4) wrenches and spanners, (5) hammer, (6) pliers, (7) needle nose pliers, (8) nipper pliers, (9) cutter, (10) tester, (11) self-adhesive tape, and (12) plastic tape
(2) Additional spanner	 There are many kinds of the use of bolts and nuts. It is recommended to prepare various size of spanners to ease the work.
(3) Precision screw drivers	 Fixing sensor cables to terminals requires precision screw drivers.

(4) Convex	  Tape measures (a) must be available for the construction and installation. Soft tape measure (b) is useful when recording the construction works for the quality check.
(5) Sealing material	  Use (adhesive) sealing materials to seal off any openings in order to prevent insects and rubbish from entering into the logger box and pipes.
(6) Electric generator	 Works are conducted at fields and requires electricity in many cases.
(7) Ladder	  Ladder is essential for the installation of the TM system.
(8) Concrete/mortar material	 Prepare cement, sand and gravels as needed. It is recommended to use a tray (photo) for mixing concrete and/or mortar at site.

(9) Galvanized wire		Galvanized wire is useful for fixing guide pipes and handholes when stainless band is not available.
(10) Spray, Pegs		Use spray and pegs to specify the installation points at fields.
(11) Paint, Brush		Apply anti-corrosion paint to a main pipe.
(12) Smartphone	 Smartphone is very useful to take photos, find geographical coordinates of the location of TM system. Users can see and check the TM data with the smartphone.	
(13) RS-232C cable		Prepare USB to RS-232C cable and its extension in order to set a datalogger with a computer. The computer must be installed necessary software.

(14) Safety measures	   Prepare safety belts, safety helmets and gloves as safety measures.

3. Manpower for the construction and installation

- Good preparation, skilled manpower and proper installation scheduling is a key to successful installation of the TM system.
- Adaption of locally familiar construction method is needed to the efficient TM installation.

One manager oversees the whole construction and installation works. 2 engineers and 2 workers are needed for the construction and installation at sites. Proper scheduling of the installation and construction works maximizes the prepared manpower.

	Irrigation engineer ・ Location selection ・ Work scheduling ・ Guidance for construction in general ・ Trouble shooting on construction
	System engineer ・ Customization of software system ・ System setting ・ Trouble shooting on TM system
	Leading worker ・ Preparation of materials ・ Arrangement of workers ・ Construction work
	Worker ・ Construction work
	Driver ・ Transport TM setting team to setting location. ・ Help purchase and transport missing materials if any.

4. Procedures of TM installation

- Setting a main pipe, frame and guide pipes for sensors are three key components of the TM installation (see figure below).
- Construct a main pipe first when using concrete and/or bricks for the main pipe,
- Establishing an appropriate work schedule and sharing the schedule among the workers involved are the key to an efficient installation work.

A figure below shows a flow of the TM system construction and/or installation. Some of the works can be carried out simultaneously, while some must precede others.

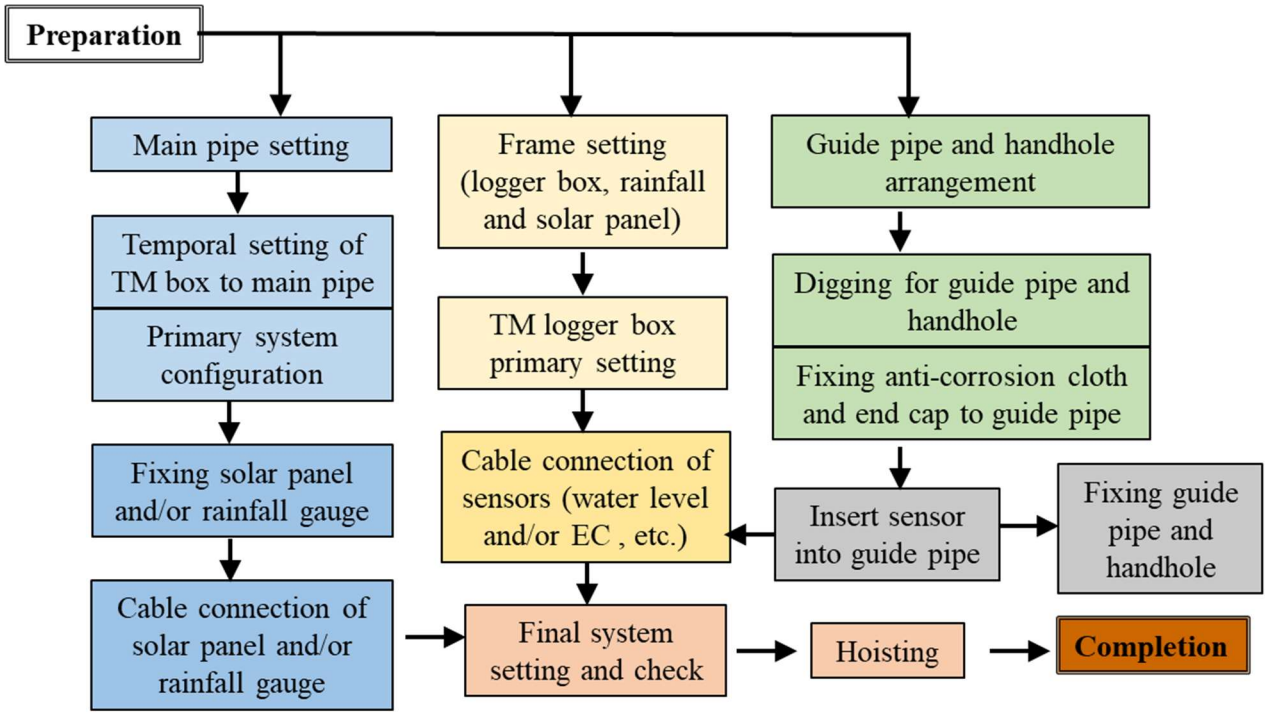


Figure 1: Flow of TM installation/construction

Followings explain construction and/or installation procedure of the components of the TM system.

4.1 Main pipe setting

4-1-1

A) Using sprays, mark locations to install/set main pipe and sensors.
B) Measure necessary distances to know the length of sensor cables, guide pipes and PF pipes.
C) For rain gauge setting, find location without tree branches or structure which causes incorrect measurement.


4-1-2

A) Install the main pipe first. It is advised to adapt familiar methods for local construction workers such as bricks and iron plate methods.
B) When installing the system at robbery prone areas, consult local people and take necessary protecting measures like photo (c) and (d) on the right.
C) Make sure the pipe stands vertically by using a plum bob or a stone attached to string.
D) Confirm the solar panel to be attached can get sufficient sunshine.


(a)

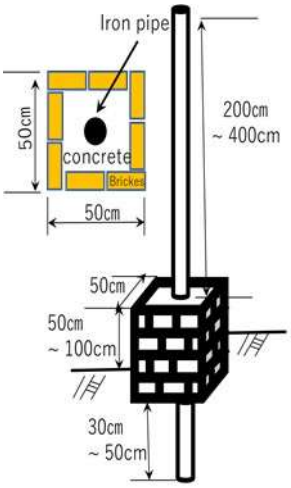

(b)


(c)


(d)

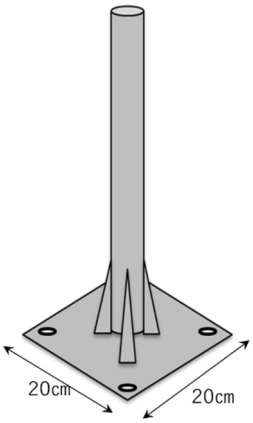
4-1-3

A) A brick method is applied when the main pipe is set at river/canal banks.
B) The method uses bricks and concrete that supports 2~4 meter long main pipe (made of iron or stainless, diameter 100mm in minimum).
C) The main pipe must be properly inserted into the ground to have good stability and vertical standing.
D) Leave 1~2 days for concrete curing.



4-1-4

A) Iron plate method uses a main pipe (2~4 meter long) welded onto an iron plate.
B) Make sure to fix the pipe and plate to a concrete floor with anchor bolts so that the pipe stands firm and vertically.



4-1-5

A) A 25cm diameter PVC pipe of 4m long inside of which filled with concrete and rebar is employed at locations of theft and robbery concerns.
B) Make sure to insert the PVC pipe vertically into the ground to be safe and stable.
C) Additional measures using berbed wires and iron bars can be taken.

	
4-1-6 A) Main pipe can be set at bridges, but needs proper supporting frames as there are traffic and vibratation. B) Consult authorities concerned for its applicability.	
4-1-7 A) When installing the main pipe and system on a dam body, care must be taken not to damage the dam and its structures.	
4-1-8 A) Protect the main pipe with anti-corrosion and color paints. B) Make sure the TM system never submerge even during the flood period. Check the spillway elevation.	 

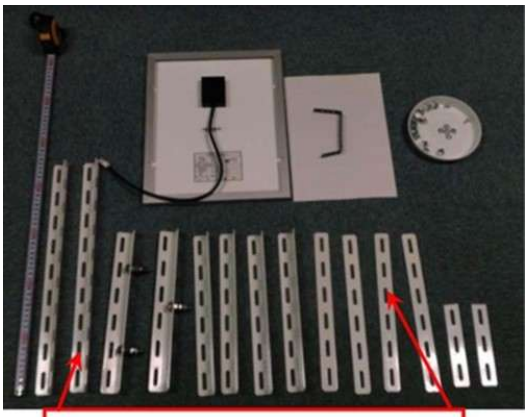
4.2 Frame and solar panel setting

4-2-1

A) Rain gauge is set on the rain gauge stand.

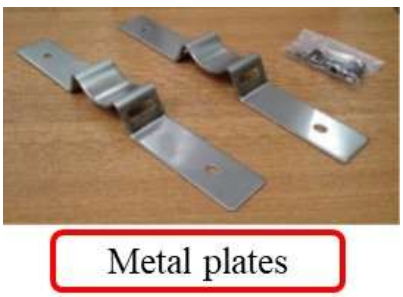
4-2-2

A) Check the contents supplied by the manufacturer.



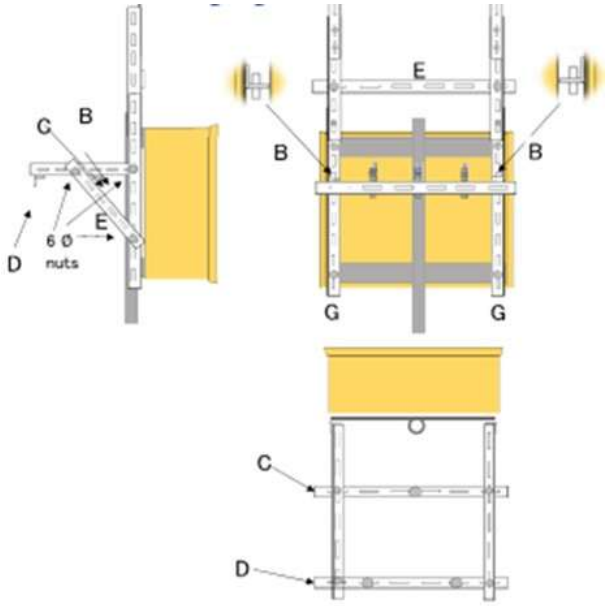
4-2-3

A) Fix metal plates to the back of the logger box.



4-2-4

A) Assemble frames for solar panel and/or rain gauge referring to the manual supplied by the manufacturer.
B) When a main pipe is small enough to pass through the opening of the frame, you can set up the rainfall frame to the back of the logger box. When difficult to pass, refer to next procedure.

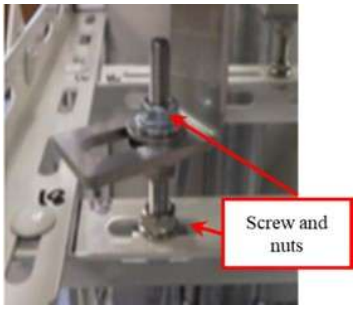


4-2-5

A) Tempolary set a logger box to the main pipe.
B) Assemble the rain gauge stand frame first, and then attach to the logger frame.

4-2-6

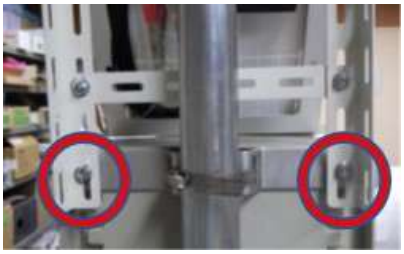
A) Set the rain gauge stand horizontal by adjusting screws and nuts referring to a level located on the rain gauge stand.
B) Remember that final level setting must be done before setting the rain gauge body.



4-2-7 A) Make sure the cable is coiled as shown in the photos at the gauge stand. B) This prevents the disconnection of the cables.	 
4-2-8 A) Photo shows an example when an existing pipe is used for rain gauge and TM system. B) The rain gauge frame is set at the top of the pipe and then fix the stand.	
4-2-9 A) Rain gauge stand is properly set. B) See “Rain gauge setting” for further work.	

4-2-10

A) Using frames provided, set frames for solar panel referring to the manual.
B) The solar panel frame is attached to the logger box frame/plate.

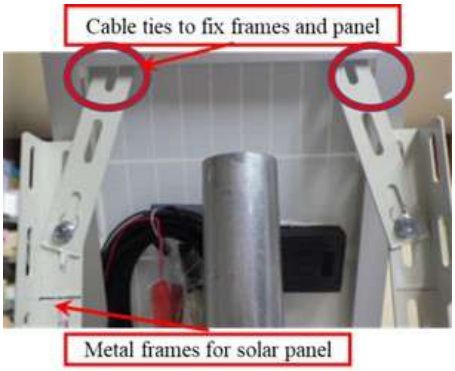


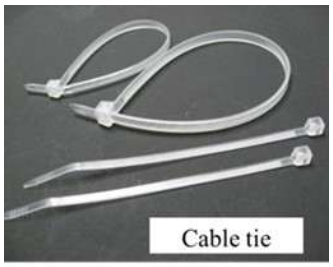
4-2-11

A) Attach solar panle to the solar panel frame with a bent plate.

4-2-12

A) Use cable ties to fix the frames and the casing of the solar panel.
B) Do not fasten the ties too rigid as the panel itself is fragile.



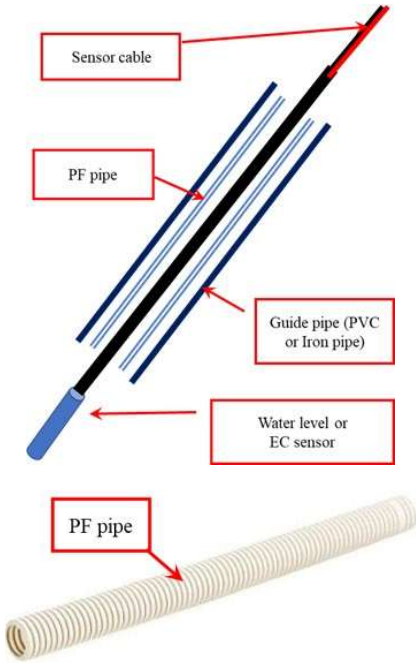


4-2-13

A) Insert the solar panel cable into PF pipe.
B) Draw the cable into the logger box and plug in the PF pipe to a coupling at the bottom of the logger box.

4-2-14 A) Make sure the PF pipe reaches to the back of the solar panel. B) Seal the opening with industrial clay. C) Use cable ties to fix the PF pipe to the panel frame.	
4-2-15 A) Set the solar panel to face appropriate direction (south for northern hemisphere, north for southern hemisphere).	

4.3 Sensor and guide pipe setting

4-3-1 A) Sensor cables must be protected with PF pipes. B) When cables and PF pipes are buried underground and/or fixed to walls and/or structures, protect cables with PVC or iron pipes.	

4-3-2

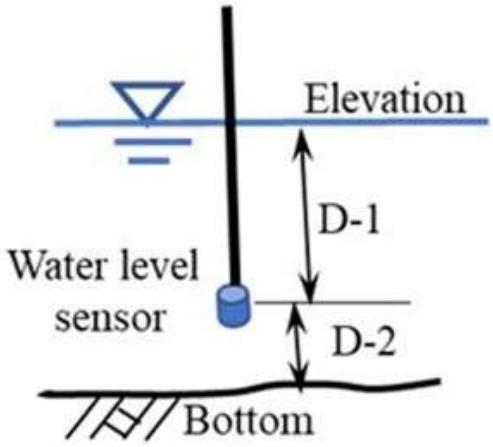
A) Arrange and decide the locations of sensors, guide pipes and handholes.

4-3-3

A) Dig earth as needed for guide pipes and handholes.

4-3-4

A) Make holes at the lower 1 meter of the guide pipe so that water goes into the pipe freely.
B) Make holes to an end cap and put it to the guide pipe.
C) Use non-woven fabric/cloth to cover the lower part of the guide pipe and fix with cable ties or wire.

	
4-3-5 A) Select a proper water level sensor as the measuring range differs among the sensors. B) Note that sensors of different cable length are available. Select appropriate cable length. C) It is necessary to specify the measuring range and cable length when ordering the sensors.	 Water level sensor  EC sensor
4-3-6 A) It is recommended to check if the sensors can pass through the PF pipes or not. B) Select and prepare proper size of sensors, PF pipes and PF couplings.	
4-3-7 A) It is ideal that a water level sensor reaches the bottom of the canal/river bed. B) In case the sensor can't reach the bottom, identify the distance betweenf the sensor positioned and the bottom (D-2) and/or the depth from water surfce (D-1). C) Adjustment and conversion must be done by connecting PC and control logger refering to Manual (SESAME II-02d).	

4-3-8

A) Iron plates are useful to set and fix guide pipes.
B) Use anchor bolts to fix the plate to a concrete floor.
C) When applicable, the guide pipe can be fixed to the plate before fixing the plate.
D) When setting the guide pipes at sea water condition, use PVC pipes.

4-3-9

A) Guide pipes must be positioned properly and fixed strong enough to withstand against water flow.
B) Saddle bands are useful to fix the guide pipes.

4-3-10

A) When guide pipes are laid along the dam body, consolidate the proposed installing line and make sure the guide pipes are straight.
B) Also, secure good base for the guide pipes.

4-3-11

A) Anchoring iron bars may be used to fix guide pipes.
B) Make sure the iron bars stand firmly.

4-3-12

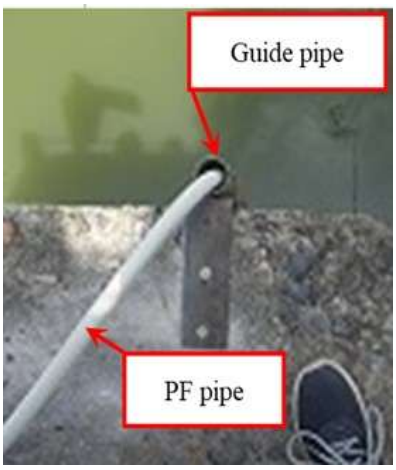
A) The sensor may not reach to the desired depth because of the water level and other reasons.
B) It may be necessary to extend the guide pipe to the desired elevation later.

4-3-13

A) When 2 (two) guide pipes are used for water level and EC sensors for instance, pipe clamps are useful.

4-3-14

A) After setting the guide pipe for sensors, insert a sensor delicately until the sensor reaches the bottom of the guide pipe.
B) PF pipe does not need to reach to the bottom, but the opening of the guide pipe is very sharp and may damage the cable. Use PF pipe to protect the cables at the openings.



4-3-15

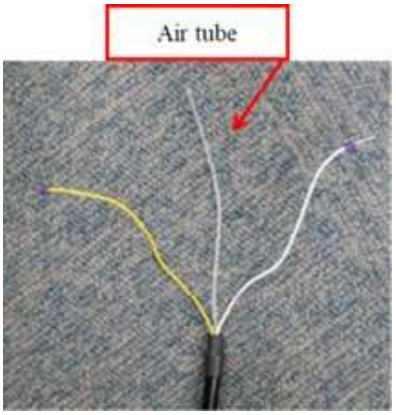
A) Guide pipe stands can be designed when necessary as shown.

4-3-16

A) When EC is measured at a pre-determined depth, take necessary measurement (for eaxmple, distance from the pipe opening to the desired measuring depth) and place marks on the cable.
B) This will help reinstalling the sensor at the desired depth after maintenance works.

4-3-17

A) The other end of the pressure type water level sensor cable has 2 fine lines (white and yellow) and a transparent air tube (photo).
B) Never press or fold the cables when handling and inserting the sensor cable into PF pipe.
C) Use electric tape to protect the fine cable lines and the air tube when handling and inserting.

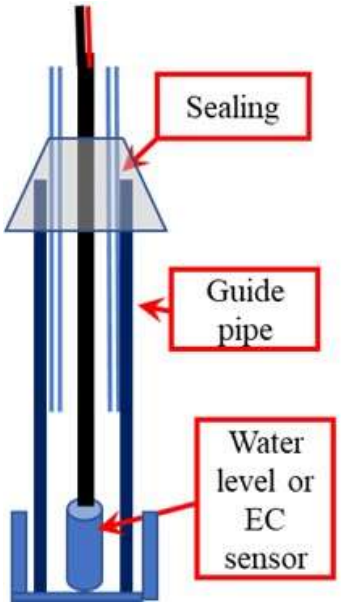


4-3-18

A) Photo shows a sensor has been inserted into guide pipe and drawn to a handhole.

4-3-19

A) Seal openings with sealing materials to prevent insects and rubbish entering into guide pipes.
B) First, cover the cable with a soft rubber sheet, then use adhesive tape to cover the sheet and seal the whole openings.
C) Don't apply adhesive material to the sensor cables directly as it may damage the cables.

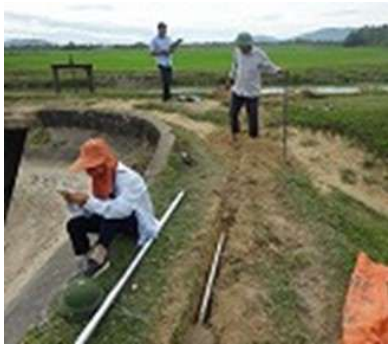


4-3-20

A) When the cable and PF pipes are burried underground, protect the cable with iron pipes or heavy-duty PVC pipes.
B) Close the openings at both ends of the iron/PVC pipes with adhessive tapes and rubber sheets.

4-3-21

A) Backfill the digged part and cover the guide pipes.



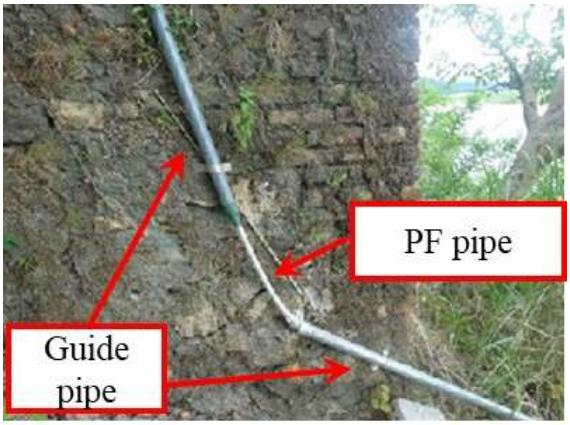
4-3-22

A) The sensor cables must pass through handholes before reaching a logger box.
B) Connect PF pipe and the handhole/logger box using PF couplings.
C) Some sensors may be too large to go through the PF pipes. In this case, insert the cable into guide pipes.

	
4-3-23 A) When mistakenly connected the PF pipes and coupling, check sign on the coupling. B) You can detach the PF pipe by rotating an outer ring to "Release" position. C) Don't forget to set it back to "Connect" position after properly connecting.	
4-3-24 A) Position the handhole at the bottom of the main pipe. B) Additional handholes are necessary when the slope/angle of the guide pipes is too acute to pass through the sensors causing troubles when retrieving the sensors for maintenance.	 

4-3-25

A) When the angle of the guide pipes is not so acute but gentle enough to pass through the sensor itself, PF pipe can be used.
B) Don't forget to seal the openings.



4-3-26

A) Handholes store excess cables and are needed when retrieving the sensor for maintenance.
B) Use 1 (one) handhole for each sensor.

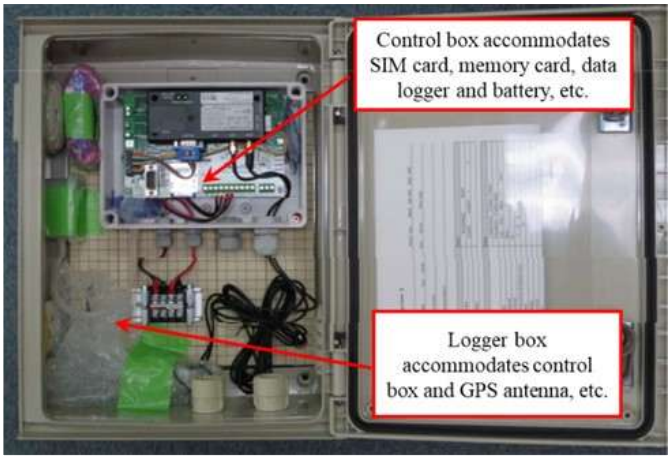
4-3-27

A) Fix handholes with stainless band and/or wires.
B) After coiling and inserting cables, put the lid and close the handholes.

