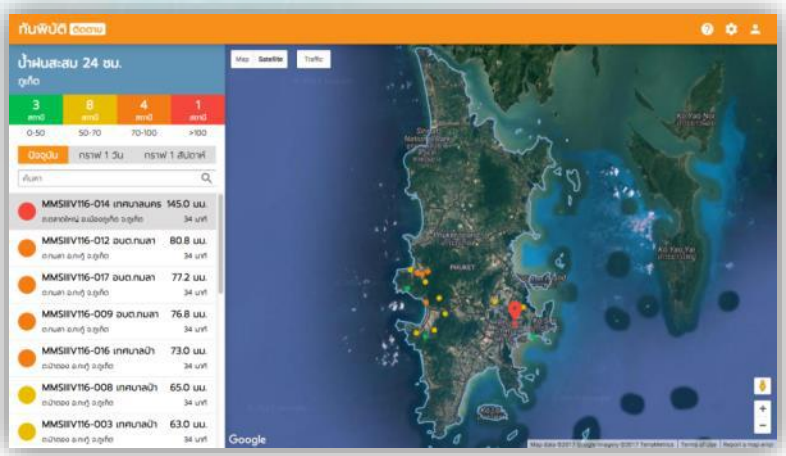
TanPibut

Disaster Early Warning System



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Khongpan Rungprateepthaworn
National Electronics and Computer Technology Center
Thailand