4.4 TM logger box setting

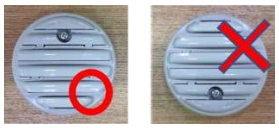
4-4-1

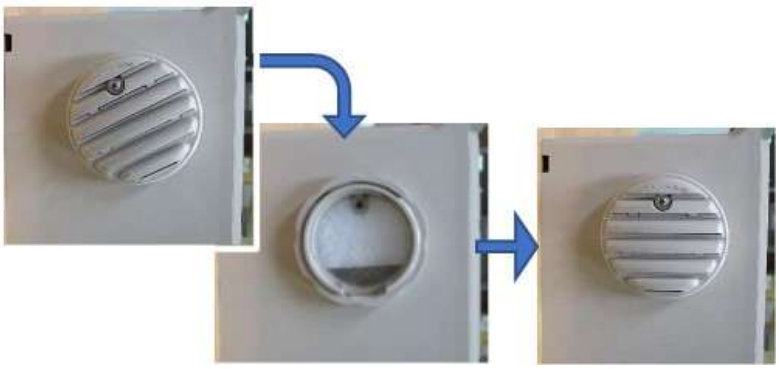
A) Check the contents in the logger box with a document supplied by manufacturer.
B) Take photo and record SIM number, charged amount, expiry date of the charge, and coordinates of installation point.



4-4-2

A) A ventilator consists of 3 parts.
B) Fix the inner part by tightening the fixing ring. The ring should locate outside the box.
C) Set the outer part and turn to right slightly.
D) Tighten the screw to fix the outer part.
E) Make sure the screw is located upward.



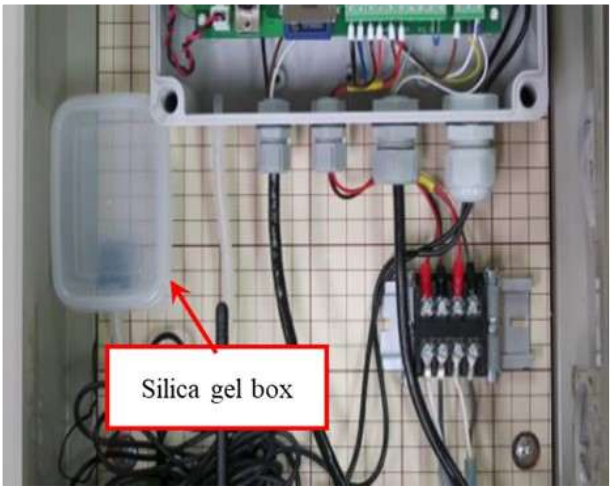


4-4-3

A) There are 4 holes for the plate fixing bolts at the corners of the logger box.
B) After fixing the plates on the back of the logger box, plug in rubber caps.
C) The caps prevent water and insects from entering into the logger box.

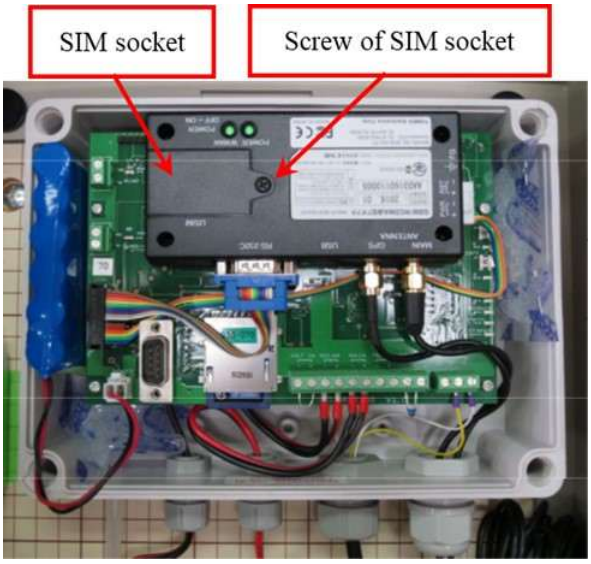
4-4-4

A) A plastic box contains silica gel to absorb moisture in the logger box.
B) Make sure a plastic pipe is connected to the logger box and set the gel box properly.



4-4-5

A) Open logger box.
B) Open the SIM socket and insert a SIM card.
C) Return the SIM socket back and tighten the screw.
D) Connect battery and check if the system works with LED lights.



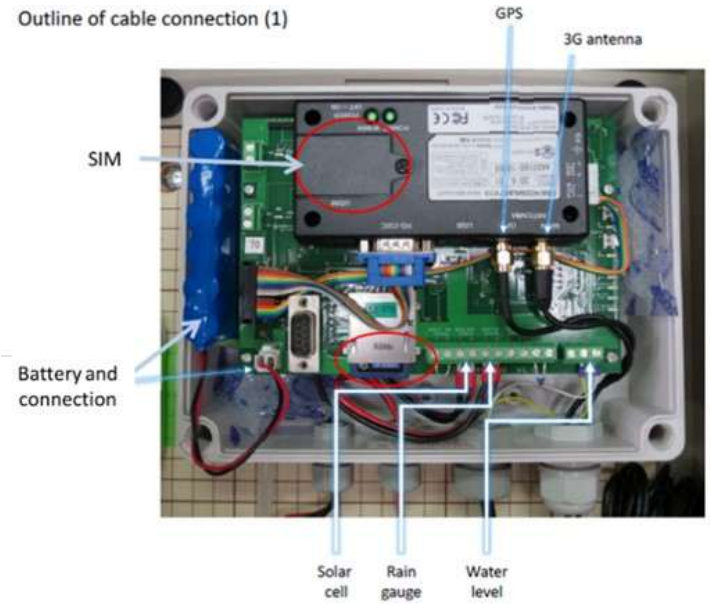
4-4-6

A) Install setup software (Sesame2_02d) to a PC. Make sure to install the software of proper version.
B) Connect to PC with USB to RS232C cable.
C) Set up necessary parameters refering to the setup manual.

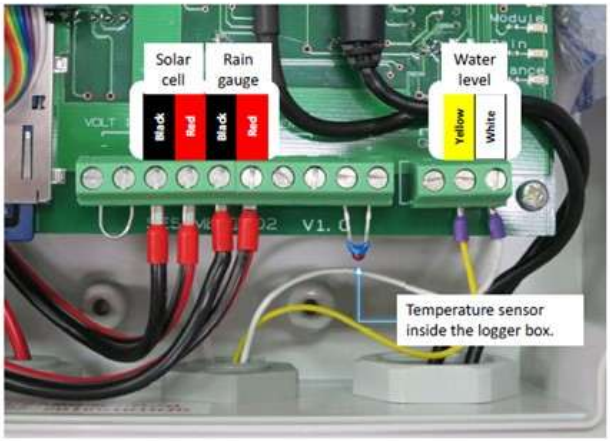
4-4-7

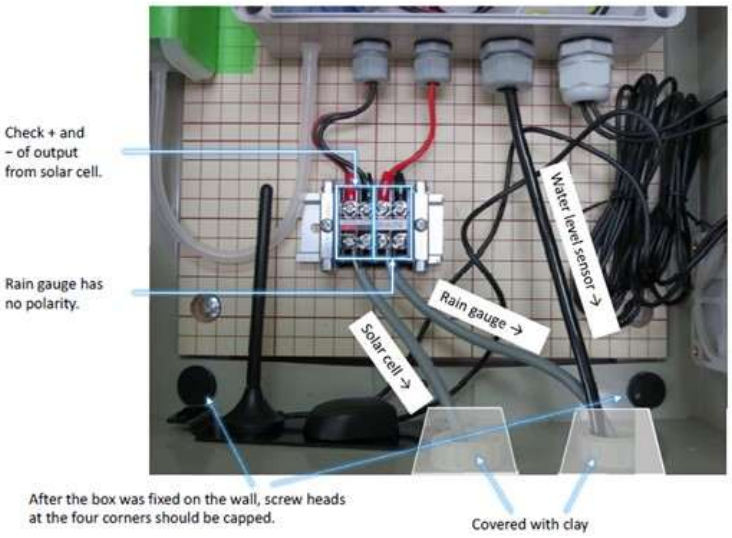
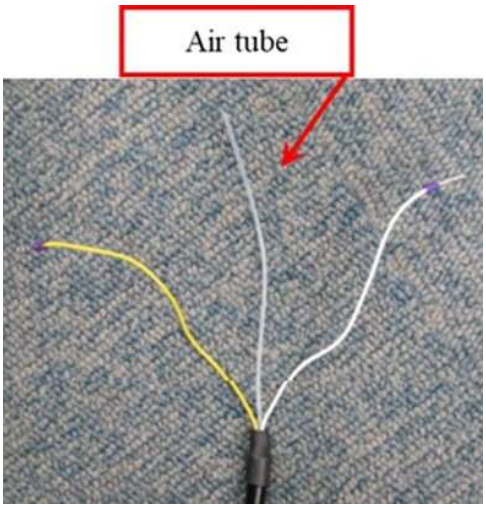
A) Make sure to understand the detail of cable connection prior to works by referring to the manual.

Outline of cable connection (1)



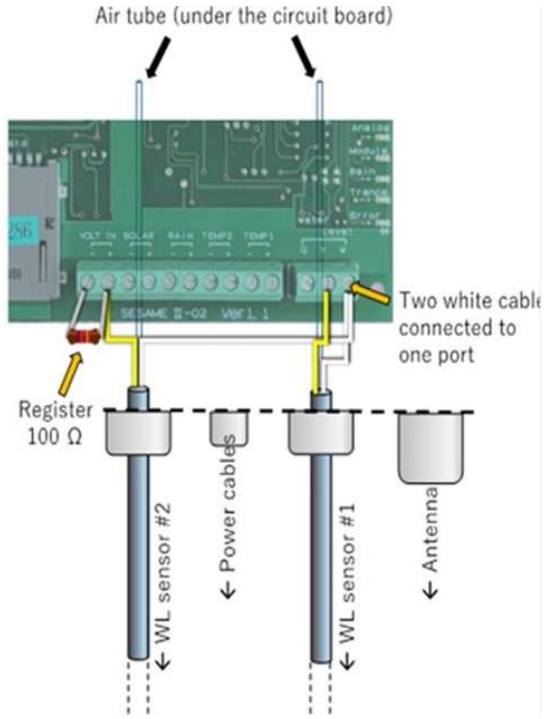
Outline of cable connection (2)



	Outline of cable connection (3) 
4-4-8 A) Cables of water level sensor are made up of 3 fine wires; white, yellow and transparatent air tube. B) The air tube keeps the pressure in the sensor same as the atomospheric pressure. C) Never press, fold or fill the tube with any substances other than air.	

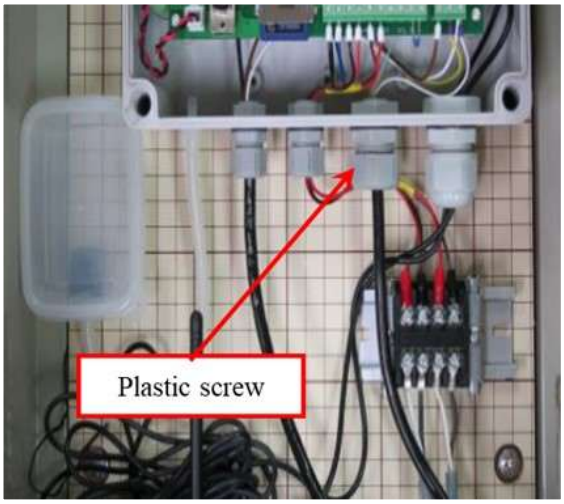
4-4-9

A) When 2 (two) water level sensors are connected to 1 (one) logger box, cable connection is different from single sensor connection.
B) Always refer to the manual provided by the manufacturer.



4-4-10

A) Plastic screws are designed to solidly tighten the cables with a rubber set inside the screw.
B) Make sure the screws are tightened enough to avoid disconnection of cables.



4-4-11

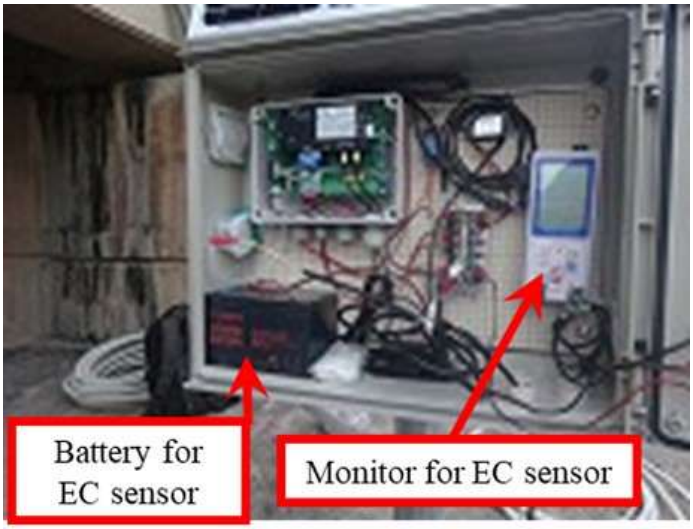
A) Make sure the connections are properly completed.
B) Coil/wind the excess cables.

4-4-12

A) After fixing the cables, coil excess cables, and seal the openings at the bottom of the logger box with industrial clay.
B) Before putting the clay, coil cables at the couplings. This prevents unnecessary disconnection.
C) Do not forget to apply the clay at openings at the cables of the solar panel and rain gauge.

4-4-13

A) When water level and EC are measured, a larger logger box is used to accommodate additional battery and EC monitor.
B) Use a main pipe of diameter more than 150mm.
C) The logger box is also heavier. So make sure to have strong main pipe and fixings of the logger box to the pipe.



4-4-14

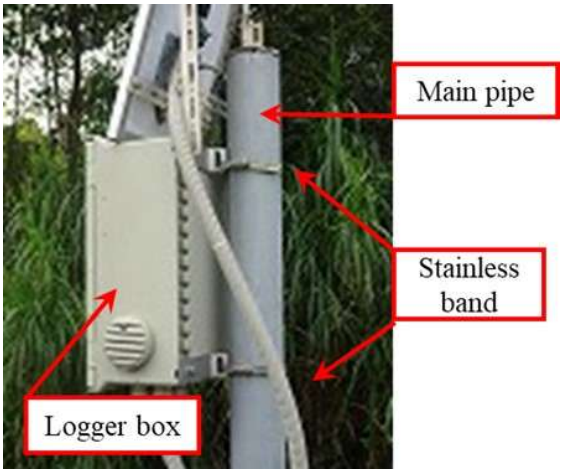
A) Connect PC and logger box, and check final system and parameter settings.
B) Apply and leave insects and ant repellent in the logger box before closing.

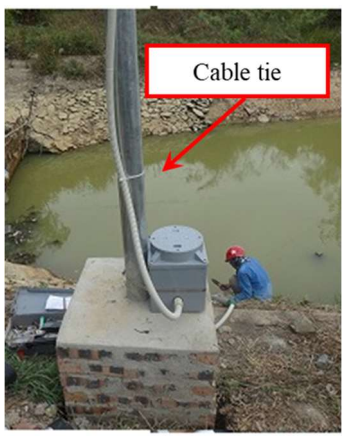
4-4-15

A) Lock the logger box.
B) Hosit the logger box to a desired height along the main pipe.

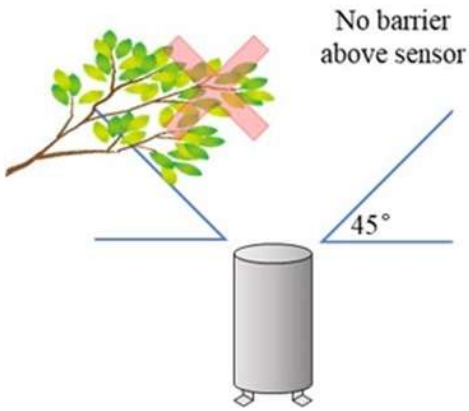
4-4-16

A) Use stainless bands to fix the logger box to the main pipe.
B) In case any mischiefs are concerned, PF pipes can be guarded with iron pipes and the iron pipes must be strongly fixed to the main pipe.



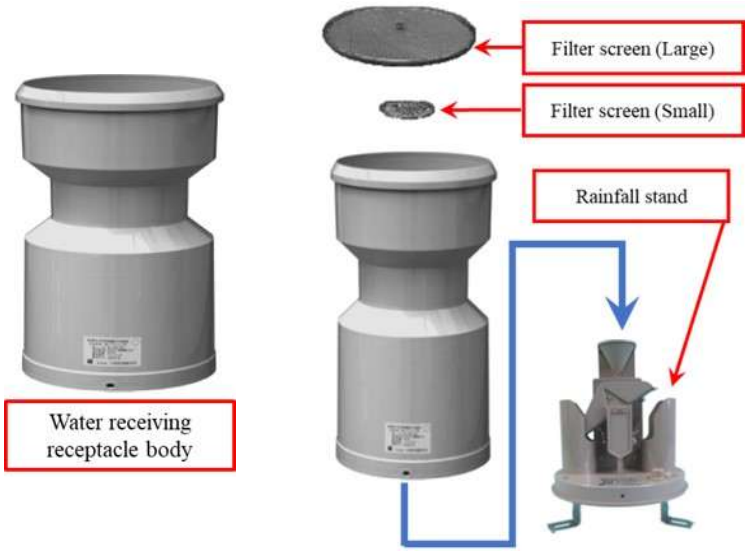
4-4-17 A) Use cables ties to orderly place and fix the PF pipes for sensors, solar panel and/or rain gauge along the main pipe. B) Make a hole at the lower part of the PF pipes so as to unintentionally entered water be drained. C) Take photos for recording.	 

4.5 Rain gauge setting

4-5-1 A) Make sure there is no obstacles and trees above and around the gauge. B) Log out those trees and any obstacles.	
4-5-2 A) After fixing metal frame, adjust screws and nuts to make the stand horizontal referring to the level located on the stand chasis. B) Note that final adjustment must be done after the rainfall gauge is hoiosted at the proper height. C) Refer “Manual OW-34-BP_005” for more detail.	 

4-5-3

A) As far as the main pipe stands vertically and the rain gauge stand is set horizontally, you can set the rain gauge body before hoisting the TM system.
B) Set 2 (two) filter screens, set and fix the body with screws.



4-5-4

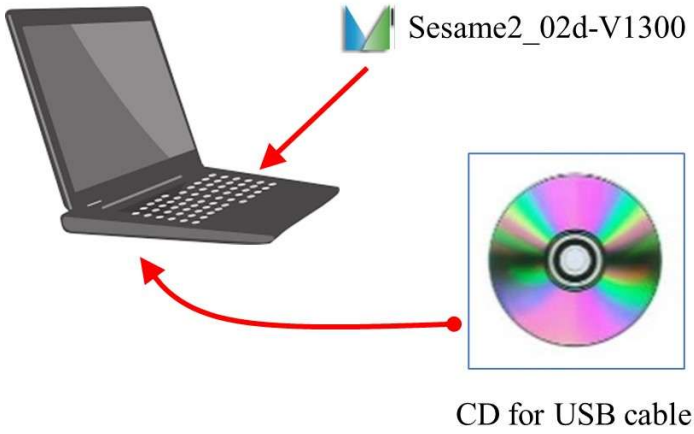
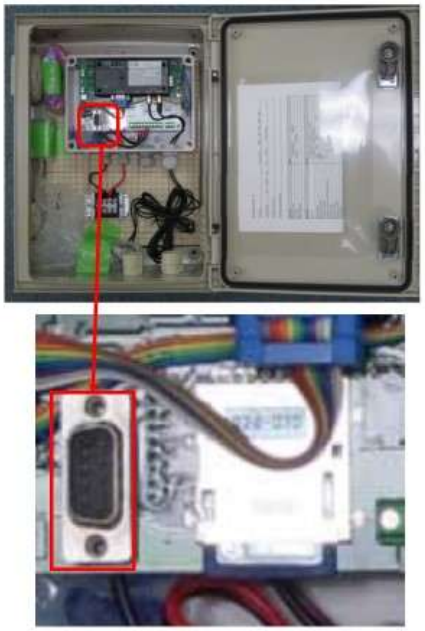
A) Insert rainfall cable into PF pipe.
B) Draw the cable to the logger box and connect to terminals as designed. Fix the PF pipe at the bottom of the logger box.
C) Seal the opening at the logger box. Make a drain hole at the lower part of the PF pipe.

4-5-5

A) Fixing the rain gauge (and logger box) to an existing iron pipe minimizes cost and time.

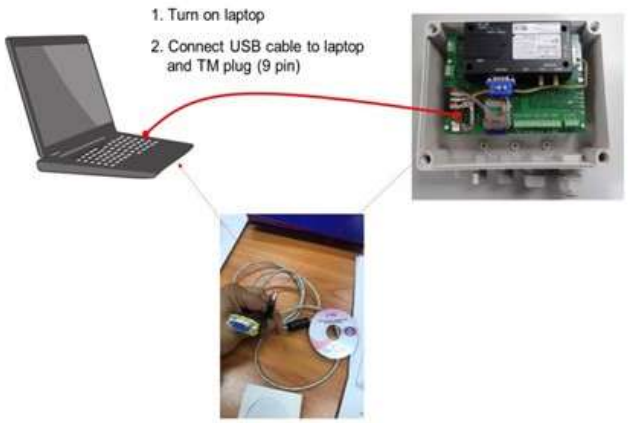
4-5-6 A) Make a drain hole at the lower part of the PF pipe. B) Fix the PF pipe to the main pipe with cable ties.	

4.6 System setting

4-6-1 A) Install set-up software to a laptop computer. B) Install a software of USB cable to the laptop.	
4-6-2 A) Open logger box, and find 9 pin plug.	

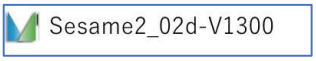
4-6-3

A) Connect the laptop USB port to 9 pin plug in a logger box by the USB serial cable.

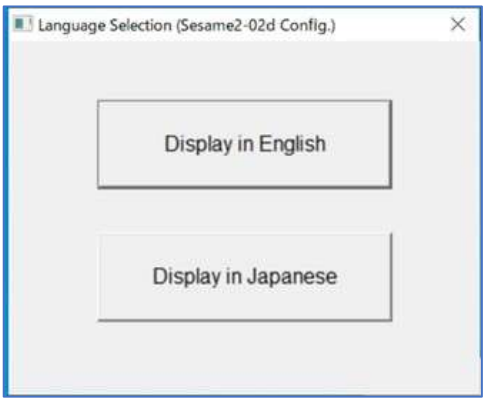


4-6-4

A) Run set-up software in laptop.

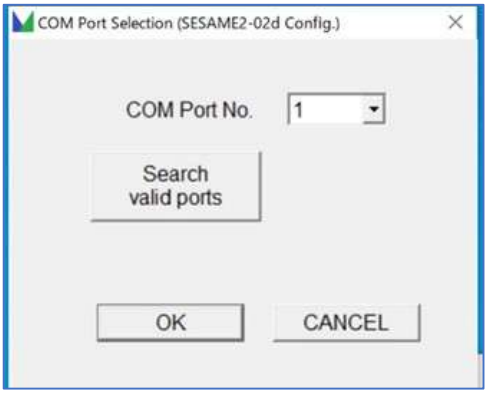


B) Select language (English)



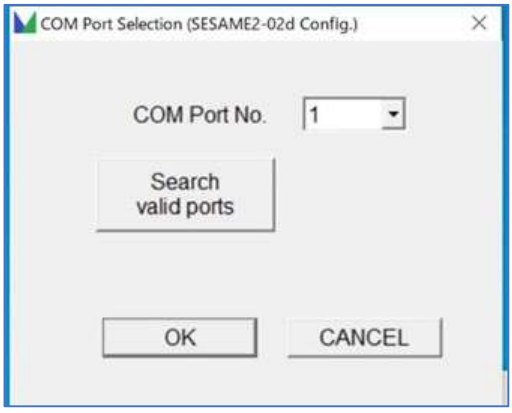
4-6-5

A) Click “Search valid ports” to find valid port.



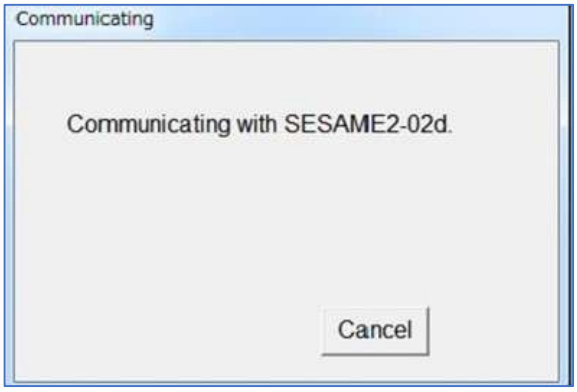
4-6-6

A) Valid ports on the PC side is displayed.
B) Click “OK”.
C) When not starting communication, click “Search valid ports,” and click “OK” (or select from pull-down button, and click “OK”).
D) Repeat (C) above until communication establishes.



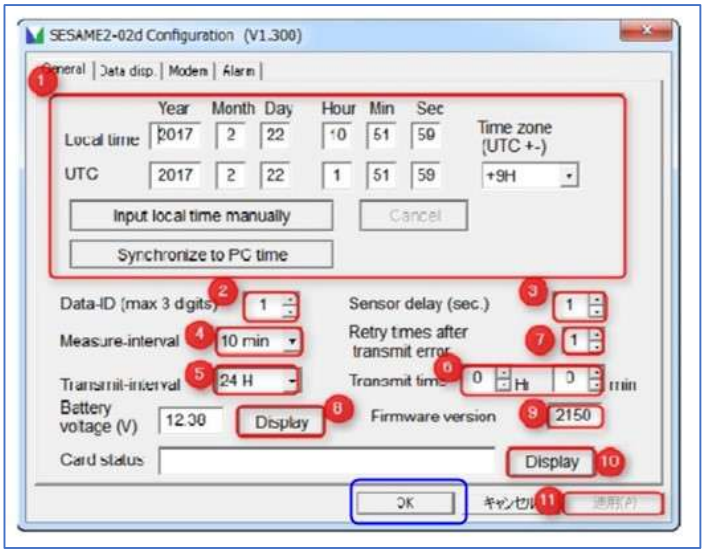
4-6-7

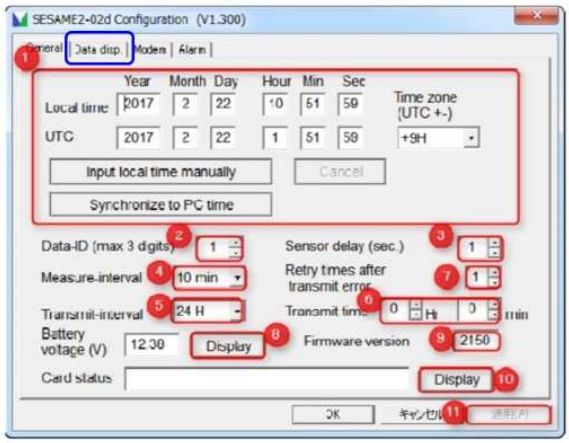
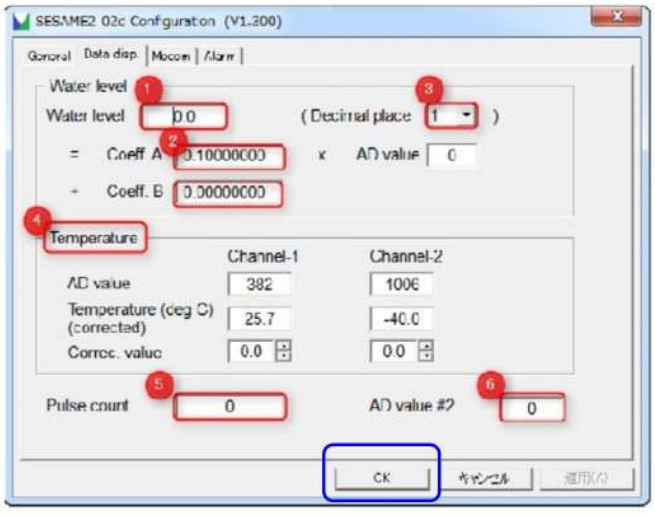
A) Communication starts.

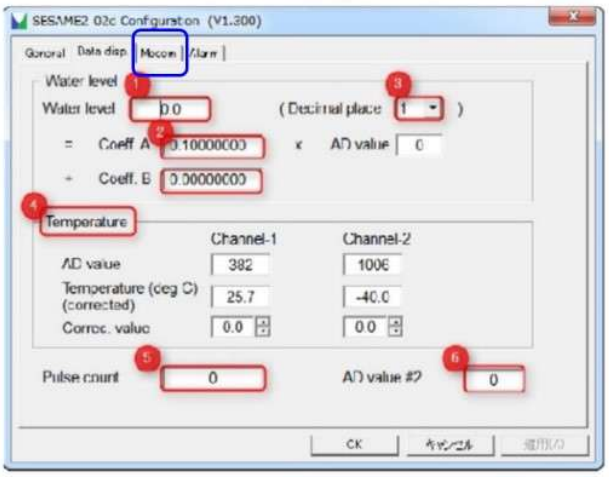
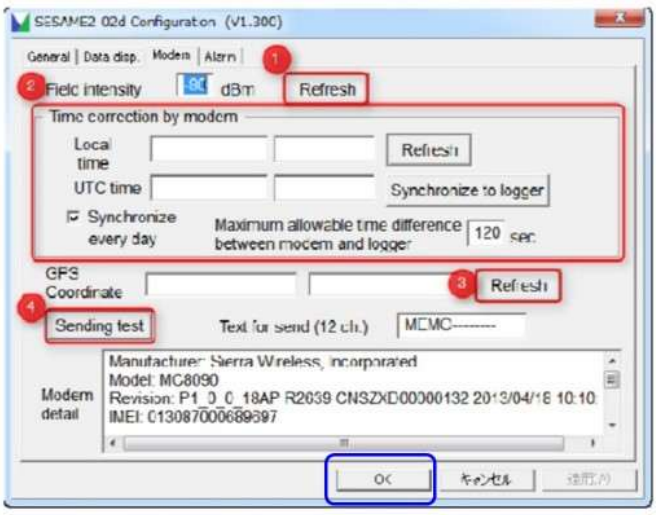


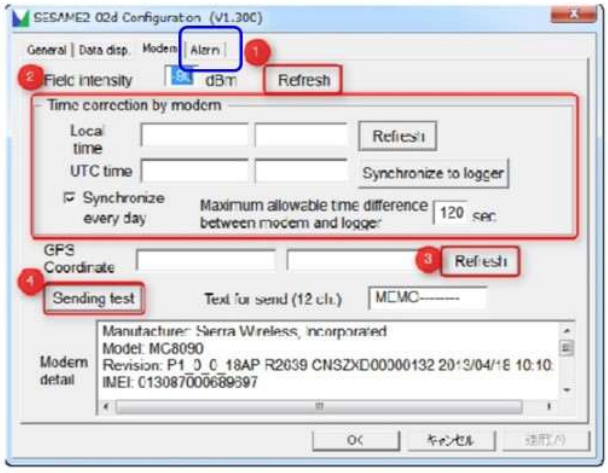
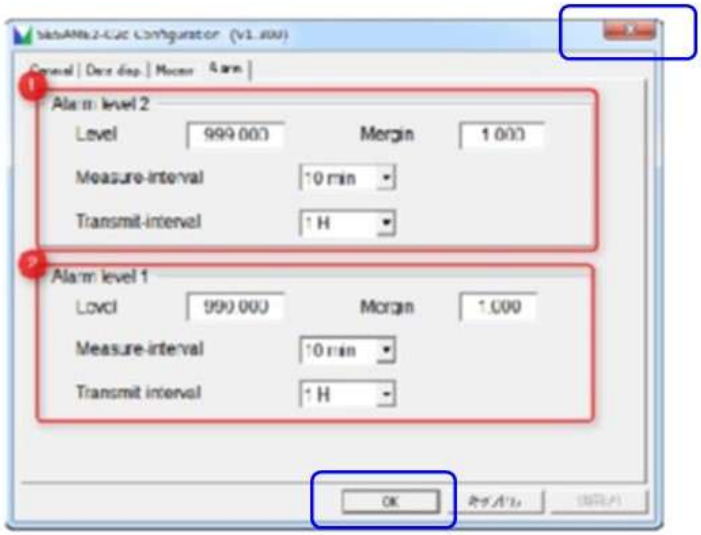
4-6-8

A) Appear general table.
B) ①: Clock adjustment. Usually, click "Synchronize to PC time".
C) ② : Data-ID. Sensor number is managed by manufacturer. Do not change this setting on the user side.
D) ③: Sensor delay. Time to the sensor stabilizes and measures. Usually set as 2 seconds. Sensor delay affects battery life. It varies depending on the power supply time required by the connected equipment. Do not change this setting on the user side.
E) ④: Measure interval. (M-interval-0: Normal interval). You can set normal measure interval from 1 minute to 1 hour. Normally 10 minutes.
F) ⑤ : Send interval. (S-interval-0: Normal interval). You can set normal send interval from 5 min to 24 hours. Normally 30 minutes.
G) ⑥ : Send time. Adjust the data sending time. Since communication starts after data is recorded, it is set at 1 to 2 min as factory default.
H) ⑦: Maximum retry count of transmit error. Set the number of retries when transmission failed. If you set retry count 1, it tries to send the data 2 times - including the first sending. Note) Increasing the number of retries will spend more battery power.
I) ⑧: Battery monitor. It checks the battery voltage of logger. Over 7volt (V) battery voltage is required, so you should check the battery if the voltage goes down below 7V.



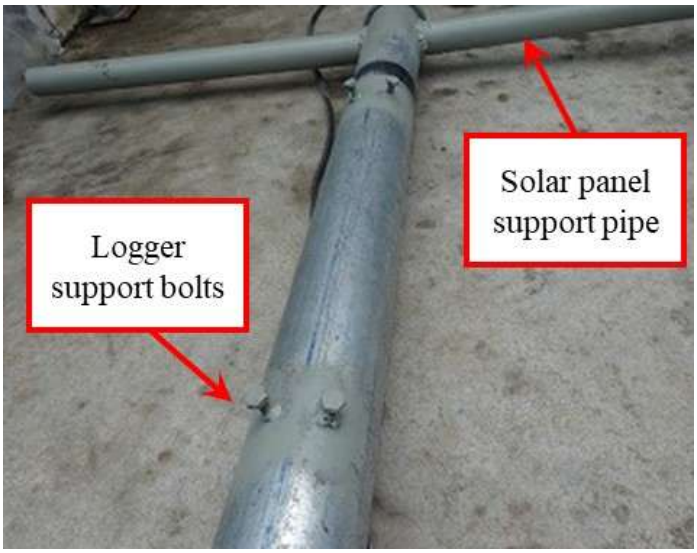
J) ⑨ : Firmware version. The base firmware version. Note) Do not change firmware on the user side. K) ⑩: Card check. It checks whether the SD card is available. If 4GB SD card is available, for example, it displays (Available = 3.67 GB/Used = 608KB). Note) Up to 2G (FAT16) memory card and 4G (FAT32) memory cards can be used. Do operation tests before use. L) Take a screenshot to confirm later. M) ⑪: Apply. If you change settings, be sure to click "Apply". Without this action, the changed settings will not be saved. N) When finish, click “OK”.	
4-6-9 A) Select “**Data disp.**” tab, and click.	
4-6-10 A) Appear data display table. B) ①: Water level. It shows the value of water level sensor.This is set up by Y＝ax+b equation. C) ②: Setting of water level coeffients. "a", "b" are the coefficients, water level = aX+b (X is AD value). The coefficient "a" is unique to sensor. And by changing the coefficient "b", you can calibrate the water level. Note 1) The unit of water level is "cm", but you can change it to "m" or "mm" by changing "a". Note 2) If information on the range of the water level is provided in advance, it will be set before shipment. Note 3) Please refer to “SESAMEII-02d Instruction manual” for the values of coefficient "a" and "b". D) ③: Decimal points. 0～3 digits are available.	

E) ④: Corrected value of temperature. “TEMP1”- Channel-1 and “TEMP2”- Channel-2 tempertures are displayed. Note) At shipment, a thermistor for measuring the internal temperature is installed in "TEMP 1". F) ⑤: Pulse count. It is the value of pluse count of rain gauge. To get the amount of rainfall, calculate from pulse rate of rain gauge. G) AD input value 2. It displays the value of analog input channel. The analog input channel can measure from 0V to 2V, and displays converted digital values from 0 to 4000. H) Take a screenshot to confirm the settings later. I) When finish, click “OK”.	
4-6-11 A) Select “**Modem**” tab, and click.	
4-6-12 A) Appear modem table. B) ①: Strength of a radio wave. It displays the status of antenna. When the minus value is smaller, the antenna level is fine. Exceeding -95dBm, the antenna level is bad and communication cannot be performed well. C) ② : Time adjustment from the modem. It has a function that can adjust data logger's RTC periodically. MEL recommends to check "Synchronize every day" and apply the change. D) ③ : GPS information. Click "Refresh" to see the newest GPS info.	

E) ④: Test sending. Put some text in the text box of sending memo, and click "Test sending". You can check on the internet whether test data has been sent. F) Take a screenshot to confirm later. G) When finish, click “OK”.	
4-6-13 A) If alarm water level is decided in advance, select “**Alarm**” tab, and click.	
4-6-14 A) Appear alarm table. B) It can set alarm from water level data. The alarm has two levels. The level 1 is PH (process higher limit alarm level) and the level 2 is HH (highest limit alarm level) which are used for river flood management. C) Normally, STA is set 0, and you don’t need to change it. D) Since alarm can be set by WEB, no need to change initial setting here. E) Take a screenshot to confirm later. F) When finish, click “OK”, then click 	
4-6-15 A) After confirming the system is working, measure the water depth by using a dry stick and a convex. B) Compare the TM water depth and measured depth. C) Correct the TM water depth by entering the difference to the system through the procedures mentioned from 6-6 to 6-10. D) Make coincidence of TM water depth and measured one by changing coefficient “b” in 6-10.	 

Ⅲ. Installation of Water Quality TM Equipment

- Water quality involves various parameter to measure and monitor. Users need to select the most appropriate sensors satisfying the needs and local condition.
- As the maintenance is vital for accurate water quality monitoring, easiness of the maintenance work must be taken into account when designing and installing the TM system.
- Measuring dissolved oxygen (DO) with septal electrode method may decrease oxygen around the sensor and yield lower DO value than actual. It is advised to estimate the most reliable daily average DO value from the measured DO values with septal electrode method.

(1) Preparation A) Water quality measurements require more power, thus additional battery and solar panel are necessary as well as sizable main pipe. B) 100~150mm diameter (depending on the length) of the main pipe is recommended. C) It is good idea to weld bolts to support heavier and larger logger box.	
(2) Water quality sensor A) The photo shows water quality sensor probe of Horiba U-53. B) As water quality sensor probe is larger and heavier than the ones for water level and EC, use larger size of guide pipe and rigid frame.	 

(3) Guide pipe

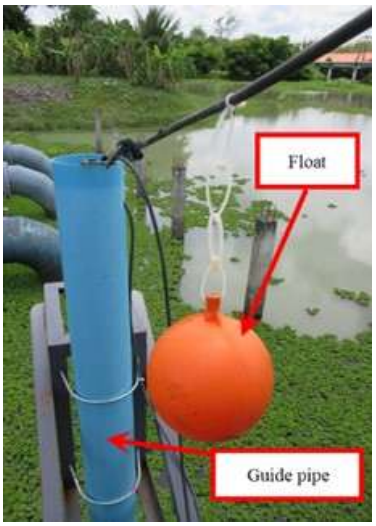
A) Water quality sensor probes are much larger in size than water level and EC sensors, thus require larger guide pipes.
B) Prepare and set up rigid frames for supporting the guide pipes.

(4) Setting guide pipe

A) Carefully install the guide pipes.
B) Work with great care. Never drop tools and materials as it may cause critical injuries.

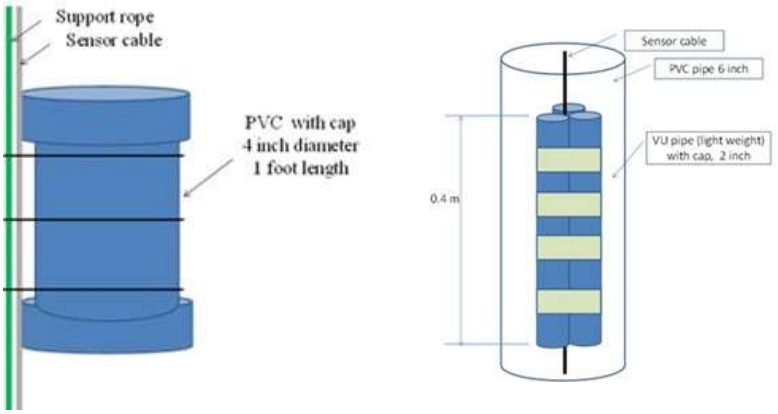
(5) Float

A) When meauaring water quality at a certain depth from the water surface, use a float tied to a support rope.
B) It is not recommended to directly tie the float to the sensor cable.
C) Make sure that the sensor stays at the desired position by adjusting the place to set the float.



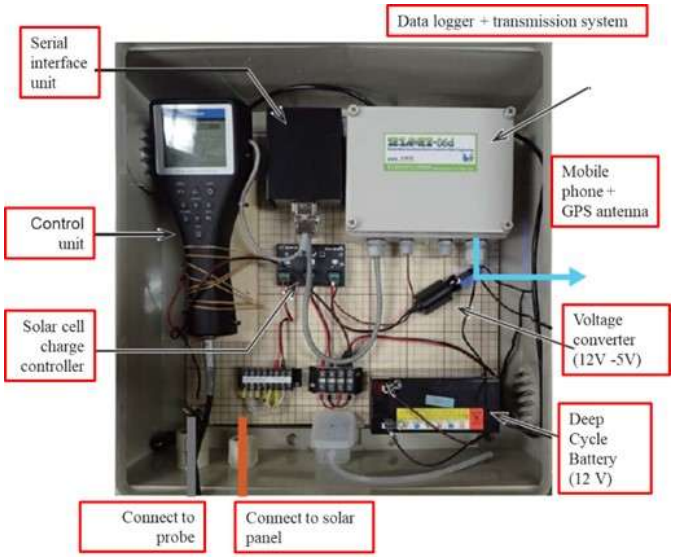
(6) Setting float

A) There are different types of float with a guide pipe.
B) Select the most suitable type depending on the environment and conditions.
C) Also consider easiness and cost of installation as well as regular maintenance works.



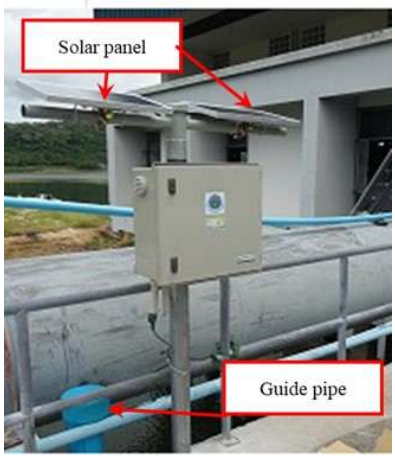
(7) Communication box

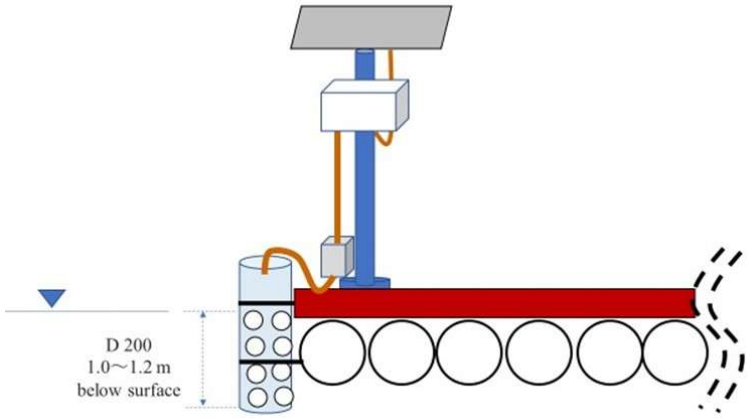
A) When using water quality sensor, a serial interface and deep cycle battry are needed.
B) Use a main pipe of diameter more than 150mm.
C) Refer to the manual provided by the manufacturer for cable connection and set up.



(8) Setting equipment

A) Installed TM system with water quality sensor.



(9) Setting TM on floating facility A) Another alternative is also available where the sensor and TM system is set on a floating pump station. B) Make a hole in the PVC pipe to secure the water flow as shown in the figure.	

Ⅳ. TM Data Display System

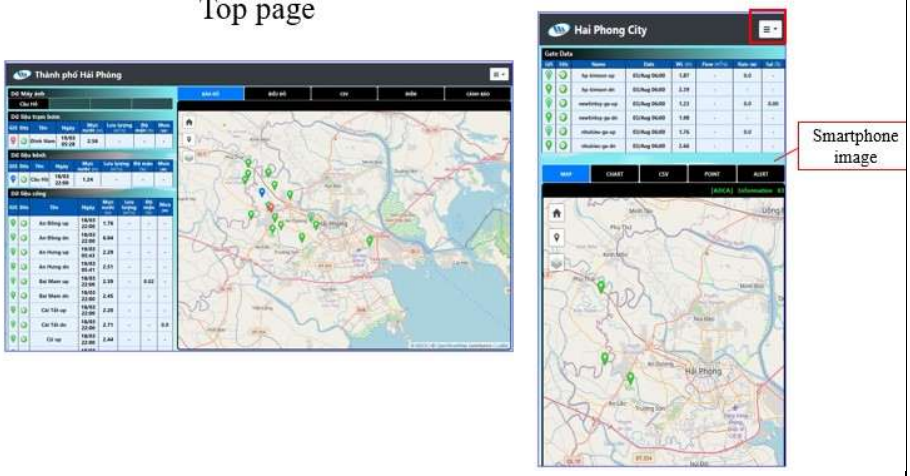
- The TM Data Display System (TM System) will enable users to easily check data on their smartphones without stress.
- The TM System will minimize system operating costs by using license-free software.
- TM data from various manufacturers installed in the irrigation project will be integrated into the TM system via API and websites, making it possible to check TM data for the entire irrigation project.
- The TM System will have the following functions: (1) Display an alert when TM data exceeds a threshold, (2) Store all past data in a database as CSV files, (3) Graph TM data for a specified period and convert the graphed data into a downloadable CSV file, and (4) Display the location, photos, SIM card information, etc. of individual TM equipment.
- Because users will view the data via the Internet, the TM System will be fully secured to withstand cyber attacks.

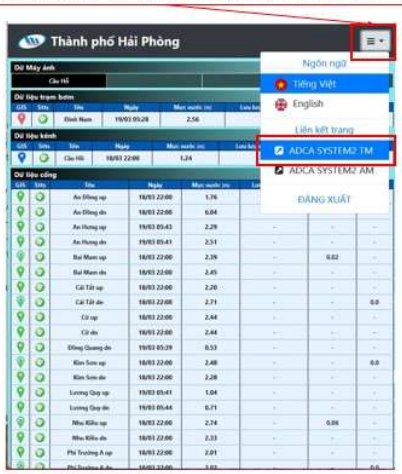
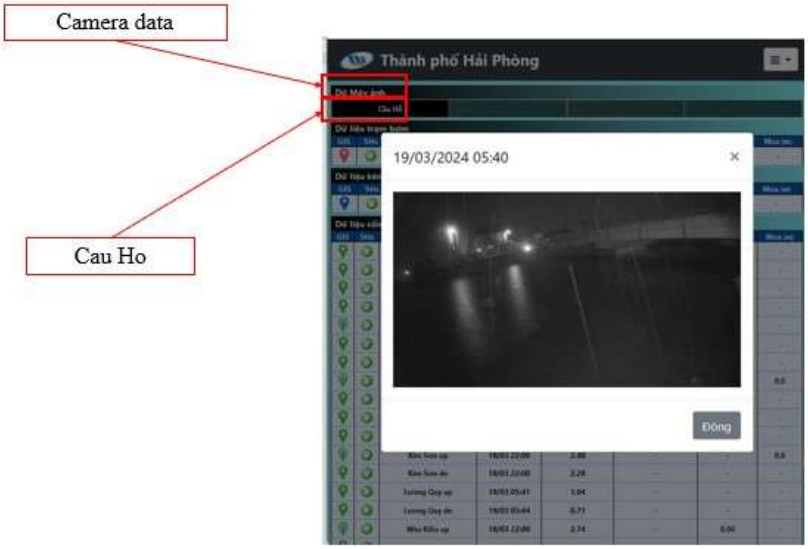
1. Log in to the VAWR system

1-1 A) Start Internet Explorer, enter the designated address or read the QR cord, and access the System.	WEB Application URL (SSL encrypted) **https://vawr.adca-system.org/** 

1-2 A) When the login form appears, enter the User name and Password, then touch (click) the [Sign in] button.	User name haiphong - User of Hai Phong City - Data entry / edit / delete and search / view functions only in Hai Phong City haiduong - User of Hai Duong Province - Data entry / edit / delete and search / view functions only in Hai Duong Province PW: [redacted]

2. Top page

2-1 A) The top page displays the name of the TM, the date of the most recent data, and data for each sensor installed on the TM, categorized by type of irrigation facility. B) The laptop view shows a data table on the left, feature tabs on the right, alert messages and a map showing TM locations below it. On the smartphone view, the TM data table appears first, followed by feature tabs, alert messages and a map.	Top page 

2-2 A) When touched the hamburger button in the top corner of the screen, a language and TM/AM selection menu will appear, along with a log out button at the bottom. B) The TM screen will be displayed first, but to switch to AM (Asset Management), touch "AM." C) When finished using the System, touch "LOGOUT."	Touch and select "ADCA System2 TM" or "ADCA System2 AM, and "Logout" when finish. 
2-3 A) If camera TM equipment is installed, the latest camera image appears by touching the point name in "Camera Data."	

2-4

A) The TM data table is categorized into reservoirs, head works, rivers, gates, pumping stations, etc. depending on the status of facilities within the irrigation project. A unique marker is set for each type of facility, so the facility classification of the point can be seen on the map. If a water level sensor and rain gauge are installed at the same point, a water drop mark will be included within the marker.

B) TM data is categorized into water level, water depth, flow rate, rainfall, water quality, etc. depending on the type of sensor installed.

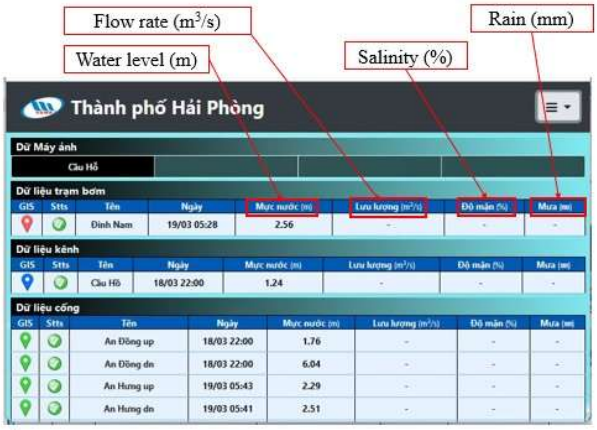
C) If a water level-storage conversion table or a water level-flow rate table has been prepared, the storage of reservoir and flow rate of river or canal according to the water level are displayed.

Pump station WL

Canal data

Gate WL

Gate WL & Rain



Status of equipment
If the marker changed to yellow or red, there is a problem in equipment.

2-5

A) The status icon indicates the status of the device.

B) The status icon changes according to the status of the TM device.

Status icon	
Normal operation	
ERROR	
WARNING	

2-6

A) An alert is issued if there is some abnormality in the data measured by the TM equipment.
B) The threshold value of the TM measurement value at which an alarm is issued is set by the TM administrator.