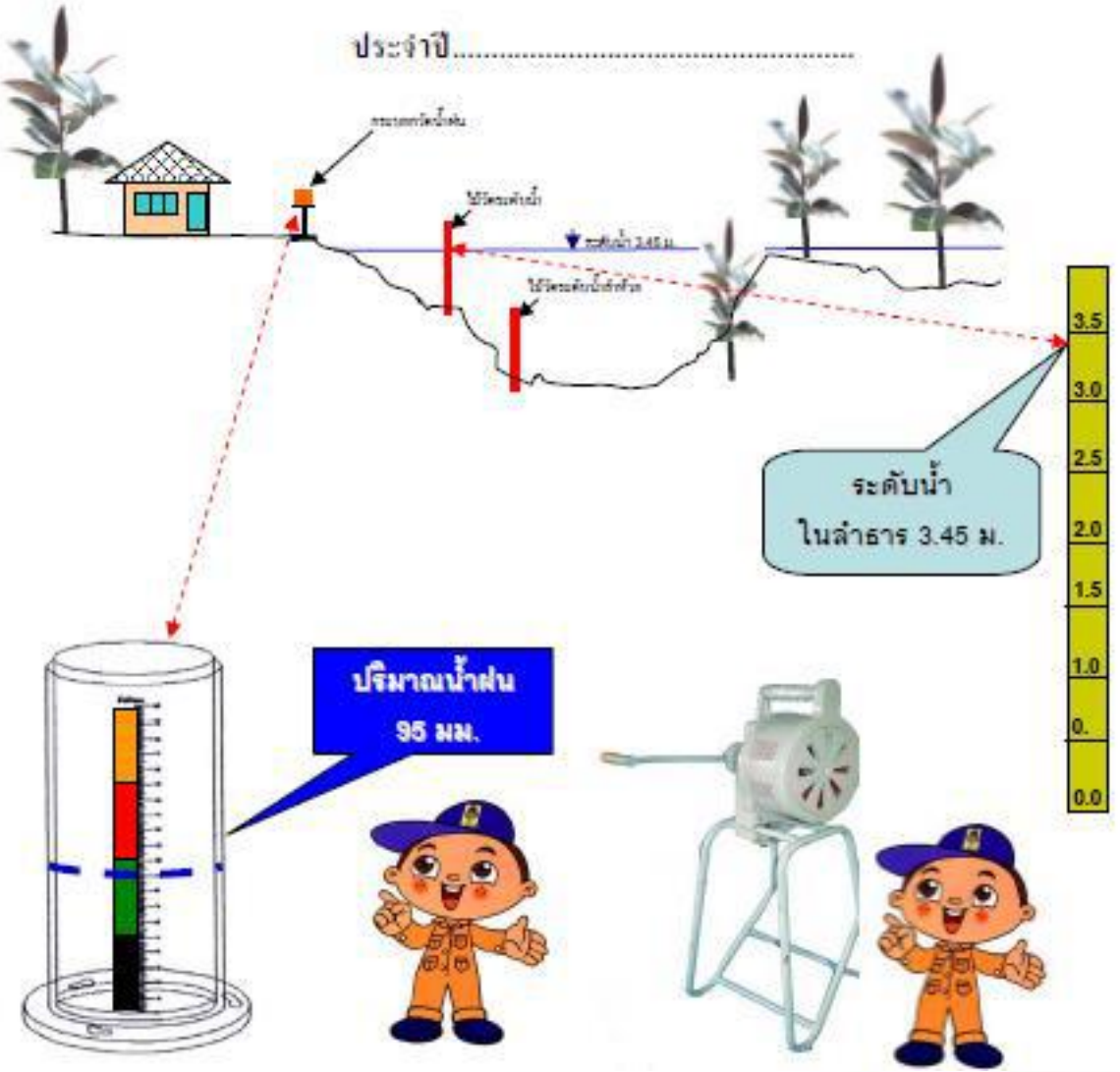
TanPibut

Disaster Early Warning System

Tan = timely , in time

Pibut = Disaster

Manual Rainfall Monitoring



TanPibut System

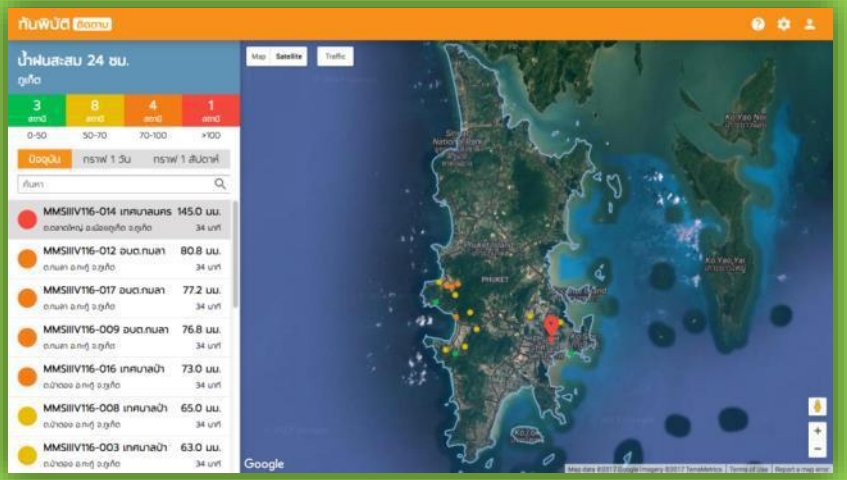
Observation Station

temperature humidity rainfall

observation data stream

Server

*.tanpibut.org



Software Ecosystem

Automatic rainfall monitoring station

Sensors

Temperature & Humidity

- Sensor type : Silicon sensor chip
- Range :
  Temperature -10 -60 °C
  Humidity 0-100 %RH
- Accuracy :
  Temperature ±0.5 °C at 10-40 °C
  Humidity ± 2% RH at 10-90% RH

Rain collector

- Sensor type : Tipping Bucket
- Resolution : 0.2 mm
- Accuracy :
  ± 5% at rain rate < 100 mm/hour
  or ± 0.2 mm whichever is greater

Energy Source

Solar cell

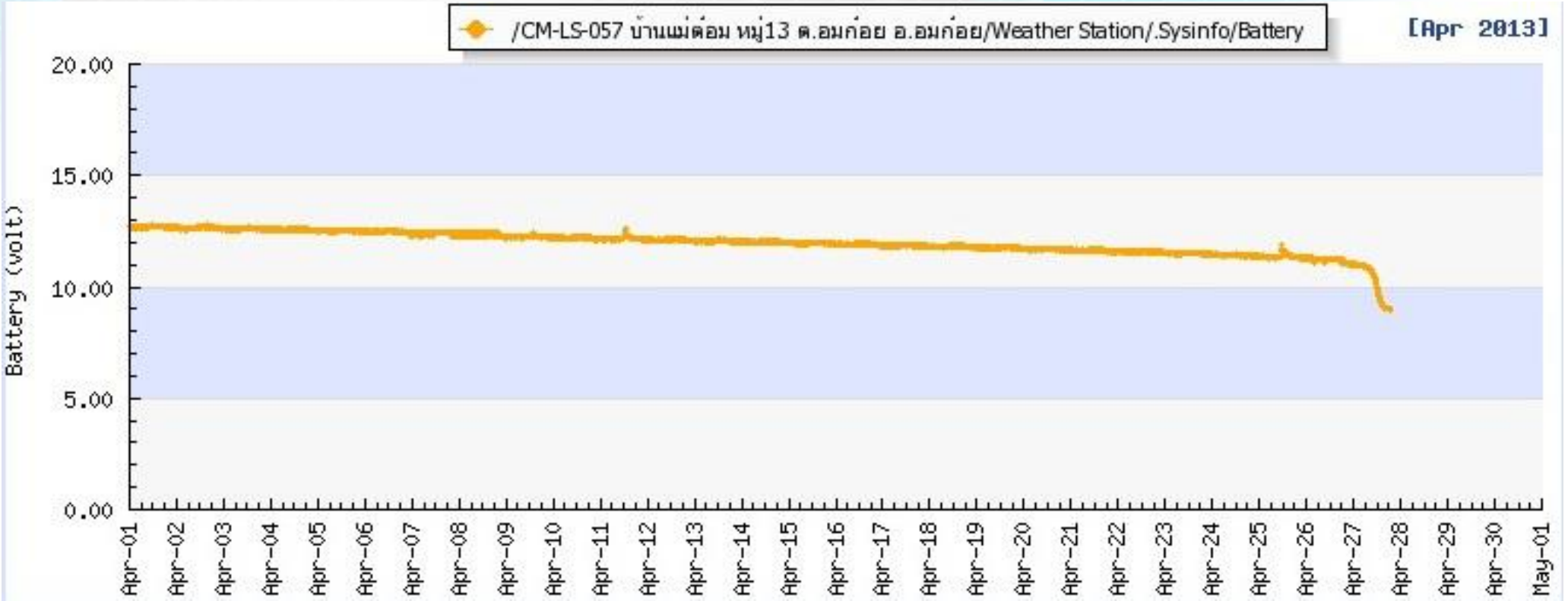
- Maximum Power 10 wattt
- Vmp 17.5 Volt
- Imp 0.58 Amp
- Isc 0.65 Amp
- Weight 1 kg