Example of threshold values

Item	ERROR	WARNING
Data receiving delay	259200s (72h)	86400s (24h)
Lowest water level	16.00 m	17.00 m
Highest water level (river)	6.00 m	5.50m
Battery voltage (upper limit)	9.30 V	9.10 V
Battery voltage (lower limit)	6.70 V	7.00 V
Water quality battery voltage (upper limit)	15.50 V	15.00 V
Water quality battery voltage (lower limit)	10.50 V	11.50 V
Temperature in control box (upper limit)	60.00 ℃	58.00 ℃
Temperature in control box (lower limit)	-15.00 ℃	-10.00 ℃
pH (upper limit)	8.50 ph	8.30 ph
pH (lower limit)	6.50 ph	6.60 ph
EC	2000 μs/cm	1900 μs/cm
DO	2.00 mg/L	2.20 mg/L
TDS	1300 mg/L	1200 mg/L
Salinity	1.0 %	0.9 %

2-7

A) Warning messages are displayed as moving captions above the map. Errors are displayed in red and warnings in orange so that the importance of the warning can be seen at a glance. If there are no abnormalities, "Normal operation" is displayed in green text.
B) Messages are displayed in the following order: point name, error or alert classification, date the abnormality occurred, and warning content.
C) At the end of the message, "Server message end" is displayed.

Example of warning messages

[point name] ERROR [date] No data update for over 72 hours.

[point name] WARNING [date] No data update for over 24 hours.

[point name] ERROR [date] Hazardous threshold exceeded. (in detail)

[point name] WARNING [date] Warning threshold exceeded. (in detail)

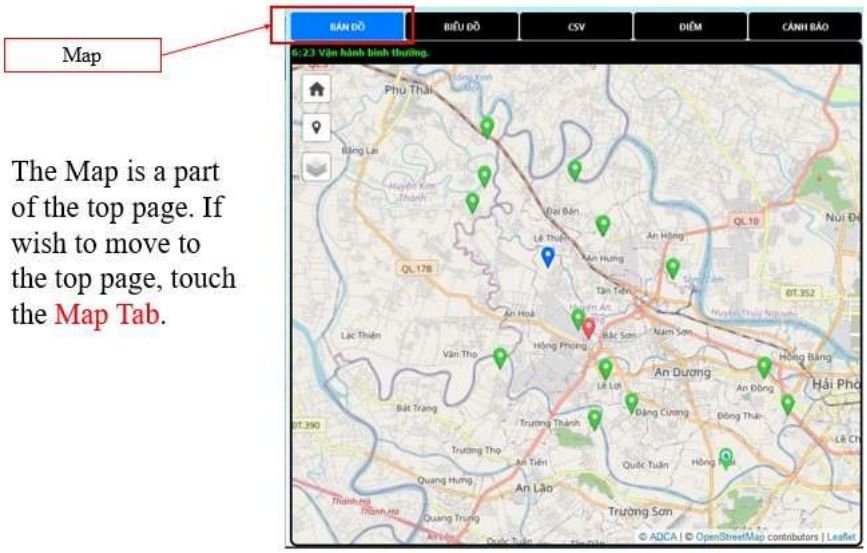
[ADCA] Information [date] Normal operation.

[ADCA] Information [date] Server message ended.

3. Map

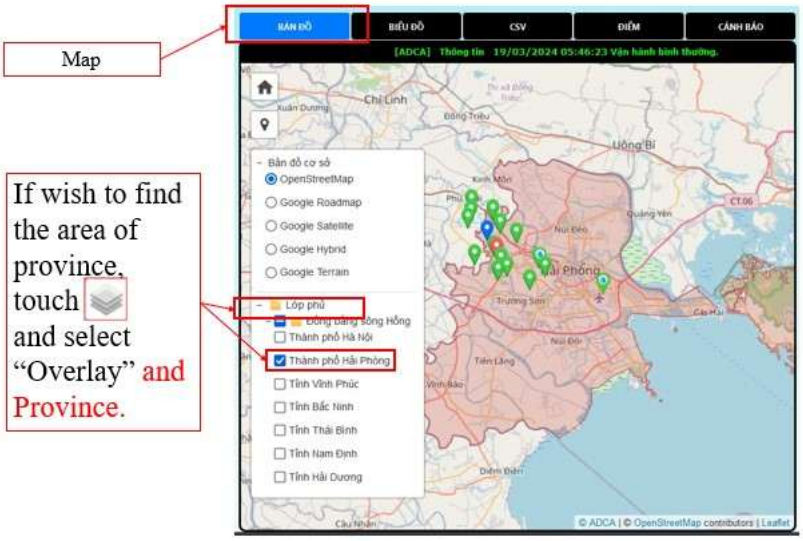
3-1

A) Following the TM data table, function tabs, messages, and a map are displayed, in that order.
B) The function tabs are divided into MAP, CHART, CSV, POINT, and ALERT, and each function is explained in the following separate sections.
C) The function of the MAP tab is to return to the top page.
D) On the map, the locations of all TM equipment registered in the System are displayed with markers. The color of the marker is determined by the facility where the TM is installed and the type of sensor.



3-2

A) Touch the document stack icon under the GPS marker to choose the map type: OpenStreetMap, Google Roadmap, Google Satellite, Google Hybrid, and Google Terrain.
B) In Overlay, provinces are arranged according to the regions of the country. Touching a region or province will show the area of the region or province shaded.



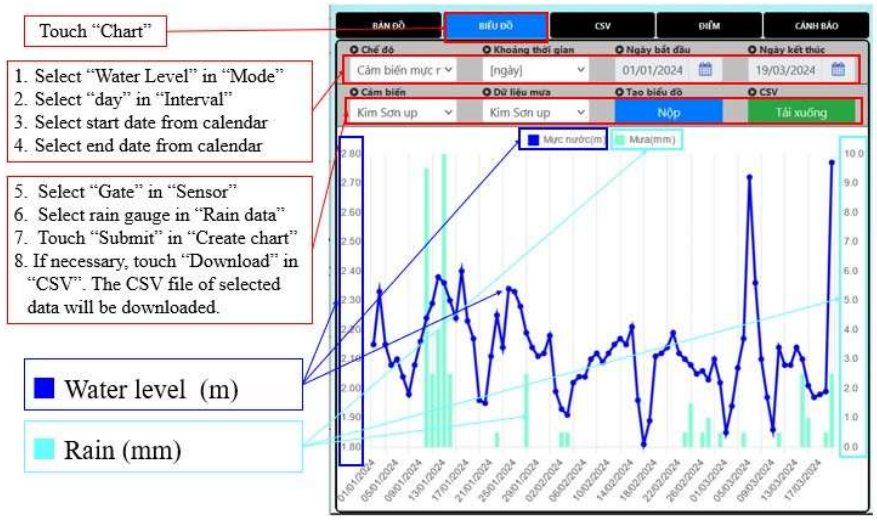
3-3

A) Moving messages indicating the status of the TM equipment are displayed under the function tabs. For details on messages, see 2-7.
B) When touched a marker on the map, the name of the point and a photo of the installed TM equipment will appear.

4. Chart

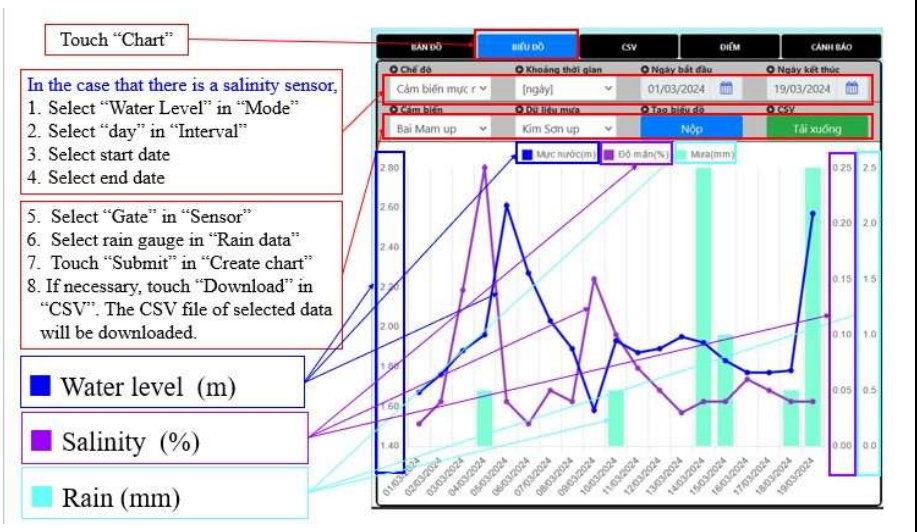
4-1

A) By touching CHART tab, graphs will be created.
B) In each box, select the TM point name, sensor type, data display interval (select from day, hour, or 10 minutes), and if necessary, select a rainfall TM from the options.
C) The data display period can be determined by manually entering the start and end dates or by selecting from the calendar.
D) After entering information in each box, touch "Submit" and the graph will be displayed. The graph data can be downloaded as a CSV file by touching "Download".



4-2

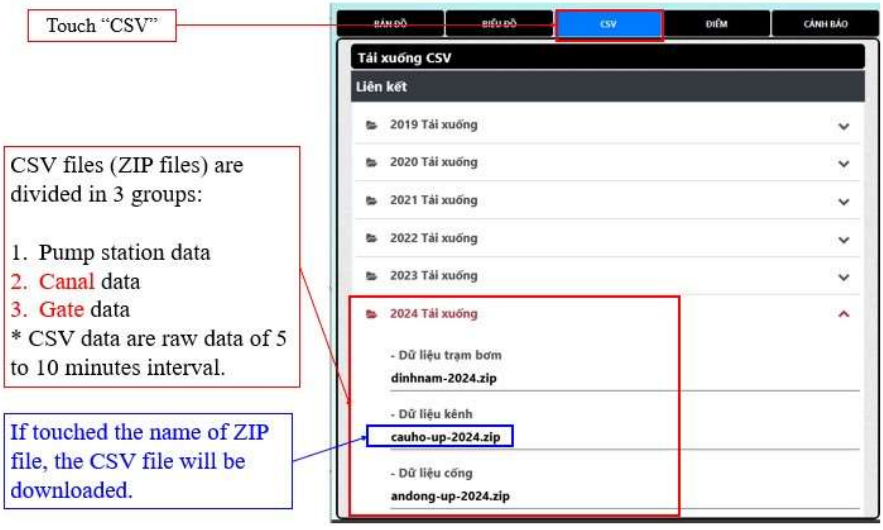
A) Water quality TM generally uses many different types of sensors, which makes the graphs complicated.
B) To display only the necessary data items, touch the legend of unnecessary items at the top of the graph to exclude them. To display the data again, touch the legend of the target item again.



5. Storage

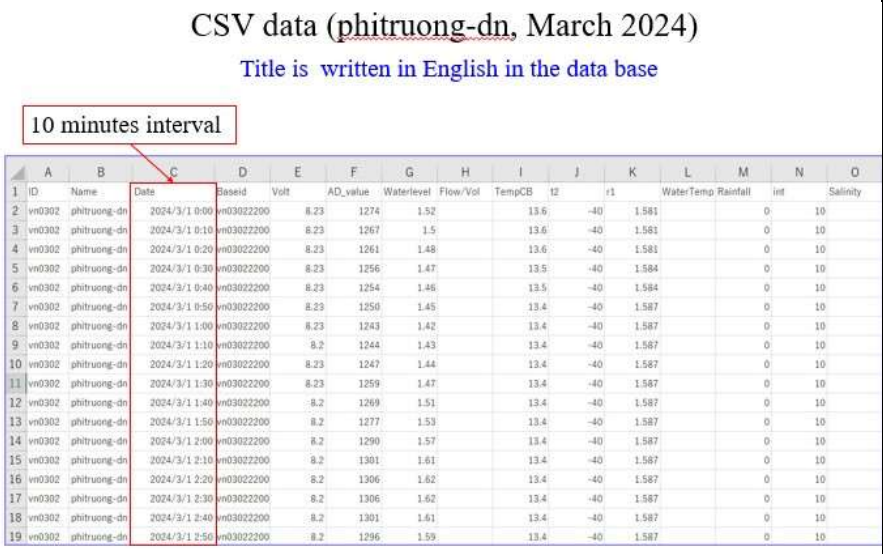
5-1

A) Once TM data is received, it is immediately put into a database.
B) When touched the CSV function tab, a breakdown by year will appear, so touch the required year. The yearly data is further divided into data for each TM point, and when touched the required TM point, a one-year CSV file for that TM point will be downloaded.
C) The CSV file contains 10-minute data for all items sent from the TM equipment.



5-2

A) The CSV file contains 10-minute data for all items sent from the TM equipment.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	ID	Name	Date	Baseid	Volt	AD_value	Waterlevel	Flow/Vol	TempCB	t2	r1	WaterTemp	Rainfall	int	Salinity
2	vn0302	phitruong-dn	2024/3/1 0:00	vn03022200	8.23	1274	1.52		13.6	-40	1.581		0	10	
3	vn0302	phitruong-dn	2024/3/1 0:10	vn03022200	8.23	1267	1.5		13.6	-40	1.581		0	10	
4	vn0302	phitruong-dn	2024/3/1 0:20	vn03022200	8.23	1261	1.48		13.6	-40	1.581		0	10	
5	vn0302	phitruong-dn	2024/3/1 0:30	vn03022200	8.23	1256	1.47		13.5	-40	1.584		0	10	
6	vn0302	phitruong-dn	2024/3/1 0:40	vn03022200	8.23	1254	1.46		13.5	-40	1.584		0	10	
7	vn0302	phitruong-dn	2024/3/1 0:50	vn03022200	8.23	1250	1.45		13.4	-40	1.587		0	10	
8	vn0302	phitruong-dn	2024/3/1 1:00	vn03022200	8.23	1243	1.42		13.4	-40	1.587		0	10	
9	vn0302	phitruong-dn	2024/3/1 1:10	vn03022200	8.2	1244	1.43		13.4	-40	1.587		0	10	
10	vn0302	phitruong-dn	2024/3/1 1:20	vn03022200	8.23	1247	1.44		13.4	-40	1.587		0	10	
11	vn0302	phitruong-dn	2024/3/1 1:30	vn03022200	8.23	1259	1.47		13.4	-40	1.587		0	10	
12	vn0302	phitruong-dn	2024/3/1 1:40	vn03022200	8.2	1269	1.51		13.4	-40	1.587		0	10	
13	vn0302	phitruong-dn	2024/3/1 1:50	vn03022200	8.2	1277	1.53		13.4	-40	1.587		0	10	
14	vn0302	phitruong-dn	2024/3/1 2:00	vn03022200	8.2	1290	1.57		13.4	-40	1.587		0	10	
15	vn0302	phitruong-dn	2024/3/1 2:10	vn03022200	8.2	1301	1.61		13.4	-40	1.587		0	10	
16	vn0302	phitruong-dn	2024/3/1 2:20	vn03022200	8.2	1306	1.62		13.4	-40	1.587		0	10	
17	vn0302	phitruong-dn	2024/3/1 2:30	vn03022200	8.2	1306	1.62		13.4	-40	1.587		0	10	
18	vn0302	phitruong-dn	2024/3/1 2:40	vn03022200	8.2	1301	1.61		13.4	-40	1.587		0	10	
19	vn0302	phitruong-dn	2024/3/1 2:50	vn03022200	8.2	1296	1.59		13.4	-40	1.587		0	10	

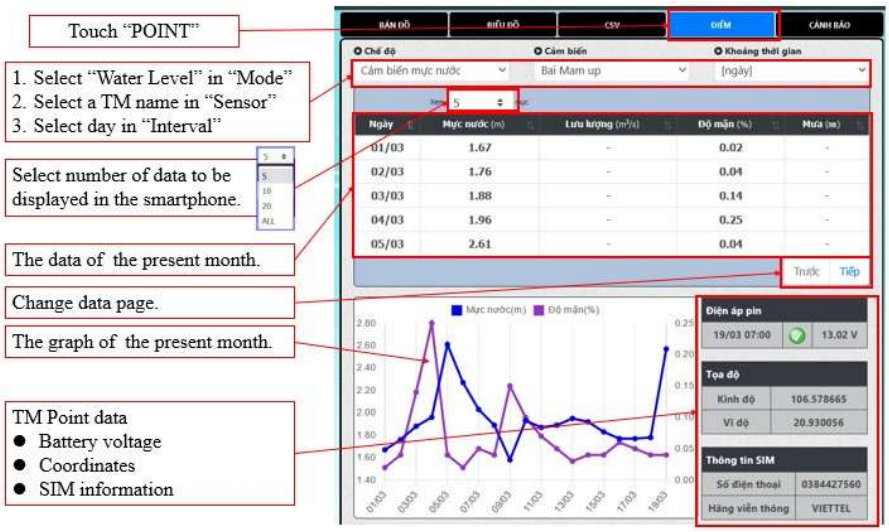
6. Point data

6-1

A) Touching the "POINT" function tab allows to see individual data for each TM point.

B) Select the TM point name from "Sensor" and either the day, hour, or 10 minutes from "Interval" to display a TM data table and graph for the day according to the designated time interval.

C) Below the graph are displayed the battery voltage, which is important indicator for TM equipment, the TM equipment coordinates, and SIM card information.



7. Alert

7-1

A) The "ALERT" function tab displays all errors and warnings that have occurred on registered TM equipment, providing information for investigating the causes of abnormalities and failures.
B) Alerts are recorded at 10-minute intervals, and if abnormalities or failures are left unchecked, a huge amount of data will accumulate. In addition, if there are abnormal values, they will be displayed in the TM data table on the top page or in a message above the map, so until now the accumulated alert data has not been used.

Touch "Alert"

The Alert Tab is designed to show the list of all alerts happened during operation. When the number of alerts increases, the alerts information accumulates too much. Therefore, this Tab will be suspended for the time being to check the necessity of the alert information.

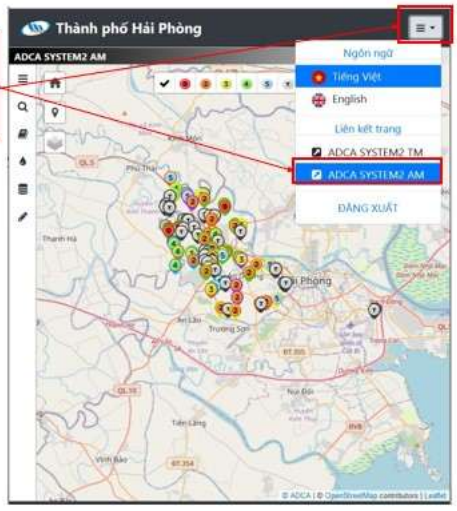
8. Reference : Asset Management System

8-1

A) By integrating the TM Display System and Asset Management (AM) System, it is possible to carry out TM irrigation water management and irrigation facility management simultaneously.
B) To switch from the TM Display System to the AM System, select AM System from the hamburger button in the top right corner of the top page.

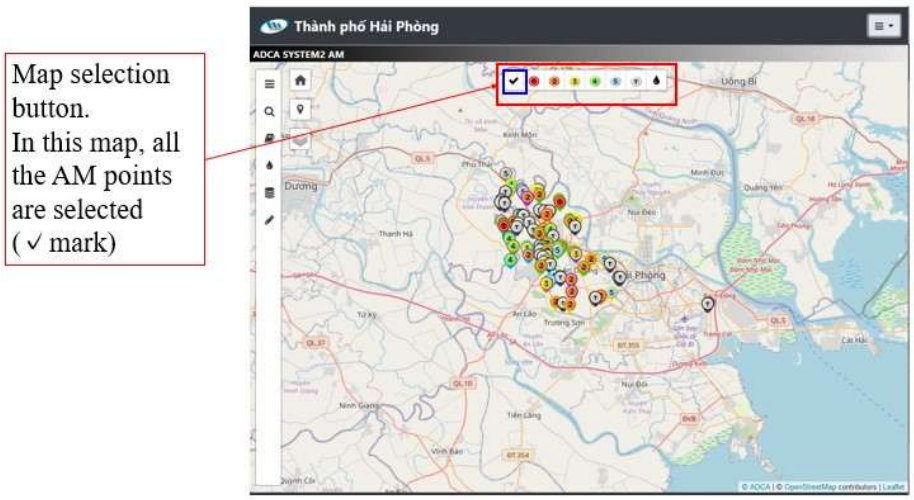
1.Touch ☰

2. Select "ADCA System2 AM"



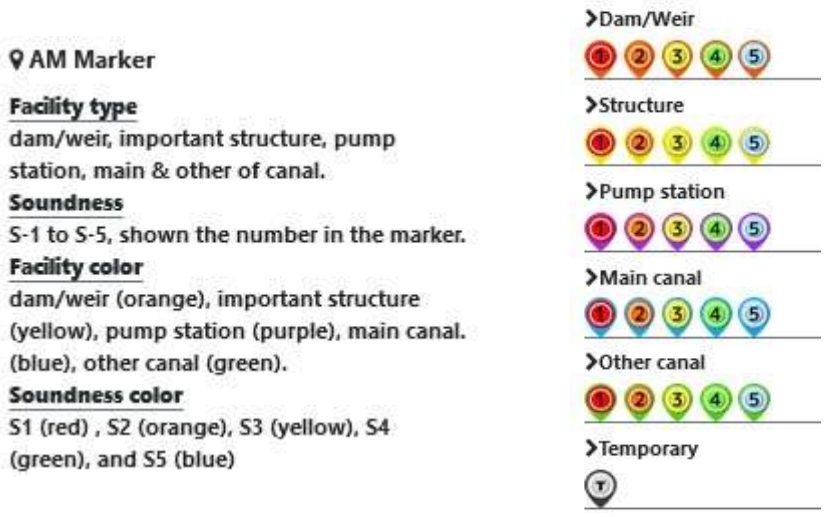
8-2

A) The AM system's home page is a map showing the locations of irrigation facility points that have undergone functional diagnosis.
B) Functional diagnosis of irrigation facilities is categorized by facility type, and the functional diagnosis results are classified as S1 to S5.
C) The selection buttons at the top of the map add all data and functional diagnosis results S1 to S5, as well as temporary points and the locations of TM equipment (shown as water drop icons). When one of these selection buttons is touched, only markers for points of the selected type are displayed on the map.



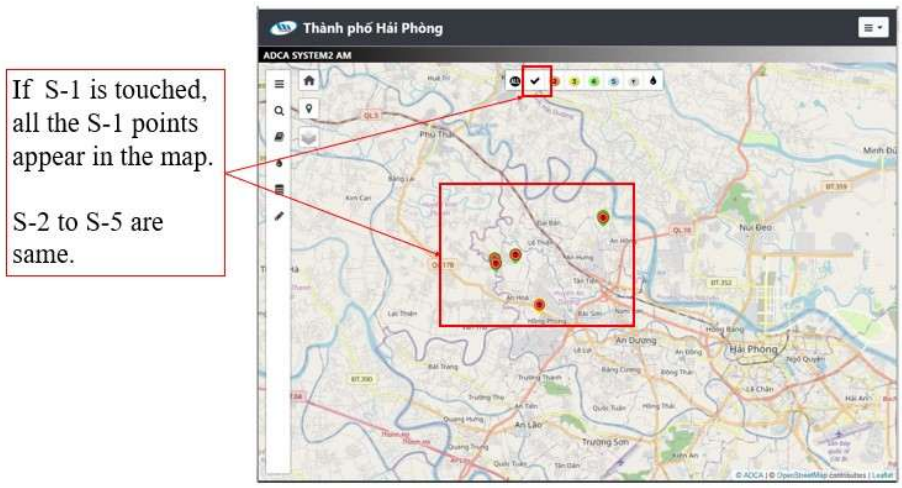
8-3

A) The colors of the markers on the map are divided into five facility types (dam/weir, important structure, pump station, main canal, and other canal), and five soundness levels (S5: Sound, S4: Signs of deterioration, S3: Ordinary deterioration, S2: Significant deterioration, S1: Serious deterioration).



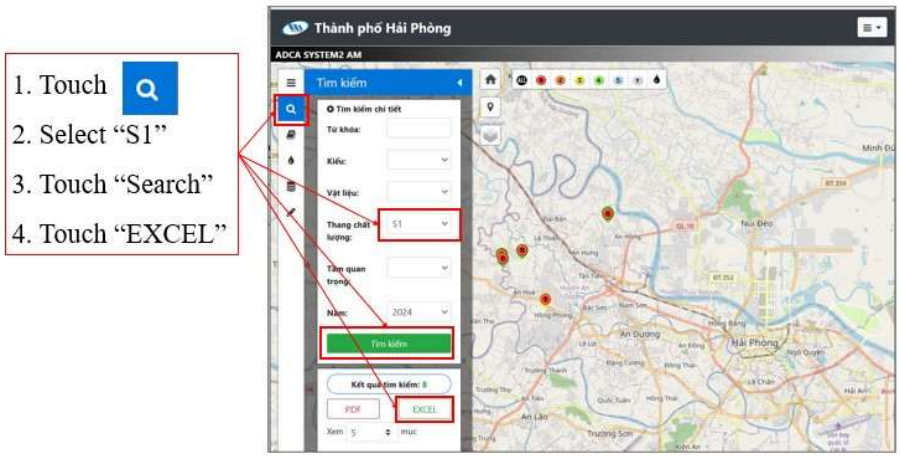
8-4

A) For example, if touched S1 button, all S1 points will be displayed on the map. Since the facility function of S1 points has been lost, it is necessary to rehabilitate the facility immediately.



8-5

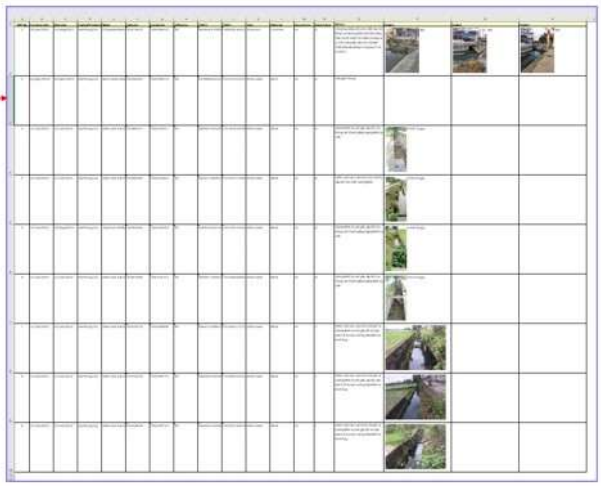
A) Touching the "Search" button displays the search menu.
B) To search, enter keywords, or select search items from the pull-down menu of facility "Type," main facility "Material," "Soundness" level, "Importance" of facility, and "Year."
C) "Keyword" can use any language, symbol, or number, regardless of the number of characters or uppercase and lowercase letters.
D) Search results can be downloaded as a PDF file or an Excel file. For PDF file, only one photo per AM point is output for easier checking within the limited space.



8-6

A) The downloaded Excel file can be used for a variety of purposes.
B) Because the AM points have been identified, the repair and renewal budget for each point can be added up and entered into the added cells, making it possible to tally up the required budget for each level of soundness.
C) The Excel file also contains photographs, comments from functional diagnosis, and measurement results of damaged parts, which serve as evidence to show the justification of the budget request.

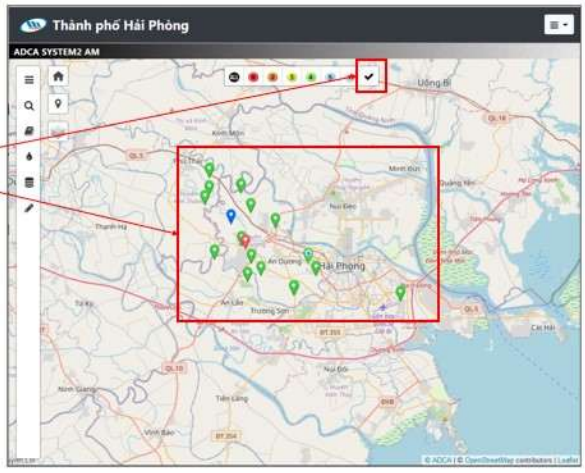
Get an Excel file of S-1 data with photos.

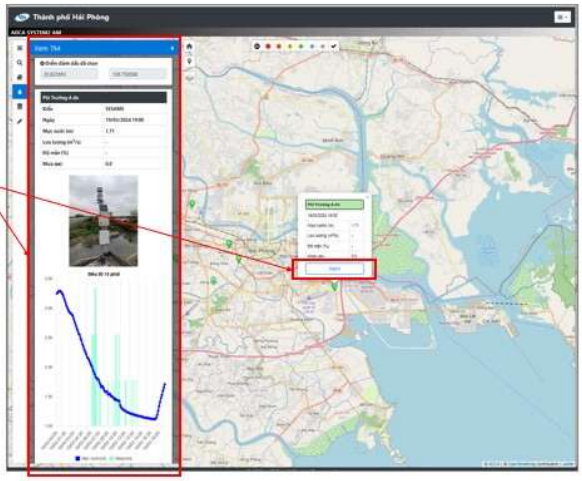
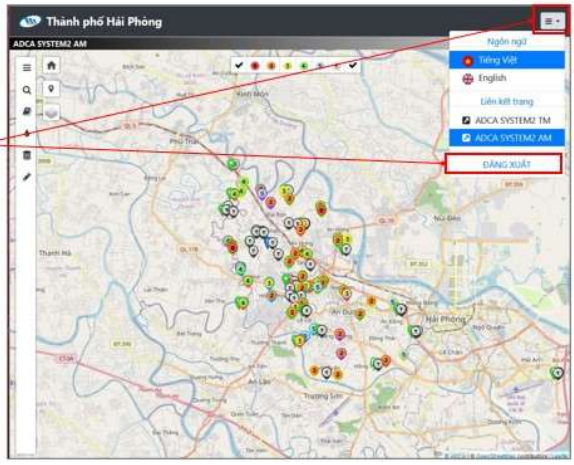


8-7

A) When touched the water drop icon, all the location of the TM equipment will be displayed on the map.

If 💧 is touched, all the TM points appear in the map.



8-8 A) When touched the TM location marker, the name of the TM point, the latest measurement date and time, and the data will be displayed.	If the TM marker is touched, the present data of the TM point appear in the map. 
8-9 A) Touching "View" on a TM point marker displays the TM point's coordinates, name, model of equipment installed, the latest measurement date and time, TM data, a photo of the equipment, and a graph of the TM data at 10-minute intervals starting from 00:00 on the current day.	If "View" is touched, the detailed data of the TM point and 10-minutes interval graph of the day appear in the map. 
8-10 A) When finished using the system, touch the hamburger button in the top right corner of the screen and select "LOGOUT" to return to the login screen.	When finish, touch ≡ and select "Logout." 

Ⅴ. Analysis of TM Data

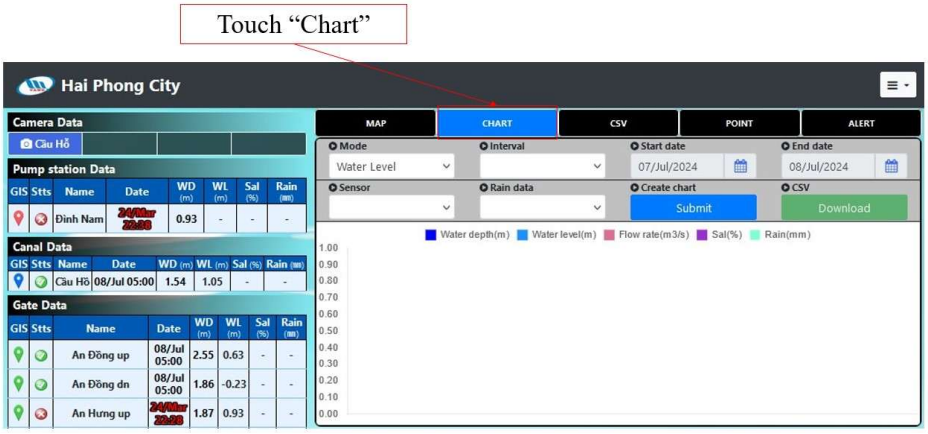
- TM data can be viewed on a smartphone and visualized by displaying graphs with simple operations.
- In the case of a reservoir, the amount of water released can be adjusted based on fluctuations in the stored water volume using the TM water level. In the case of a river or canal, the timing of opening and closing irrigation gates can be optimized based on hourly rising or falling water level trends.
- In addition to daily irrigation water management, TM data can be used to understand long-term trends and optimize annual irrigation plans and cropping plans within irrigation areas.
- TM data is generally downloaded to a PC as a CSV file over a target period, and then analyzed using spreadsheet software such as Excel. Providing TM data can also improve the accuracy of simulation analyses such as flood analysis when heavy rain continues, and optimization of water resource usage that changes throughout the year.

1. Data download and arrangement

1-1

A) The yearly TM data for the required TM points can be easily downloaded from the "CSV" function tab. However, since the CSV file contains all data for the set time interval, for example, if downloading yearly data in 10-minute intervals, the amount of data would be enormous.

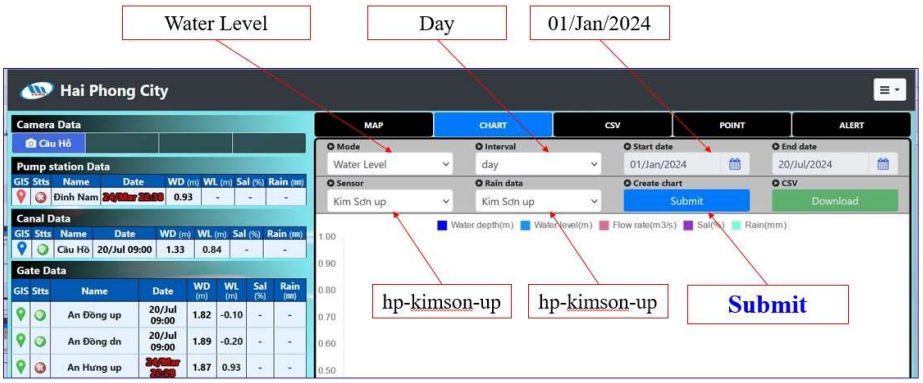
B) If the required analysis period and time interval are decided, it is recommended that creating a graph by using the "CHART" tab and downloading the graph data to PC as a CSV file.



1-2

A) As an example, make a graph around five years of average daily water levels and rainfall data for "Kim Son Gate Upstream" and show how to analyze the data downloaded as a CSV file.

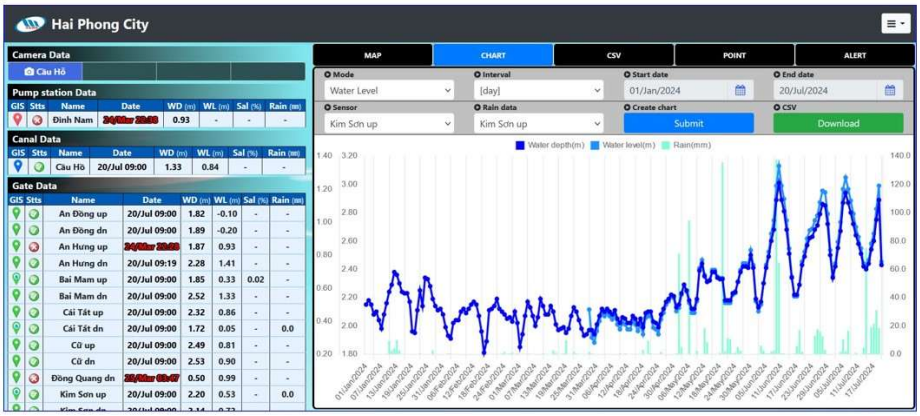
B) Touch the "CHART" tab, select "Water Level", select "Daily" interval, set the "Start Date" to January 1, 2024, the "End Date" to the day of analysis, and touch "Submit".



1-3

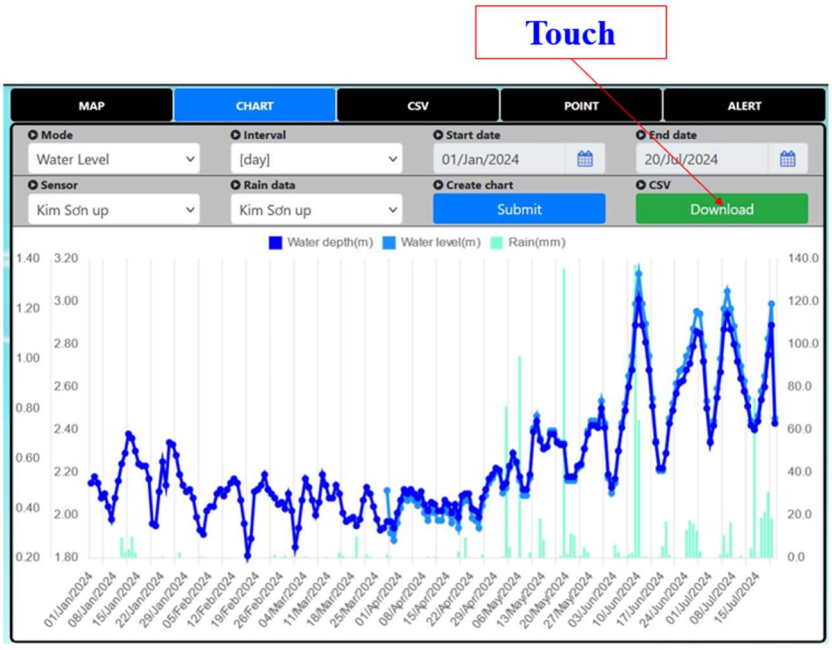
A) A graph will be displayed showing the average daily water level and rainfall in the "Kim Song Gate Upstream" from January 2024 to the present.

Chart of water level and rainfall of Kim Son Gate Upstream from 1 January 2024 to the present



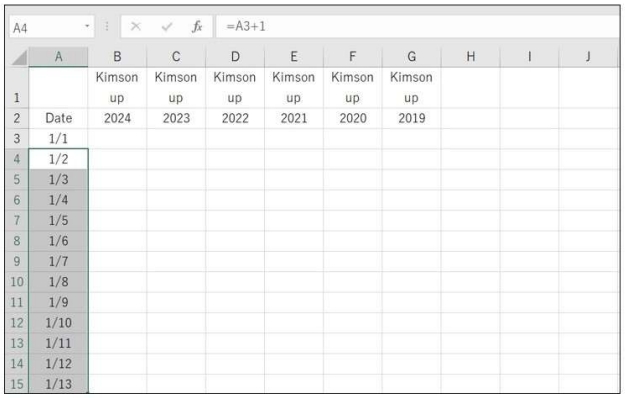
1-4

A) To download the graph data as a CSV file, touch "Download."



1-5

A) Create an Excel file for each target TM equipment. Use "Kimson Up" as an example.
B) Enter the date, TM name (Kimson up), and year into the sheet. For dates, enter January 1st to December 31st 2024, but display the date on the sheet as the month and day, not the year. This is so that figures for the same day can be compared when showing multiple years on one graph.
C) Save the data as an Excel file, giving it the TM name.



	A	B	C	D	E	F	G	H	I	J
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up			
2	Date	2024	2023	2022	2021	2020	2019			
3	1/1									
4	1/2									
5	1/3									
6	1/4									
7	1/5									
8	1/6									
9	1/7									
10	1/8									
11	1/9									
12	1/10									
13	1/11									
14	1/12									
15	1/13									

Save the sheet as an Excel file, and name it Kimson gate.

1-6

A) Copy the water level data from January 1, 2024 to the present from the downloaded CSV file.
B) From here on, CSV files will be shown in a red frame to distinguish them from the Excel file.

	A	B	C	D	E	F	G	H
1	Ngày	Tên	Độ sâu(m)	Mực nước(m)	Lưu lượng(m3	Độ mặn(%)	Máy đo mưa	Mưa(mm)
2	01/01/2024	Kim Sơn up	2.15				Kim Sơn up	0
3	02/01/2024	Kim Sơn up	2.18				Kim Sơn up	0
4	03/01/2024	Kim Sơn up	2.15				Kim Sơn up	0
5	04/01/2024	Kim Sơn up	2.08				Kim Sơn up	0
6	05/01/2024	Kim Sơn up	2.1				Kim Sơn up	0
7	06/01/2024	Kim Sơn up	2.04				Kim Sơn up	0
8	07/01/2024	Kim Sơn up	1.98				Kim Sơn up	0
9	08/01/2024	Kim Sơn up	2.08				Kim Sơn up	0
10	09/01/2024	Kim Sơn up	2.16				Kim Sơn up	0
11	10/01/2024	Kim Sơn up	2.24				Kim Sơn up	9.5
12	11/01/2024	Kim Sơn up	2.29				Kim Sơn up	2.5
13	12/01/2024	Kim Sơn up	2.38				Kim Sơn up	4
14	13/01/2024	Kim Sơn up	2.36				Kim Sơn up	10
15	14/01/2024	Kim Sơn up	2.3				Kim Sơn up	2.5
16	15/01/2024	Kim Sơn up	2.24				Kim Sơn up	0
17	16/01/2024	Kim Sơn up	2.23				Kim Sơn up	0
18	17/01/2024	Kim Sơn up	2.23				Kim Sơn up	0
19	18/01/2024	Kim Sơn up	2.17				Kim Sơn up	0
20	19/01/2024	Kim Sơn up	1.96				Kim Sơn up	0

1-7

A) Copy the rainfall data from January 1, 2024 to the present from the downloaded CSV file.

	A	B	C	D	E	F	G	H
1	Ngày	Tên	Độ sâu(m)	Mực nước(m)	Lưu lượng(m3	Độ mặn(%)	Máy đo mưa	Mưa(mm)
2	01/01/2024	Kim Sơn up	2.15				Kim Sơn up	0
3	02/01/2024	Kim Sơn up	2.18				Kim Sơn up	0
4	03/01/2024	Kim Sơn up	2.15				Kim Sơn up	0
5	04/01/2024	Kim Sơn up	2.08				Kim Sơn up	0
6	05/01/2024	Kim Sơn up	2.1				Kim Sơn up	0
7	06/01/2024	Kim Sơn up	2.04				Kim Sơn up	0
8	07/01/2024	Kim Sơn up	1.98				Kim Sơn up	0
9	08/01/2024	Kim Sơn up	2.08				Kim Sơn up	0
10	09/01/2024	Kim Sơn up	2.16				Kim Sơn up	0
11	10/01/2024	Kim Sơn up	2.24				Kim Sơn up	9.5
12	11/01/2024	Kim Sơn up	2.29				Kim Sơn up	2.5
13	12/01/2024	Kim Sơn up	2.38				Kim Sơn up	4
14	13/01/2024	Kim Sơn up	2.36				Kim Sơn up	10
15	14/01/2024	Kim Sơn up	2.3				Kim Sơn up	2.5
16	15/01/2024	Kim Sơn up	2.24				Kim Sơn up	0
17	16/01/2024	Kim Sơn up	2.23				Kim Sơn up	0
18	17/01/2024	Kim Sơn up	2.23				Kim Sơn up	0
19	18/01/2024	Kim Sơn up	2.17				Kim Sơn up	0
20	19/01/2024	Kim Sơn up	1.96				Kim Sơn up	0

1-8

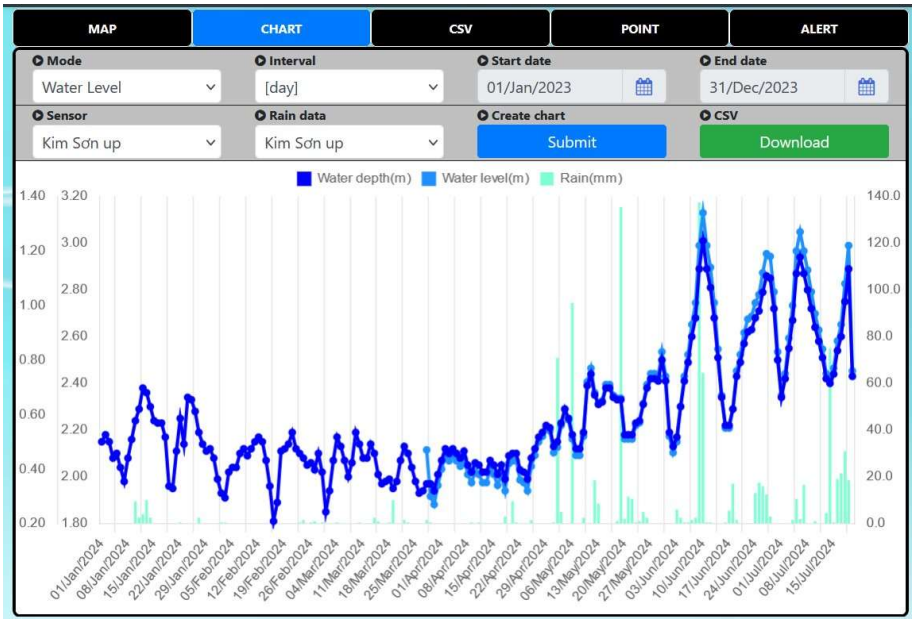
A) Paste the rainfall data from January 1, 2024 to the present into the Kim Son Up Excel file.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15							0					
4	1/2	2.18							0					
5	1/3	2.15							0					
6	1/4	2.08							0					
7	1/5	2.1							0					
8	1/6	2.04							0					
9	1/7	1.98							0					
10	1/8	2.08							0					
11	1/9	2.16							0					
12	1/10	2.24							9.5					
13	1/11	2.29							2.5					
14	1/12	2.38							4					
15	1/13	2.36							10					
16	1/14	2.3							2.5					
17	1/15	2.24							0					
18	1/16	2.23							0					
19	1/17	2.23							0					
20	1/18	2.17							0					
21	1/19	1.96							0					
22	1/20	1.95							0					

1-9

A) Select the daily average water level and rainfall at Kim Son Up from January 1, 2023 to December 31, 2023.

B) Touching "Submit" will display a graph of the average daily water level and rainfall from January 1, 2023 to December 31, 2023. Touching "Download" will download the data from this graph as a CSV file.



1-10

A) Copy the water level data from January 1, 2023 to December 31, 2023 from the downloaded CSV file.

	A	B	C	D	E	F	G	H
1	Ngày	Tên	Độ sâu(m)	Mực nước(m	Lưu lượng(m	Độ mặn(%)	Máy đo mưa	Mưa(mm)
2	01/01/2023	Kim Sơn up	2.01				Kim Sơn up	0
3	02/01/2023	Kim Sơn up	1.98				Kim Sơn up	0
4	03/01/2023	Kim Sơn up	2.01				Kim Sơn up	0
5	04/01/2023	Kim Sơn up	2.15				Kim Sơn up	0
6	05/01/2023	Kim Sơn up	2.27				Kim Sơn up	0
7	06/01/2023	Kim Sơn up	2.25				Kim Sơn up	0
8	07/01/2023	Kim Sơn up	2.2				Kim Sơn up	0
9	08/01/2023	Kim Sơn up	2.28				Kim Sơn up	0
10	09/01/2023	Kim Sơn up	2.24				Kim Sơn up	0
11	10/01/2023	Kim Sơn up	2.19				Kim Sơn up	0
12	11/01/2023	Kim Sơn up	2.12				Kim Sơn up	0
13	12/01/2023	Kim Sơn up	2.14				Kim Sơn up	2
14	13/01/2023	Kim Sơn up	2.12				Kim Sơn up	0.5
15	14/01/2023	Kim Sơn up	2.04				Kim Sơn up	0
16	15/01/2023	Kim Sơn up	1.91				Kim Sơn up	0
17	16/01/2023	Kim Sơn up	1.78				Kim Sơn up	0
18	17/01/2023	Kim Sơn up	1.97				Kim Sơn up	0
19	18/01/2023	Kim Sơn up	1.96				Kim Sơn up	0
20	19/01/2023	Kim Sơn up	2.05				Kim Sơn up	0

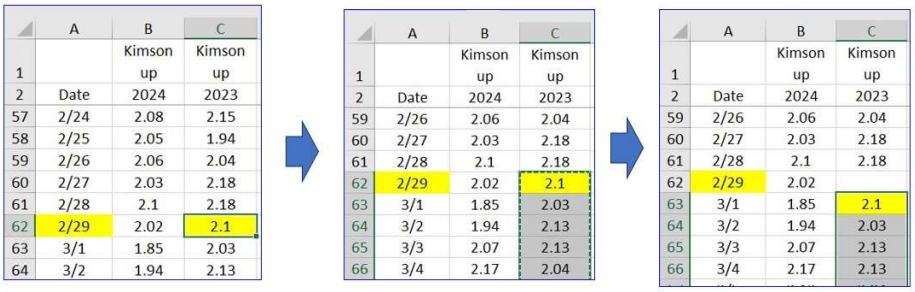
1-11

A) Paste the water level data from January 1, 2023 to December 31, 2023 into the Kim Son Up Excel file.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01						0					
4	1/2	2.18	1.98						0					
5	1/3	2.15	2.01						0					
6	1/4	2.08	2.15						0					
7	1/5	2.1	2.27						0					
8	1/6	2.04	2.25						0					
9	1/7	1.98	2.2						0					
10	1/8	2.08	2.28						0					
11	1/9	2.16	2.24						0					
12	1/10	2.24	2.19						9.5					
13	1/11	2.29	2.12						2.5					
14	1/12	2.38	2.14						4					
15	1/13	2.36	2.12						10					
16	1/14	2.3	2.04						2.5					
17	1/15	2.24	1.91						0					
18	1/16	2.23	1.78						0					
19	1/17	2.23	1.97						0					
20	1/18	2.17	1.96						0					
21	1/19	1.96	2.05						0					
22	1/20	1.95	2.08						0					

1-12

A) 2024 is a leap year and has February 29th. 2023 is a normal year, so the data for March 1st will be entered into the cell for February 29th. Therefore, cut the data from February 29 onwards and paste it into the cell for March 1st.



1-13

A) Paste the rainfall data from January 1, 2023 to December 31, 2023 into the Kim Son Up Excel file.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01						0	0				
4	1/2	2.18	1.98						0	0				
5	1/3	2.15	2.01						0	0				
6	1/4	2.08	2.15						0	0				
7	1/5	2.1	2.27						0	0				
8	1/6	2.04	2.25						0	0				
9	1/7	1.98	2.2						0	0				
10	1/8	2.08	2.28						0	0				
11	1/9	2.16	2.24						0	0				
12	1/10	2.24	2.19						9.5	0				
13	1/11	2.29	2.12						2.5	0				
14	1/12	2.38	2.14						4	2				
15	1/13	2.36	2.12						10	0.5				
16	1/14	2.3	2.04						2.5	0				
17	1/15	2.24	1.91						0	0				
18	1/16	2.23	1.78						0	0				
19	1/17	2.23	1.97						0	0				
20	1/18	2.17	1.96						0	0				
21	1/19	1.96	2.05						0	0				
22	1/20	1.95	2.08						0	0				

1-14

A) As with the water level data, cut out the data from February 29th, 2023 onwards and paste it into the cell for March 1st.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
58	2/25	2.05	1.94						0	0				
59	2/26	2.06	2.04						0.5	0				
60	2/27	2.03	2.18						1	0				
61	2/28	2.1	2.18						0	0				
62	2/29	2.02							0.5	0				
63	3/1	1.85	2.1						0	0				
64	3/2	1.94	2.03						0	0				
65	3/3	2.07	2.13						0	0				
66	3/4	2.17	2.13						0.5	0				
67	3/5	2.13	2.04						0	0				

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
58	2/25	2.05	1.94						0	0				
59	2/26	2.06	2.04						0.5	0				
60	2/27	2.03	2.18						1	0				
61	2/28	2.1	2.18						0	0				
62	2/29	2.02							0.5					
63	3/1	1.85	2.1						0	0				
64	3/2	1.94	2.03						0	0				
65	3/3	2.07	2.13						0	0				
66	3/4	2.17	2.13						0.5	0				
67	3/5	2.13	2.04						0	0				

1-15

A) The same process is repeated for other years.