Battery

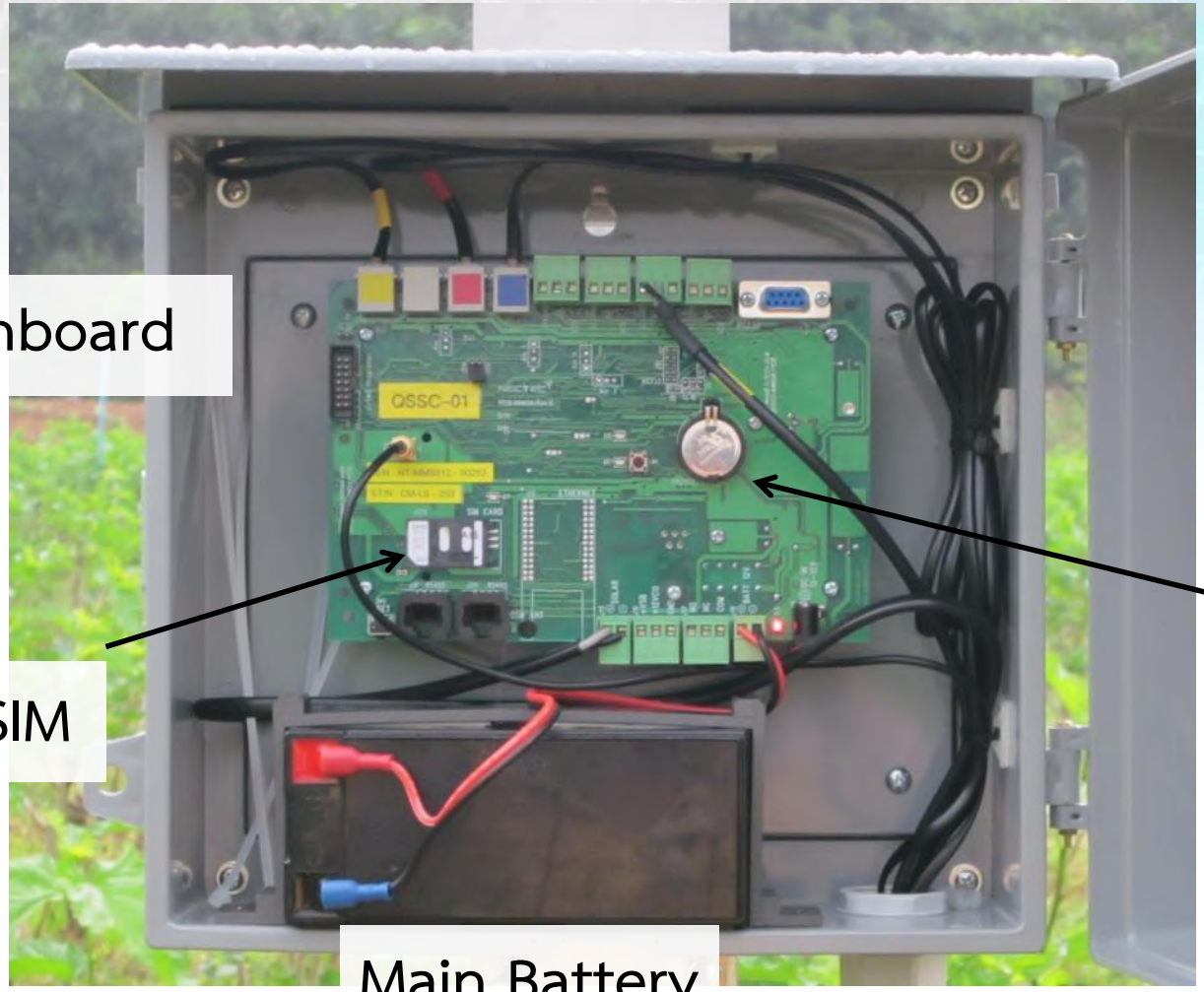
- Type : Sealed lead acid battery
- Normal Voltage : 12 V
- Capacity 7.8 Ah
- Internal Resistance 18 mΩ

Solar black-out duration.