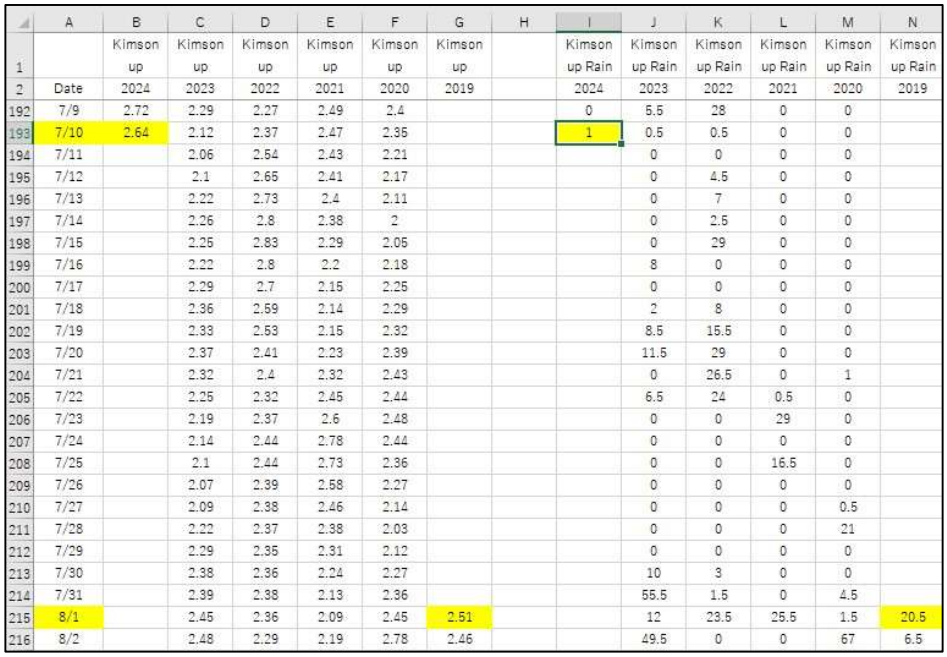
B) Since 2020 is a leap year, there is no need to adjust the data for February 29th.

C) The TM equipment was installed in July 2019, and stable measurement data began to be transmitted on August 1, 2019.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
212	7/29		2.29	2.35	2.31	2.12				0	0	0	0	
213	7/30		2.38	2.36	2.24	2.27				10	3	0	0	
214	7/31		2.39	2.38	2.13	2.36				55.5	1.5	0	4.5	
215	8/1		2.45	2.36	2.09	2.45	2.51			12	23.5	25.5	1.5	20.5
216	8/2		2.48	2.29	2.19	2.78	2.46			49.5	0	0	67	6.5
217	8/3		2.48	2.2	2.24	2.79	2.74			2	0	0	20	78.5
218	8/4		2.55	2.15	2.24	2.72	2.96			85.5	0	0	3.5	0.5

1-16

A) A dataset of annual mean daily water level and rainfall at Kim Son Up from August 1, 2019 to the present day of July, 2024 has been completed.

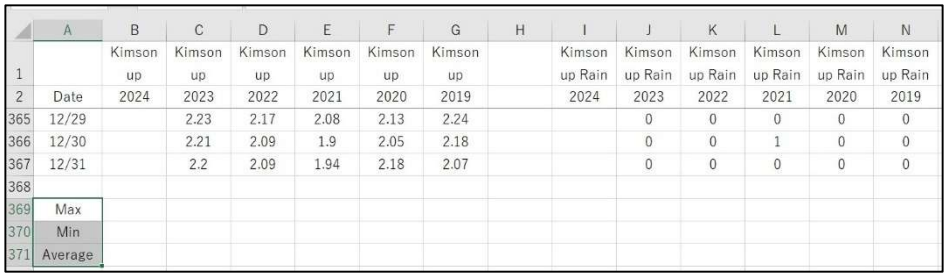


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
192	7/9	2.72	2.29	2.27	2.49	2.4			0	5.5	28	0	0	
193	7/10	2.64	2.12	2.37	2.47	2.35			1	0.5	0.5	0	0	
194	7/11		2.06	2.54	2.43	2.21				0	0	0	0	
195	7/12		2.1	2.65	2.41	2.17				0	4.5	0	0	
196	7/13		2.22	2.73	2.4	2.11				0	7	0	0	
197	7/14		2.26	2.8	2.38	2				0	2.5	0	0	
198	7/15		2.25	2.83	2.29	2.05				0	29	0	0	
199	7/16		2.22	2.8	2.2	2.18				8	0	0	0	
200	7/17		2.29	2.7	2.15	2.25				0	0	0	0	
201	7/18		2.36	2.59	2.14	2.29				2	8	0	0	
202	7/19		2.33	2.53	2.15	2.32				8.5	15.5	0	0	
203	7/20		2.37	2.41	2.23	2.39				11.5	29	0	0	
204	7/21		2.32	2.4	2.32	2.43				0	26.5	0	1	
205	7/22		2.25	2.32	2.45	2.44				6.5	24	0.5	0	
206	7/23		2.19	2.37	2.6	2.48				0	0	29	0	
207	7/24		2.14	2.44	2.78	2.44				0	0	0	0	
208	7/25		2.1	2.44	2.73	2.36				0	0	16.5	0	
209	7/26		2.07	2.39	2.58	2.27				0	0	0	0	
210	7/27		2.09	2.38	2.46	2.14				0	0	0	0.5	
211	7/28		2.22	2.37	2.38	2.03				0	0	0	21	
212	7/29		2.29	2.35	2.31	2.12				0	0	0	0	
213	7/30		2.38	2.36	2.24	2.27				10	3	0	0	
214	7/31		2.39	2.38	2.13	2.36				55.5	1.5	0	4.5	
215	8/1		2.45	2.36	2.09	2.45	2.51			12	23.5	25.5	1.5	20.5
216	8/2		2.48	2.29	2.19	2.78	2.46			49.5	0	0	67	6.5

1-17

A) Add the annual maximum, minimum and average values to the table.

B) Add "Max", "Min", and "Average" to the bottom of the Date column.

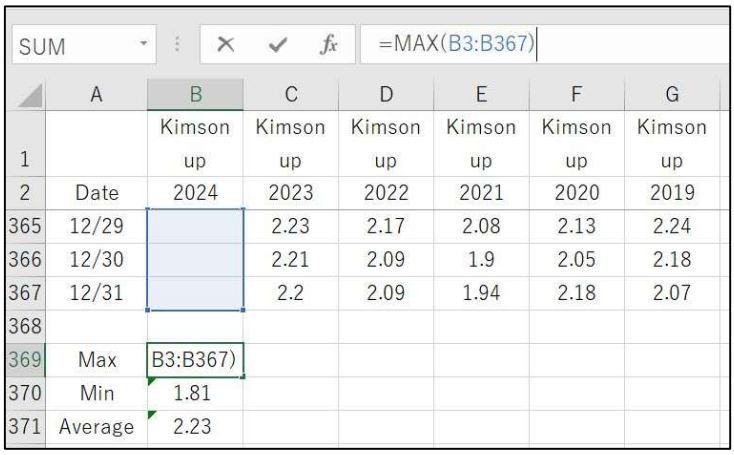


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
365	12/29		2.23	2.17	2.08	2.13	2.24			0	0	0	0	0
366	12/30		2.21	2.09	1.9	2.05	2.18			0	0	1	0	0
367	12/31		2.2	2.09	1.94	2.18	2.07			0	0	0	0	0
368														
369	Max													
370	Min													
371	Average													

1-18

A) Enter Excel functions below 2024.

Maximum: "=Max(b3:b367)"
Minimum: "=Min(b3:b367)"
Average: "=Average(b3:b367)"

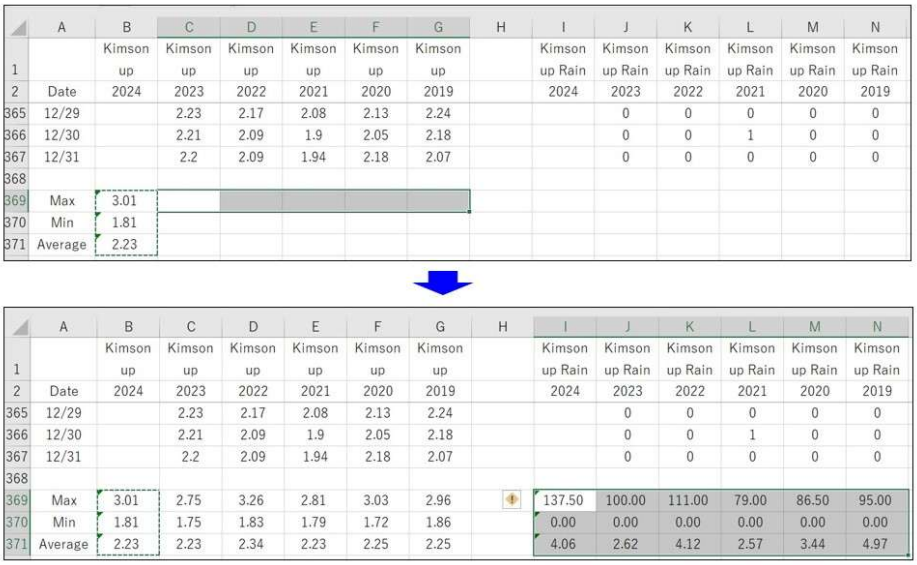


SUM =MAX(B3:B367)

	A	B	C	D	E	F	G
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up
2	Date	2024	2023	2022	2021	2020	2019
365	12/29		2.23	2.17	2.08	2.13	2.24
366	12/30		2.21	2.09	1.9	2.05	2.18
367	12/31		2.2	2.09	1.94	2.18	2.07
368							
369	Max	B3:B367)					
370	Min	1.81					
371	Average	2.23					

1-19

A) By copying the function for 2024, get the maximum, minimum and average values for the entire table.

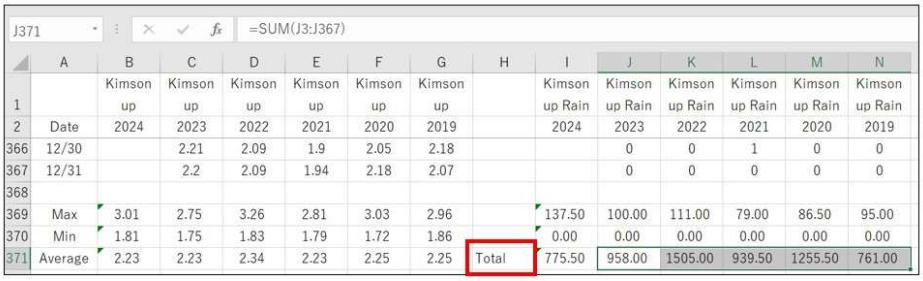


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
365	12/29		2.23	2.17	2.08	2.13	2.24			0	0	0	0	0
366	12/30		2.21	2.09	1.9	2.05	2.18			0	0	1	0	0
367	12/31		2.2	2.09	1.94	2.18	2.07			0	0	0	0	0
368														
369	Max	3.01												
370	Min	1.81												
371	Average	2.23												

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
365	12/29		2.23	2.17	2.08	2.13	2.24			0	0	0	0	0
366	12/30		2.21	2.09	1.9	2.05	2.18			0	0	1	0	0
367	12/31		2.2	2.09	1.94	2.18	2.07			0	0	0	0	0
368														
369	Max	3.01	2.75	3.26	2.81	3.03	2.96		137.50	100.00	111.00	79.00	86.50	95.00
370	Min	1.81	1.75	1.83	1.79	1.72	1.86		0.00	0.00	0.00	0.00	0.00	0.00
371	Average	2.23	2.23	2.34	2.23	2.25	2.25		4.06	2.62	4.12	2.57	3.44	4.97

1-20

A) For rainfall, change the average to a total, and for 2024 enter "=sum(i3:i367)" and copy it to other years.



J371 =SUM(J3:J367)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
366	12/30		2.21	2.09	1.9	2.05	2.18			0	0	1	0	0
367	12/31		2.2	2.09	1.94	2.18	2.07			0	0	0	0	0
368														
369	Max	3.01	2.75	3.26	2.81	3.03	2.96		137.50	100.00	111.00	79.00	86.50	95.00
370	Min	1.81	1.75	1.83	1.79	1.72	1.86		0.00	0.00	0.00	0.00	0.00	0.00
371	Average	2.23	2.23	2.34	2.23	2.25	2.25	Total	775.50	958.00	1505.00	939.50	1255.50	761.00

2. Graph making : Kim Son Gate Upstream

2-1

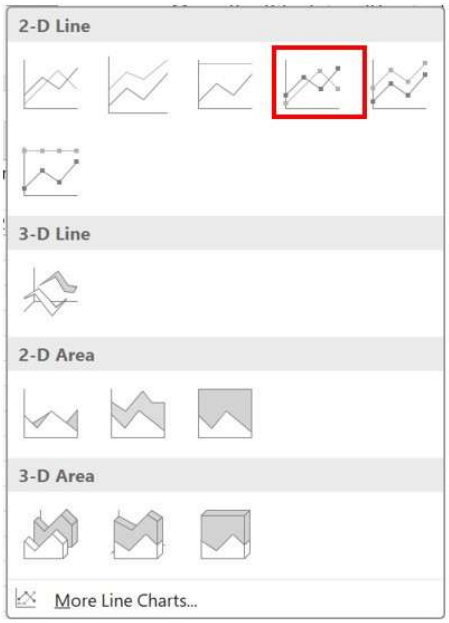
A) Put all the water level data for Kimson Up together into a graph separated by years.

B) First, select the dates in the Excel sheet and all the water level data from 2019 to 2024.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01	2.13	2.27	2.18			0	0	0	0	0	
4	1/2	2.18	1.98	2.21	2.3	2.25			0	0	0	0	0	
5	1/3	2.15	2.01	2.35	2.29	2.12			0	0	0	0	0	
6	1/4	2.08	2.15	2.43	2.21	1.99			0	0	0	0	0	
7	1/5	2.1	2.27	2.49	2.18	2			0	0	0	0	0	
8	1/6	2.04	2.25	2.41	2.1	1.95			0	0	0	0	0	
9	1/7	1.98	2.2	2.36	2.04	1.96			0	0	0	0	0	
10	1/8	2.08	2.28	2.34	1.88	1.92			0	0	0	0	0	
11	1/9	2.16	2.24	2.21	1.97	1.97			0	0	0	0	0	
12	1/10	2.24	2.19	2.07	1.98	2.06			9.5	0	0.5	0	0	
13	1/11	2.29	2.12	1.83	2.11	2.16			2.5	0	0	0	0.5	
14	1/12	2.38	2.14	1.96	2.09	2.08			4	2	0	0	0	
15	1/13	2.36	2.12	2.01	2.28	2.21			10	0.5	0.5	0	0	
16	1/14	2.3	2.04	2.14	2.33	2.26			2.5	0	0	0	0.5	
17	1/15	2.24	1.91	2.19	2.27	2.3			0	0	0	0	0	
18	1/16	2.23	1.78	2.28	2.22	2.16			0	0	0.5	0	0	
19	1/17	2.23	1.97	2.24	2.08	1.99			0	0	8	0	0	
20	1/18	2.17	1.96	2.16	1.98	1.94			0	0	0	0	0	

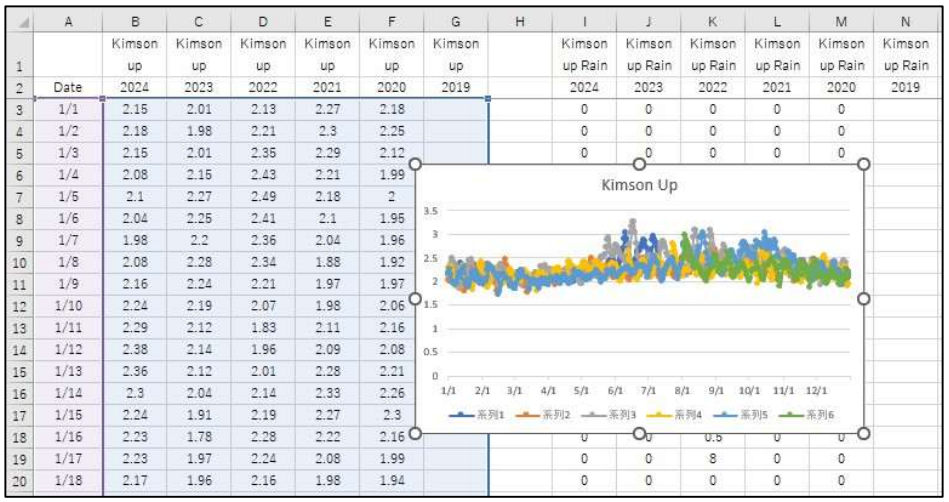
2-2

A) From the menu at the top of the Excel sheet, click "Insert" and select a graph from "Charts." Select the line graph and click on it.



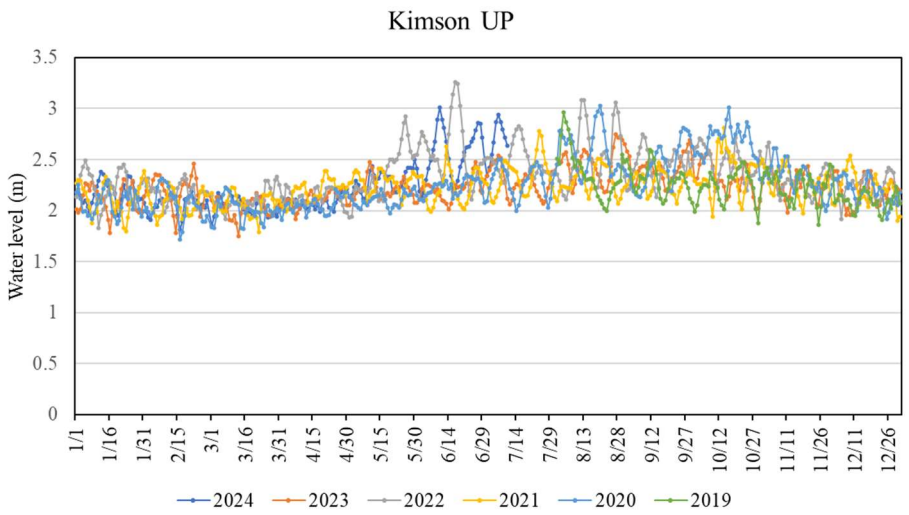
2-3

A) The graph will be displayed, so enter "Kimson Up" as the title.



2-4

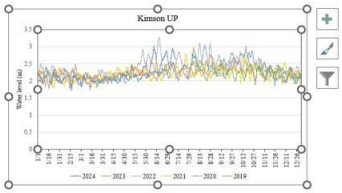
A) Final graph example.
B) The water level at Kimson Up fluctuates between 1.72m and 3.26m.
C) When the water level threshold is crossed, the cause is investigated by checking the water level fluctuations before and after the threshold was crossed using hourly or 10-minute data rather than daily data.



2-5

A) Extract a single year graph from the overall graph.
B) Click on the graph to activate it.
C) Select "Select Data" from the menu.
D) Uncheck all years except 2024.

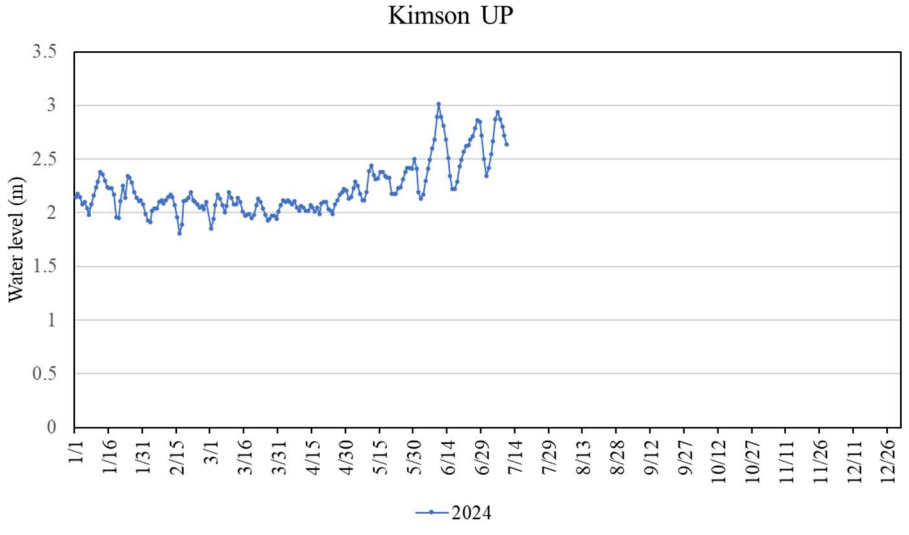
■ Extract a single year graph from the overall graph.
■ Click on the graph to activate it.



■ Select "Select Data" from the menu.
■ Uncheck all years except 2024.

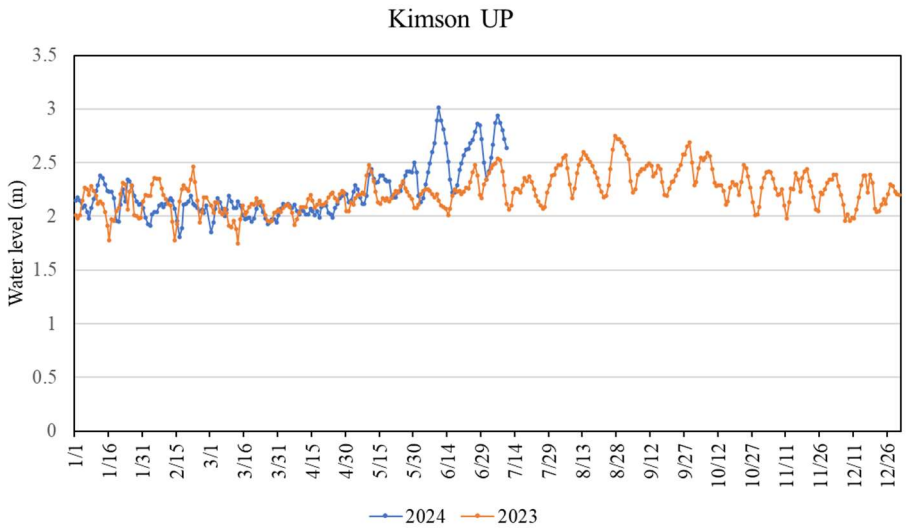
2-6

A) A graph of water level fluctuations in 2024 is displayed.



2-7

A) Check 2024 and 2023.
B) Two graphs, for 2024 and 2023, will appear and can be compared them.



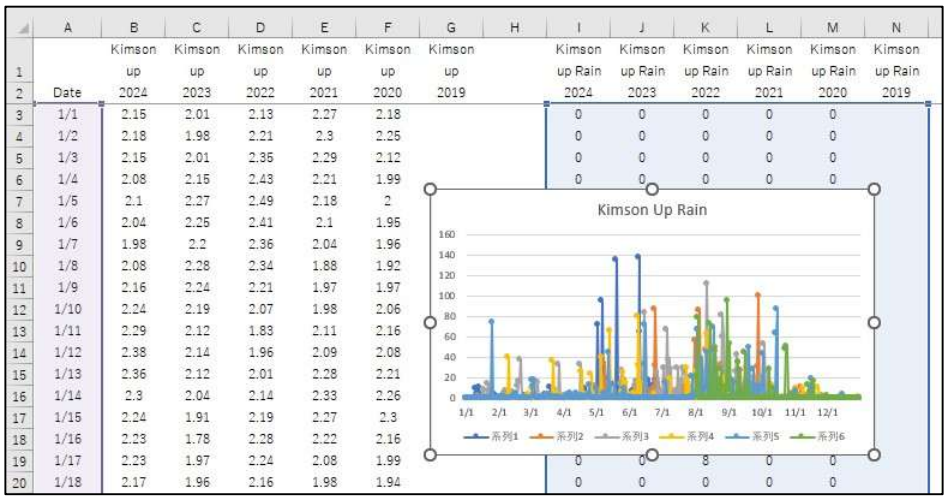
2-8

A) Put all the rainfall data for Kimson Up together into a graph separated by years.
B) First, select the dates in the Excel sheet and all the rainfall data from 2019 to 2024.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01	2.13	2.27	2.18			0	0	0	0	0	
4	1/2	2.18	1.98	2.21	2.3	2.25			0	0	0	0	0	
5	1/3	2.15	2.01	2.35	2.29	2.12			0	0	0	0	0	
6	1/4	2.08	2.15	2.43	2.21	1.99			0	0	0	0	0	
7	1/5	2.1	2.27	2.49	2.18	2			0	0	0	0	0	
8	1/6	2.04	2.25	2.41	2.1	1.95			0	0	0	0	0	
9	1/7	1.98	2.2	2.36	2.04	1.96			0	0	0	0	0	
10	1/8	2.08	2.28	2.34	1.88	1.92			0	0	0	0	0	
11	1/9	2.16	2.24	2.21	1.97	1.97			0	0	0	0	0	
12	1/10	2.24	2.19	2.07	1.98	2.06			9.5	0	0.5	0	0	
13	1/11	2.29	2.12	1.83	2.11	2.16			2.5	0	0	0	0.5	
14	1/12	2.38	2.14	1.96	2.09	2.08			4	2	0	0	0	
15	1/13	2.36	2.12	2.01	2.28	2.21			10	0.5	0.5	0	0	
16	1/14	2.3	2.04	2.14	2.33	2.26			2.5	0	0	0	0.5	
17	1/15	2.24	1.91	2.19	2.27	2.3			0	0	0	0	0	
18	1/16	2.23	1.78	2.28	2.22	2.16			0	0	0.5	0	0	
19	1/17	2.23	1.97	2.24	2.08	1.99			0	0	8	0	0	
20	1/18	2.17	1.96	2.16	1.98	1.94			0	0	0	0	0	

2-9

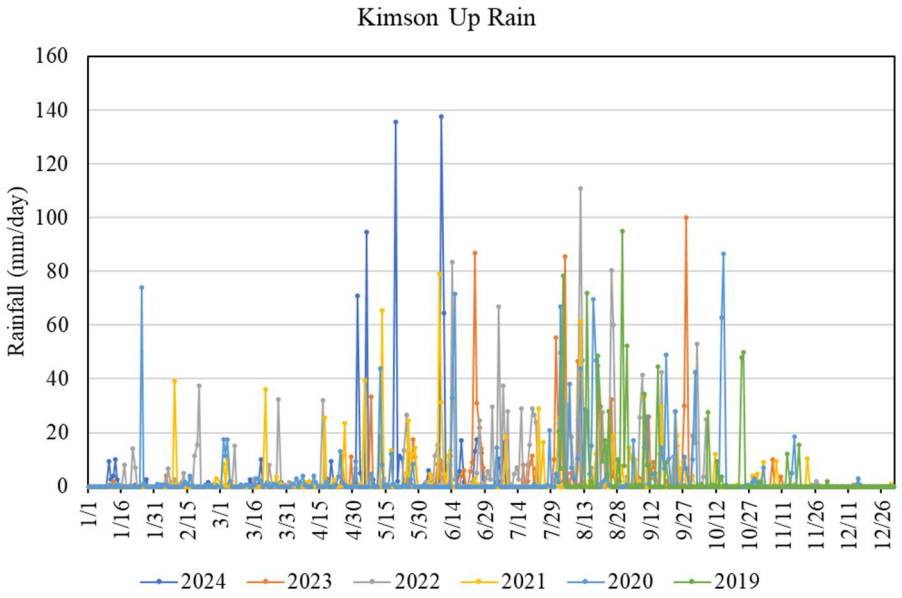
A) The graph will be displayed, so enter "Kimson Up Rain" as the title.



2-10

A) Final rainfall graph example.

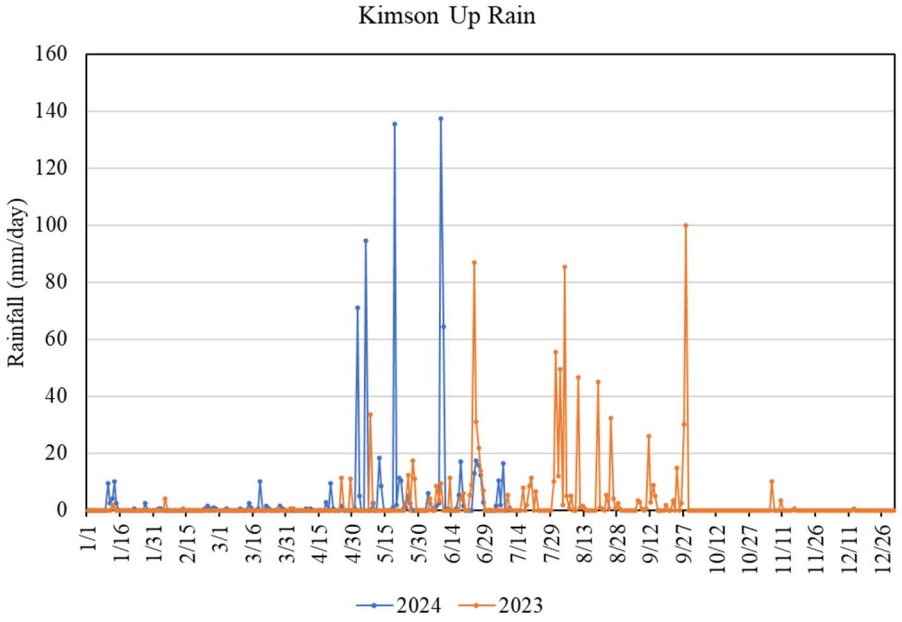
B) The maximum rainfall at Kimson Up was 137.5 mm/day on 9 June, 2024.



2-11

A) Check 2024 and 2023.

B) Two graphs, for 2024 and 2023, will appear and can be compared them.



2-12

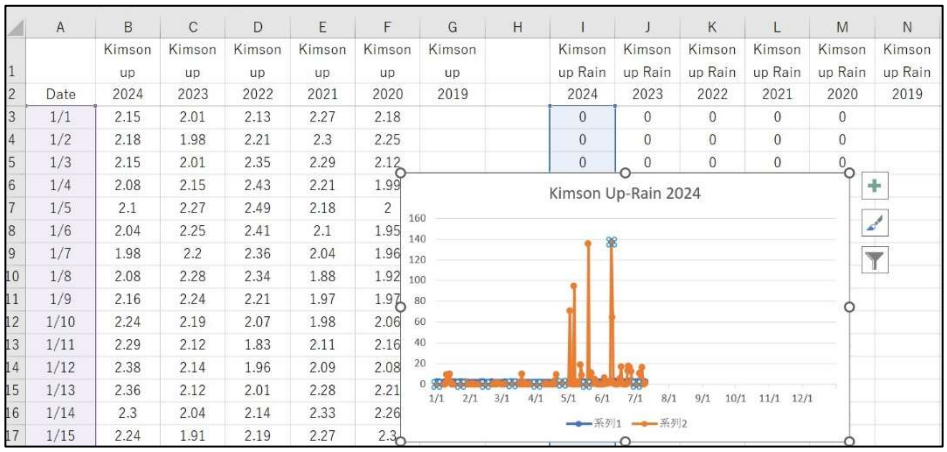
A) To graph the relationship between water level and rainfall at Kimson Up in 2024, select the water level and rainfall data for 2024.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01	2.13	2.27	2.18			0	0	0	0	0	
4	1/2	2.18	1.98	2.21	2.3	2.25			0	0	0	0	0	
5	1/3	2.15	2.01	2.35	2.29	2.12			0	0	0	0	0	
6	1/4	2.08	2.15	2.43	2.21	1.99			0	0	0	0	0	
7	1/5	2.1	2.27	2.49	2.18	2			0	0	0	0	0	
8	1/6	2.04	2.25	2.41	2.1	1.95			0	0	0	0	0	
9	1/7	1.98	2.2	2.36	2.04	1.96			0	0	0	0	0	
10	1/8	2.08	2.28	2.34	1.88	1.92			0	0	0	0	0	
11	1/9	2.16	2.24	2.21	1.97	1.97			0	0	0	0	0	
12	1/10	2.24	2.19	2.07	1.98	2.06			9.5	0	0.5	0	0	

2-13

A) From the menu at the top of the Excel sheet, click "Insert" and select a graph from "Charts." Select the line graph and click on it.

B) The graph will be displayed, so enter "Kimson Up" as the title.

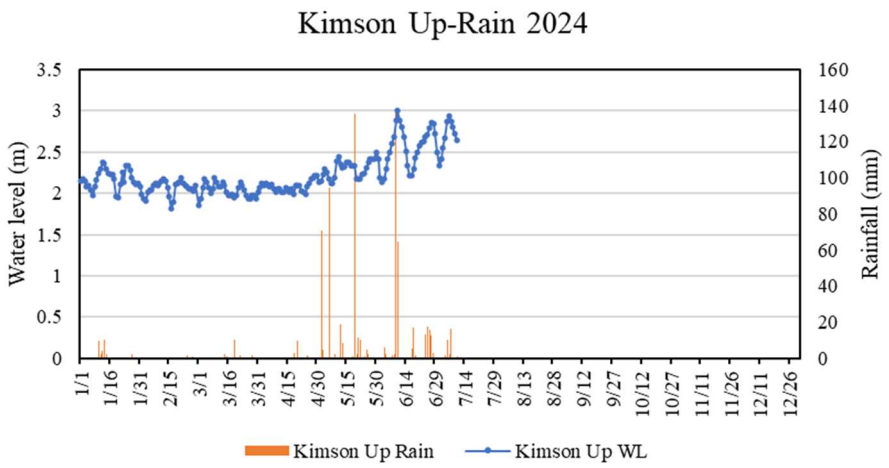


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01	2.13	2.27	2.18			0	0	0	0	0	
4	1/2	2.18	1.98	2.21	2.3	2.25			0	0	0	0	0	
5	1/3	2.15	2.01	2.35	2.29	2.12			0	0	0	0	0	
6	1/4	2.08	2.15	2.43	2.21	1.99								
7	1/5	2.1	2.27	2.49	2.18	2								
8	1/6	2.04	2.25	2.41	2.1	1.95								
9	1/7	1.98	2.2	2.36	2.04	1.96								
10	1/8	2.08	2.28	2.34	1.88	1.92								
11	1/9	2.16	2.24	2.21	1.97	1.97								
12	1/10	2.24	2.19	2.07	1.98	2.06								
13	1/11	2.29	2.12	1.83	2.11	2.16								
14	1/12	2.38	2.14	1.96	2.09	2.08								
15	1/13	2.36	2.12	2.01	2.28	2.21								
16	1/14	2.3	2.04	2.14	2.33	2.26								
17	1/15	2.24	1.91	2.19	2.27	2.3								

2-14

A) Example of final water level and rainfall graph.

B) The rainfall graph will be changed to a bar graph, with the second axis on the right labeled in "mm," making the graph easier to understand.

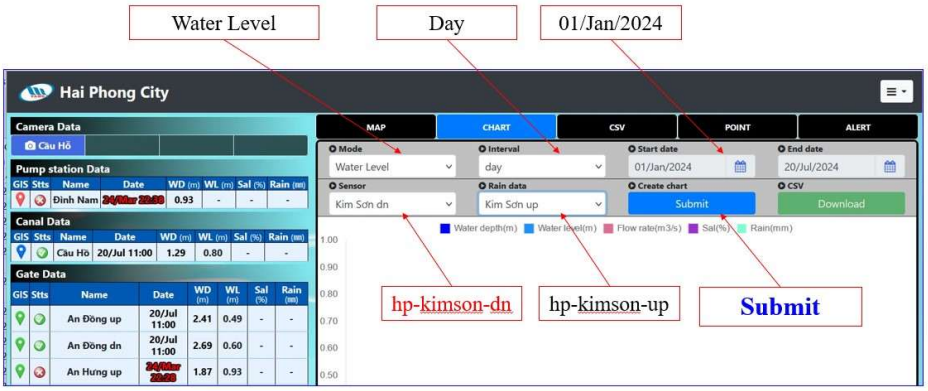


3. Graph making : Comparison of Kim Son Gate Upstream & Downstream

3-1

A) By comparing the changes in the TM water level upstream and downstream of the gate, the operation of gate opening and closing can be checked.

B) The water level downstream of the gate can be graphed by entering the same conditions as upstream of the gate in the "CHART" tab.

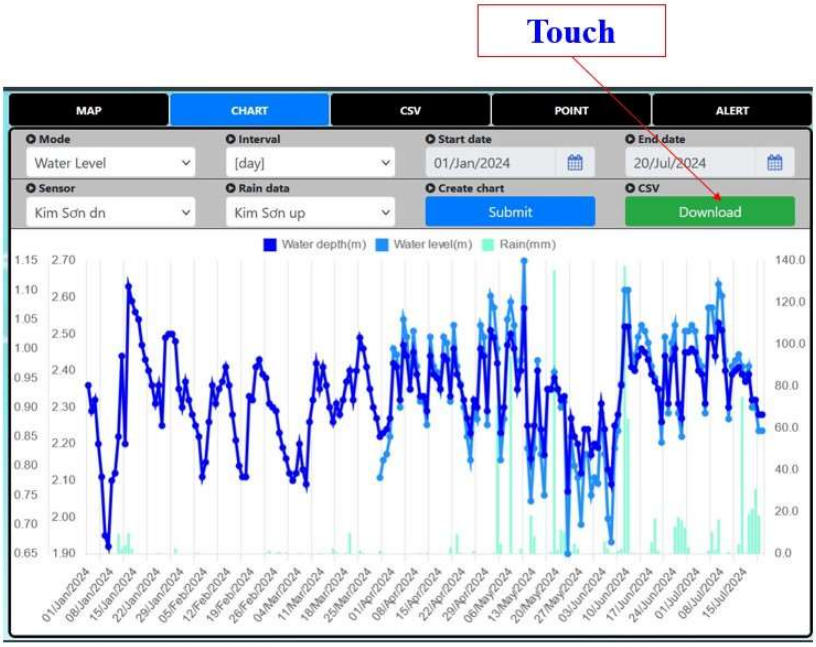


3-2

A) After entering the necessary information, touch "Submit," and a graph of water level trend downstream of the gate will be displayed.

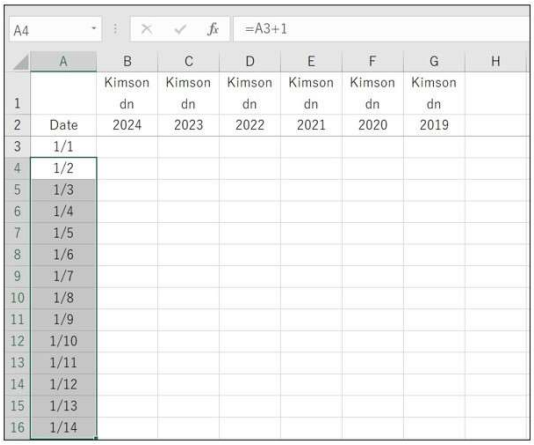
3-3

A) To download the graph data as a CSV file, touch "Download."



3-4

A) Create an Excel file for "Kimson Dn" as an example.
B) Copy the Excel file of "Kimson gate" and change name to "Kimson gate Dn."
C) In the sheet, change "Kimson up" to "Kimson dn." Delete all the water level data except for Date.
D) Kimson Dn uses the same rainfall data as Kimson Up, so the rainfall data should be remained as is.



3-5

A) Copy the water level data from January 1, 2024 to the present from the downloaded CSV file.

	A	B	C	D	E	F	G	H
1	Ngày	Tên	Độ sâu(m)	Mực nước(m)	Lưu lượng(m3/s)	Độ mặn(%)	Máy đo mưa	Mưa(mm)
2	01/01/2024	Kim Sơn dn	2.36				Kim Sơn up	0
3	02/01/2024	Kim Sơn dn	2.29				Kim Sơn up	0
4	03/01/2024	Kim Sơn dn	2.32				Kim Sơn up	0
5	04/01/2024	Kim Sơn dn	2.2				Kim Sơn up	0
6	05/01/2024	Kim Sơn dn	2.11				Kim Sơn up	0
7	06/01/2024	Kim Sơn dn	1.95				Kim Sơn up	0
8	07/01/2024	Kim Sơn dn	1.92				Kim Sơn up	0
9	08/01/2024	Kim Sơn dn	2.1				Kim Sơn up	0
10	09/01/2024	Kim Sơn dn	2.12				Kim Sơn up	0
11	10/01/2024	Kim Sơn dn	2.22				Kim Sơn up	9.5
12	11/01/2024	Kim Sơn dn	2.44				Kim Sơn up	2.5
13	12/01/2024	Kim Sơn dn	2.2				Kim Sơn up	4
14	13/01/2024	Kim Sơn dn	2.63				Kim Sơn up	10
15	14/01/2024	Kim Sơn dn	2.59				Kim Sơn up	2.5
16	15/01/2024	Kim Sơn dn	2.56				Kim Sơn up	0
17	16/01/2024	Kim Sơn dn	2.54				Kim Sơn up	0
18	17/01/2024	Kim Sơn dn	2.47				Kim Sơn up	0
19	18/01/2024	Kim Sơn dn	2.43				Kim Sơn up	0
20	19/01/2024	Kim Sơn dn	2.4				Kim Sơn up	0
21	20/01/2024	Kim Sơn dn	2.36				Kim Sơn up	0

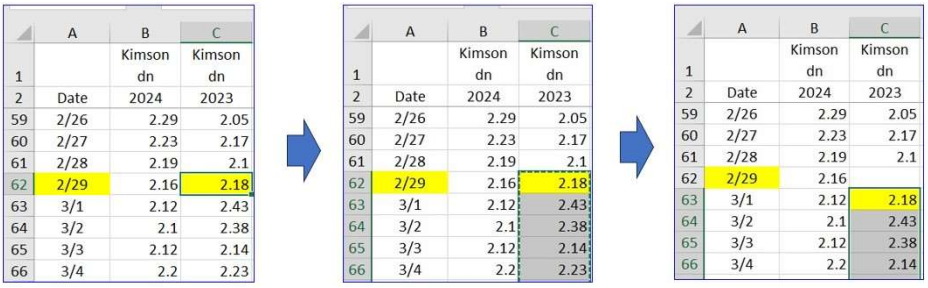
3-6

A) Paste the water level data from January 1, 2023 to December 31, 2023 into the Kim Son Dn Excel file.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.36	2.19						0	0	0	0	0	
4	1/2	2.29	2.12						0	0	0	0	0	
5	1/3	2.32	2.3						0	0	0	0	0	
6	1/4	2.2	2.34						0	0	0	0	0	
7	1/5	2.11	2.52						0	0	0	0	0	
8	1/6	1.95	2.59						0	0	0	0	0	
9	1/7	1.92	2.65						0	0	0	0	0	
10	1/8	2.1	2.49						0	0	0	0	0	
11	1/9	2.12	2.49						0	0	0	0	0	
12	1/10	2.22	2.19						9.5	0	0.5	0	0	
13	1/11	2.44	2.31						2.5	0	0	0	0.5	
14	1/12	2.2	2.39						4	2	0	0	0	
15	1/13	2.63	2.32						10	0.5	0.5	0	0	
16	1/14	2.59	2.3						2.5	0	0	0	0.5	
17	1/15	2.56	2.22						0	0	0	0	0	
18	1/16	2.54	2.11						0	0	0.5	0	0	

3-7

A) 2024 is a leap year and has February 29th. 2023 is a normal year, so the data for March 1st will be entered into the cell for February 29th. Therefore, cut the data from February 29 onwards and paste it into the cell for March 1st.



	A	B	C
1		Kimson dn	Kimson dn
2	Date	2024	2023
59	2/26	2.29	2.05
60	2/27	2.23	2.17
61	2/28	2.19	2.1
62	2/29	2.16	2.18
63	3/1	2.12	2.43
64	3/2	2.1	2.38
65	3/3	2.12	2.14
66	3/4	2.2	2.23

3-8

A) The same process is repeated for other years.
B) Because 2020 is a leap year, there is no need to adjust data after February 29th.
C) A dataset of annual mean daily water level and rainfall at Kim Son Dn from August 1, 2019 to the present day of July, 2024 has been completed.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
192	7/9	2.4	2.2	2.22	2.54	2.67			0	5.5	28	0	0	
193	7/10	2.3	2.19	2.35	2.57	2.46			1	0.5	0.5	0	0	
194	7/11		2.07	2.51	2.38	2.38				0	0	0	0	
195	7/12		1.94	2.59	2.14	2.32				0	4.5	0	0	
196	7/13		1.85	2.7	2.21	2.23				0	7	0	0	
197	7/14		1.77	2.83	2.48	2.15				0	2.5	0	0	
198	7/15		2.07	2.72	2.28	2.07				0	29	0	0	
199	7/16		2.1	2.68	2.09	2.21				8	0	0	0	
200	7/17		1.93	2.64	2.1	2.44				0	0	0	0	
201	7/18		1.63	2.49	2.11	2.53				2	8	0	0	
202	7/19		1.95	2.48	2.13	2.67				8.5	15.5	0	0	
203	7/20		2.14	2.36	2.24	2.69				11.5	29	0	0	
204	7/21		2.21	2.27	2.13	2.53				0	26.5	0	1	
205	7/22		2.22	2.32	1.99	2.57				6.5	24	0.5	0	
206	7/23		2.2	2.36	2.17	2.54				0	0	29	0	
207	7/24		2.13	2.4	2.19	2.59				0	0	0	0	
208	7/25		2.05	2.5	2.18	2.47				0	0	16.5	0	
209	7/26		1.97	2.49	2.07	2.44				0	0	0	0	
210	7/27		1.9	2.49	2.14	2.34				0	0	0	0.5	
211	7/28		1.93	2.39	2.12	2.29				0	0	0	21	
212	7/29		2.02	2.47	2.14	2.23				0	0	0	0	
213	7/30		2.13	2.51	2.16	2.38				10	3	0	0	
214	7/31		2.26	2.38	2.2	2.4				55.5	1.5	0	4.5	
215	8/1		2.2	2.48	2.15	2.5	2			12	23.5	25.5	1.5	20.5
216	8/2		1.92	2.31	2.2	2.47	1.96			49.5	0	0	67	6.5

3-9

A) To compare the water level fluctuations upstream and downstream of the Kimson Gate, copy the Kimson Up sheet and replace the rainfall data column with the water level data copied from the Kimson Dn sheet.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain	Kimson up Rain
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
366	12/30		2.21	2.09	1.9	2.05	2.18			0	0	1	0	0
367	12/31		2.2	2.09	1.94	2.18	2.07			0	0	0	0	0
368														
369	Max	3.01	2.75	3.26	2.81	3.03	2.96		137.50	100.00	111.00	79.00	86.50	95.00
370	Min	1.81	1.75	1.83	1.79	1.72	1.86		0.00	0.00	0.00	0.00	0.00	0.00
371	Average	2.23	2.23	2.34	2.23	2.25	2.25	Total	775.50	958.00	1505.00	939.50	1255.50	761.00
372														

Sheet1 | Sheet1 (2)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01	2.13	2.27	2.18			2.36	2.19	2.47	2.29	2.4	
4	1/2	2.18	1.98	2.21	2.3	2.25			2.29	2.12	2.61	2.4	2.41	
5	1/3	2.15	2.01	2.35	2.29	2.12			2.32	2.3	2.71	2.41	2.33	
6	1/4	2.08	2.15	2.43	2.21	1.99			2.2	2.34	2.8	2.38	2.11	
7	1/5	2.1	2.27	2.49	2.18	2			2.11	2.52	2.76	2.39	1.95	
8	1/6	2.04	2.25	2.41	2.1	1.95			1.95	2.59	2.63	2.36	1.91	
9	1/7	1.98	2.2	2.36	2.04	1.96			1.92	2.65	2.63	2.27	2.09	

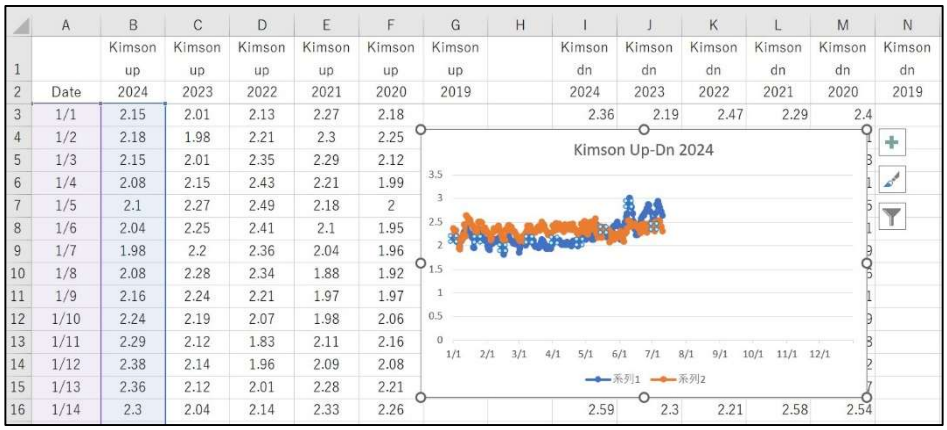
3-9

A) From the menu at the top of the Excel sheet, click "Insert" and select a graph from "Charts." Select the line graph and click on it.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01	2.13	2.27	2.18			2.36	2.19	2.47	2.29	2.4	
4	1/2	2.18	1.98	2.21	2.3	2.25			2.29	2.12	2.61	2.4	2.41	
5	1/3	2.15	2.01	2.35	2.29	2.12			2.32	2.3	2.71	2.41	2.33	
6	1/4	2.08	2.15	2.43	2.21	1.99			2.2	2.34	2.8	2.38	2.11	
7	1/5	2.1	2.27	2.49	2.18	2			2.11	2.52	2.76	2.39	1.95	
8	1/6	2.04	2.25	2.41	2.1	1.95			1.95	2.59	2.63	2.36	1.91	
9	1/7	1.98	2.2	2.36	2.04	1.96			1.92	2.65	2.63	2.27	2.09	
10	1/8	2.08	2.28	2.34	1.88	1.92			2.1	2.49	2.55	2.19	2.16	
11	1/9	2.16	2.24	2.21	1.97	1.97			2.12	2.49	2.47	2.13	2.31	
12	1/10	2.24	2.19	2.07	1.98	2.06			2.22	2.19	2.39	2.16	2.49	
13	1/11	2.29	2.12	1.83	2.11	2.16			2.44	2.31	2.34	2.24	2.58	
14	1/12	2.38	2.14	1.96	2.09	2.08			2.2	2.39	2.29	2.47	2.62	
15	1/13	2.36	2.12	2.01	2.28	2.21			2.63	2.32	2.28	2.58	2.57	
16	1/14	2.3	2.04	2.14	2.33	2.26			2.59	2.3	2.21	2.58	2.54	
17	1/15	2.24	1.91	2.19	2.27	2.3			2.56	2.22	2.48	2.65	2.33	

3-10

A) The graph will be displayed, so enter "Kimson Up-Dn 2024" as the title.

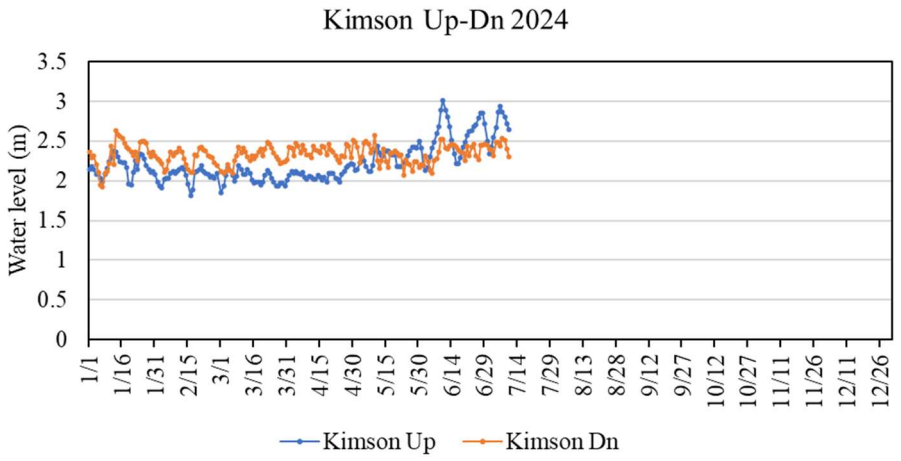


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Kimson up	Kimson up	Kimson up	Kimson up	Kimson up	Kimson up		Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn	Kimson dn
2	Date	2024	2023	2022	2021	2020	2019		2024	2023	2022	2021	2020	2019
3	1/1	2.15	2.01	2.13	2.27	2.18			2.36	2.19	2.47	2.29	2.4	
4	1/2	2.18	1.98	2.21	2.3	2.25								
5	1/3	2.15	2.01	2.35	2.29	2.12								
6	1/4	2.08	2.15	2.43	2.21	1.99								
7	1/5	2.1	2.27	2.49	2.18	2								
8	1/6	2.04	2.25	2.41	2.1	1.95								
9	1/7	1.98	2.2	2.36	2.04	1.96								
10	1/8	2.08	2.28	2.34	1.88	1.92								
11	1/9	2.16	2.24	2.21	1.97	1.97								
12	1/10	2.24	2.19	2.07	1.98	2.06								
13	1/11	2.29	2.12	1.83	2.11	2.16								
14	1/12	2.38	2.14	1.96	2.09	2.08								
15	1/13	2.36	2.12	2.01	2.28	2.21								
16	1/14	2.3	2.04	2.14	2.33	2.26			2.59	2.3	2.21	2.58	2.54	

3-11

A) Example of final graph.

B) Since the water level downstream is usually higher than the water level upstream, it can be seen that the gate is well managed to keep the water level in the downstream canal at 2m or more.

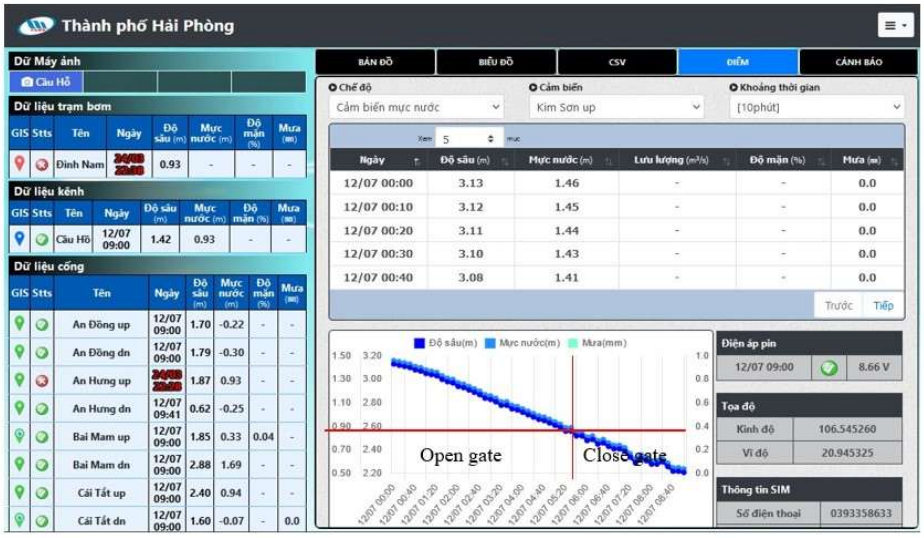


4. Timing of gate opening and closing

4-1

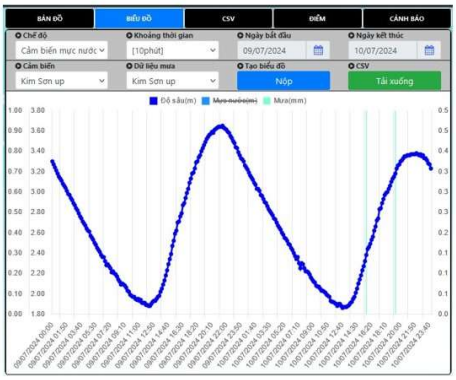
A) Touch the "POINT" tab and select "Kimson up" and "10min" to display and graph water level data for 10-minute intervals starting at 00:00 on the current day.

B) For example, if the water level threshold is set to 2.6m, the gate keeper opens the gate when the water level is above 2.6m and closes it before the water level falls below 2.6m, allowing the canal downstream of the gate to continue to fill with water.



4-2

A) Using the "CHART" tab, show graphs of water level and rainfall fluctuations at 10-minute intervals for Kimson Up and Kimson Dn from 00:00 on July 9, 2024 to 24:00 on July 10, 2024.



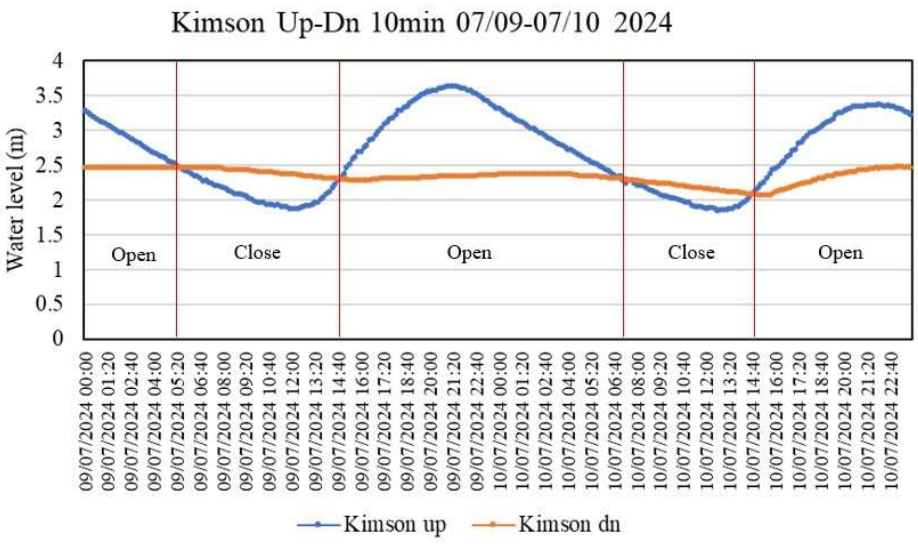
Kimson Up

Kimson Dn

4-3

A) A graph of water level fluctuations at Kimson Up and Dn over two days from 00:00 on July 9th to 24:00 on July 10th.

B) The gates are assumed to be closed, so the upstream and downstream water levels reverse twice a day due to the influence of the tides. The gates need to be operated so that they open when the upstream water level is high and close when it is low.



Ⅵ. Maintenance works

- Maintenance works is essential for accurate and prolonging measurement by the TM system.
- Clearing weeds and cleaning of TM system including sensors must be conducted while checking the measured data regularly.
- SIM cards must be charged in order to continuously send the measured data.

1. Logger box maintenance

OM 1-1

A) Attacks of ants and insects are sometimes inevitable.
B) Check and monitor the system frequently, and apply insect repellent and any measures.

OM 1-2 A) Clean inside of the logger boxes. B) Change desiccant/silica gel and place anti-ant and anti-insect repellent.	 
OM 1-3 A) Regular visits and checks can avoid such case.	 

2. Solar panel maintenance

OM 2-1 A) Solar panels require regular maintenance. B) Spray clean water and wipe with soft cloth at least once a year. C) Regularly check battery voltage whether the solar panel functions properly or not. D) Also check the cable connection and sealing at the openings.	 

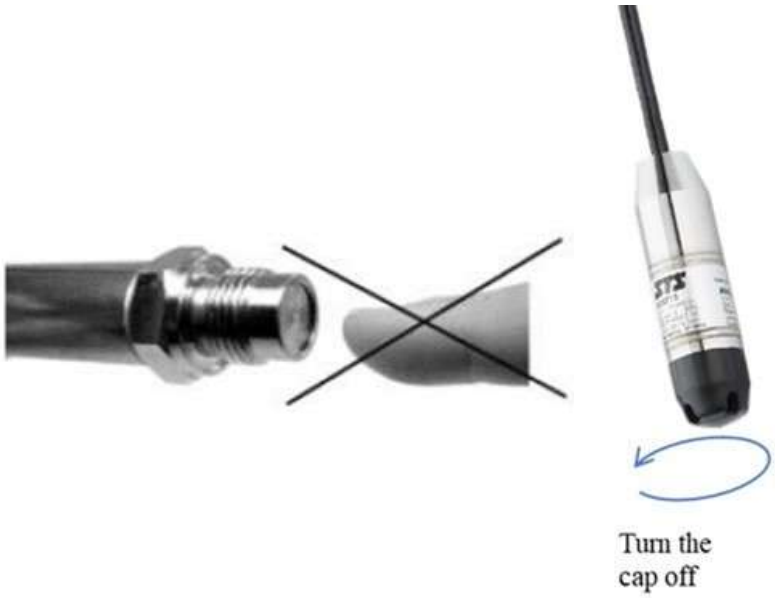
OM 2-2 A) Birds dropping, bagworms and other foreign matters on the panel surface must be removed immediately. B) After the removal, use water and soft cloth to clean the surface.	 
OM 2-3 A) If the panel is physically damaged, check the battery voltage and consult MEL and/or manufacturer.	

3. Water level sensor maintenance

OM 3-1 A) No maintenance causes abnormal water level data. Conduct the maintenance at least once a year. B) Open the handhole of the sensor, remove sealing at the top of the guide pipe and draw out the sensor by carefully pulling the cable. C) Clean the outside of the sensor with clean water.	 

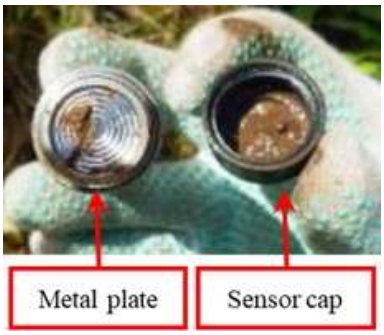
OM 3-2

A) Turn the black cap counter-clockwise and remove the cap.
B) Never touch the metal plate of the sensor, or you may damage the expensive sensor.



OM 3-3

A) Clean the cap and the metal plate by gently spraying clean water or swirling/shaking in a water-filled bucket.
B) When finished, return the black cap, reset the sensor into the guide pipe, seal the opening, put the cable into the handhole and set the lid of the handhole.
C) Record date and time of the maintenance work.



OM 3-4

A) There are reports of damaged sensor cables and guide pipes.
B) Regular monitoring and check of the data and the system avoids such damages before too late to recover.

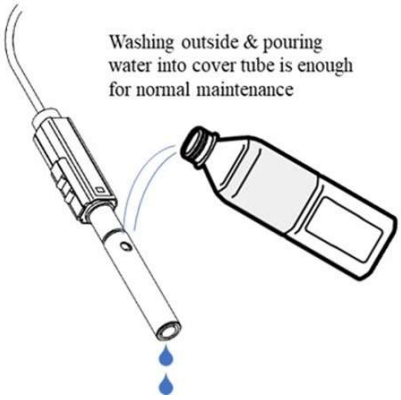
4. EC sensor maintenance

OM 4-1

A) EC sensor also requires regular maintenance.
B) Open the handhole, draw cables, remove sealing and carefully pull out the sensor.
C) Make sure the mark of a plastic tape is intact on the cable that indicates the depth to set the sensor.

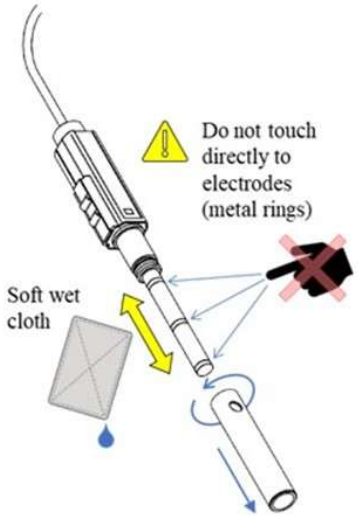
OM 4-2

A) Clean the outside of the sensor with clean water.



OM 4-3

A) Remove the outer casing by rotating counter clock wise.
B) Never touch the electrodes directly.
C) Clean the inner part with a soft wet towel and clean water.
D) When finished, return the outer casing, reset the sensor to the preset depth using the tape mark, seal the opening, set back the cable into the handhole, and put the lid to the handhole.
E) Record date and time of the maintenance work.



5. Rain gauge maintenance

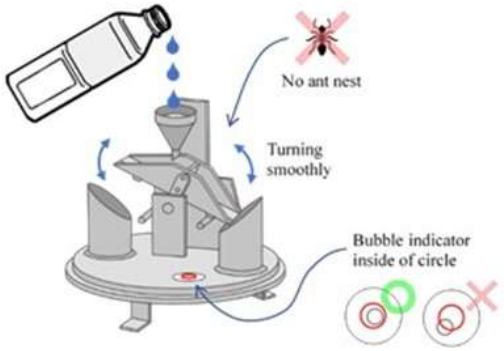
OM 5-1 A) Rain gauge body inevitably collects insects, rubbish and other foreign matters. B) Regularly check 2 (two) screens and clean.	  

OM 5-2

A) At least once a year, clean the rain gauge.

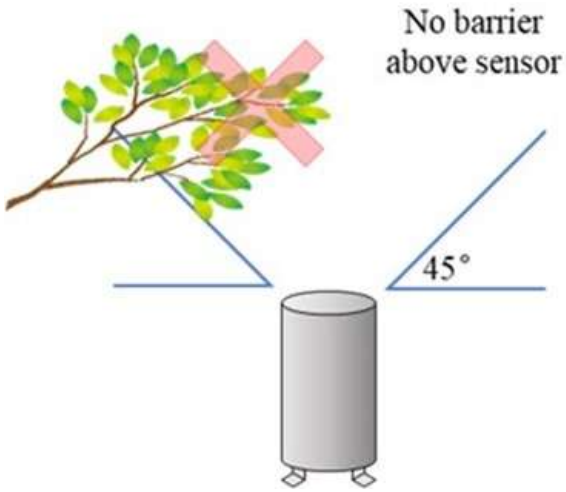
OM 5-3

A) When cleaning, disconnect the rainfall cable first, remove the rain gauge body, and then clean the tipping bucket with water, cotton swabs and soft cloth.
B) After cleaning, confirm the bucket moves smoothly and the bubble of the level stays center.
C) Reset the body by tightening screws and reconnect the cables.



OM 5-4

A) Before re-hoisting the gauge, make sure there is no obstacle above and around the gauge.
B) Log out those trees and any obstacles.



6. Water quality sensor maintenance

OM 6-1

A) Water quality sensor requires regular and frequent maintenance. Sometimes, insects may be found stuck on the probe.
B) Conduct calibration after the maintenance.

OM 6-2

A) Carefully remove the sensor probe.
B) Clen outside of the probe with a soft brush and water.

OM 6-3

A) Remove the outer ring of the probe.
B) Carefully wash out the dust and rubbish with a soft brush and clean distilled water.

OM 6-4

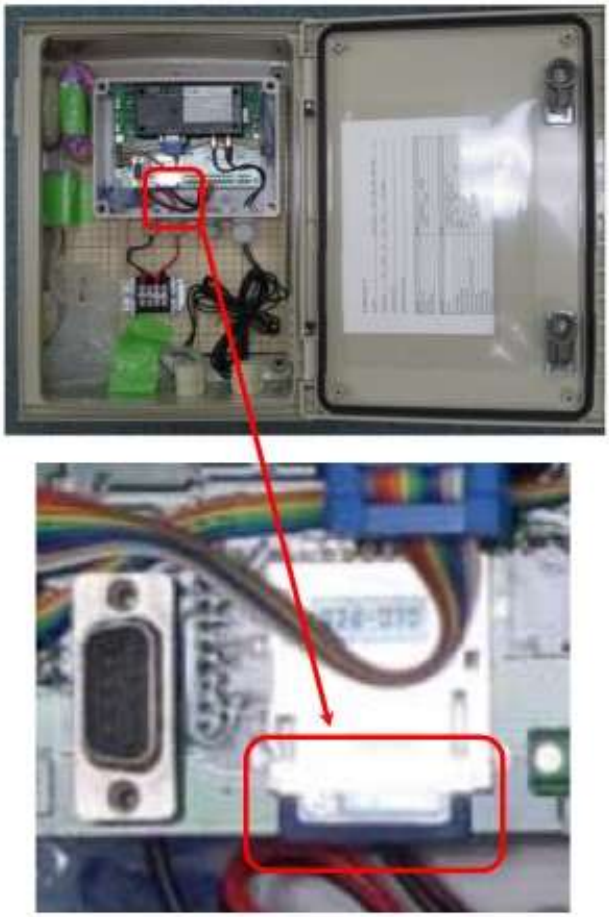
A) Calibration must be conducted while following manual and instructions provided by the manufacturer.

OM 6-5 A) It is a good practice to compare the measurements with salty water of known concentration or other sensors when available.	 
OM 6-6 A) After maintenance work, carefully reset the probe by inserting into the guide pipe. B) Note and record date and time for the maintenance work.	 

7. TM logger maintenance

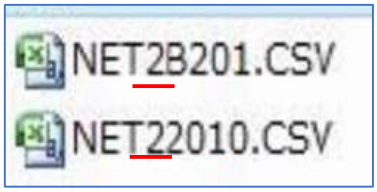
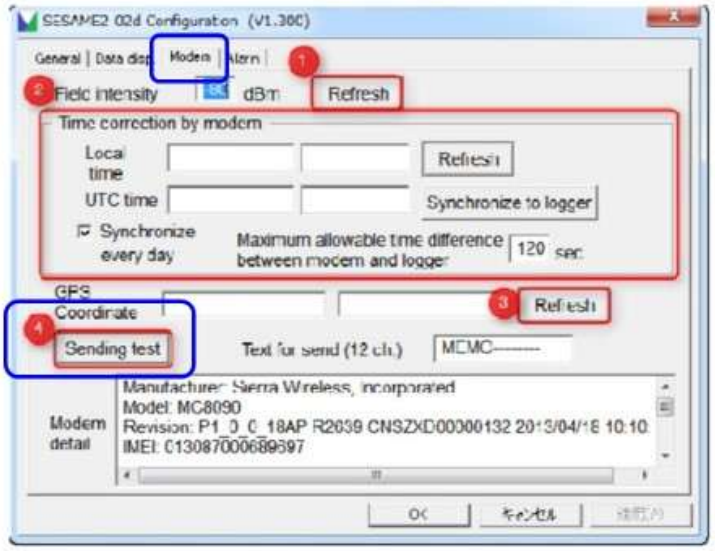
OM 7-1

A) When communication is failed and data is missing, take out SD card and copy the card to laptop.
B) Open logger box, and confirm the location of SD card holder.



OM 7-2

A) SD card holder is a push-push type that locks when pushed once and ejects when pushed again.
B) Take out SD card and insert it to computer for data retrieval.

	
OM 7-3 A) SD data files show: (i) "NET2B201. CSV" is copied file from the internal memory, and (ii) "NET22010.CSV" is all the data this TM has been stored ever. B) Just check the last 2 digits as the code name is different for every TM.	
OM 7-4 A) Recovery of data sending. When data sending is not working, wait for restarting of data sending for several days. It takes more than 10 days at maximum depending on communication conditions at the TM point. B) If the not sending time has passed more than a week, do the following procedures. (1) Connect laptop and 9 pin plug by cable according to the process of "System setting". (2) Select "Modem" (3) Click "Sending test" (4) When no response, try again to click, and wait. Repeat click until "OK" message appears.	

Manual

Telemetry for Irrigation Water Management Equipment, System, Data analysis, Operation and Maintenance

September 2024	Vietnam Academy for Water Resources

Buku panduan

Panduan penerapan sistem pengukuran jarak jauh (TM) untuk pengelolaan air irigas Peralatan, Sistem, Analisis Data, Operasi dan Pemeliharaani

September 2024	Institut Ilmu Pengetahuan Irigasi Vietnam

សៀវភៅណែនាំ

សចេក្តីណែនាំសម្រាប់អនុវត្តបច្ចេកវិទ្យាវាស់វែងពីចម្ងាយ (TM) ដម្លីប្រើប្រាស់ប្រព័ន្ធទឹកស្វ័យប្រវត្តិ បរិក្ខារ ប្រព័ន្ធការវិភាគទិន្នន័យ ប្រតិបត្តិការ និងការថែទាំ

ខែកញ្ញា ឆ្នាំ 2024	បណ្ឌិតសភាវៀតណាម សម្រាប់ធនធានទឹកៗ

ຄູ່ມື

ແນະນຳການນຳໃຊ້ລະບົບວັດແທກຈາກໄກ (TM) ເພື່ອຄຸ້ມຄອງນ້ຳທີ່ຫົດ ອຸປະກອນ, ລະບົບ, ການວິເຄາະຂໍ້ມູນ, ການໃຊ້ງານ ແລະ ການບຳລຸງຮັກສາ

ກັນຍາ 2024	ສະຖາບັນ ວິທະຍາສາດ ຊົນລະປະທານ ຫວຽດນາມ


VAWR
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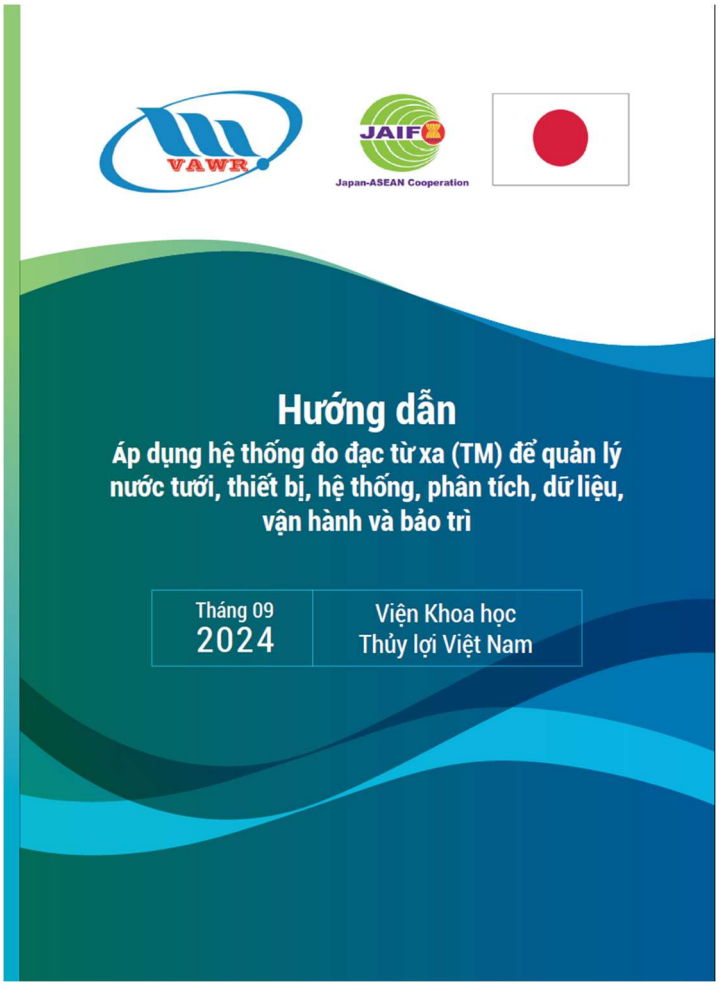
สังสอน
นำระบบโทรมาตร (TM) มาใช้เพือการบริหารจัดการ
น้ำชลประทาน อุปกรณ์ ระบบ การวิเคราะห์ ข้อมูล
การดำเนินงานและการบำรุงรักษา
กันยายน
2024
สถาบันวิทยาศาสตร์
รัพยากรน้ำแห่งเวียดนาม


VAWR
JAIF
Japan-ASEAN Cooperation
Hướng dẫn
Áp dụng hệ thống đo đạc từ xa (TM) để quản lý
nước tưới, thiết bị, hệ thống, phân tích, dữ liệu,
vận hành và bảo trì
Tháng 09
2024
Viện Khoa học
Thủy lợi Việt Nam

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This MANUAL is available not only in English but also in Indonesia, Khmer, Lao, Thai and Vietnamese.

We hope this MANUAL would be utilized widely and actively, together with “Guideline for planning ICT use in irrigation and drainage project” which was also published from ADCA in March 2025.　If you have any inquiries regarding copyright, etc., please contact　adca@adca.or.jp

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