> 2 weeks with 12 Volts 7.8 AH Battery



Control Box



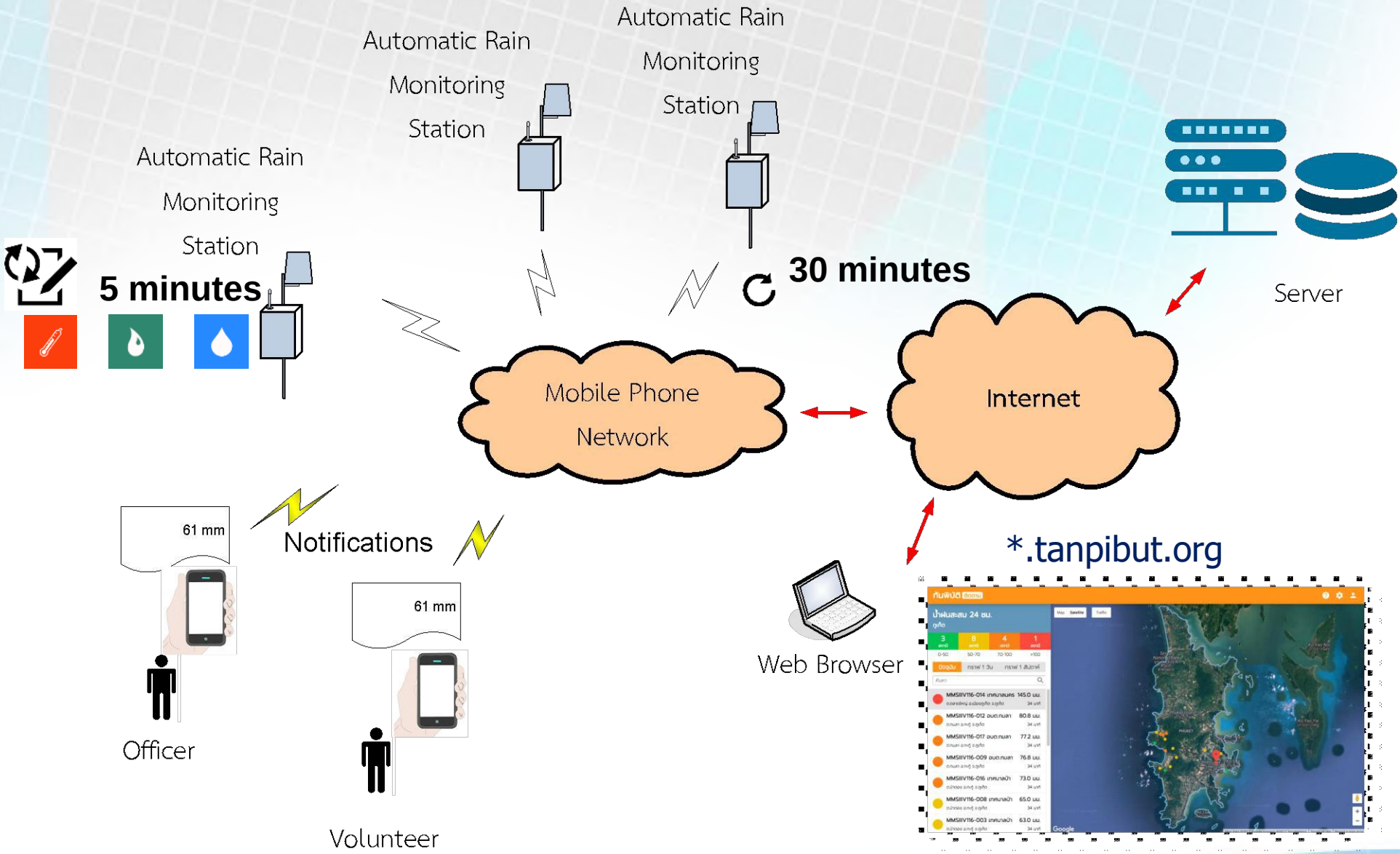
Mainboard

Mobile SIM

Main Battery

RTC battery

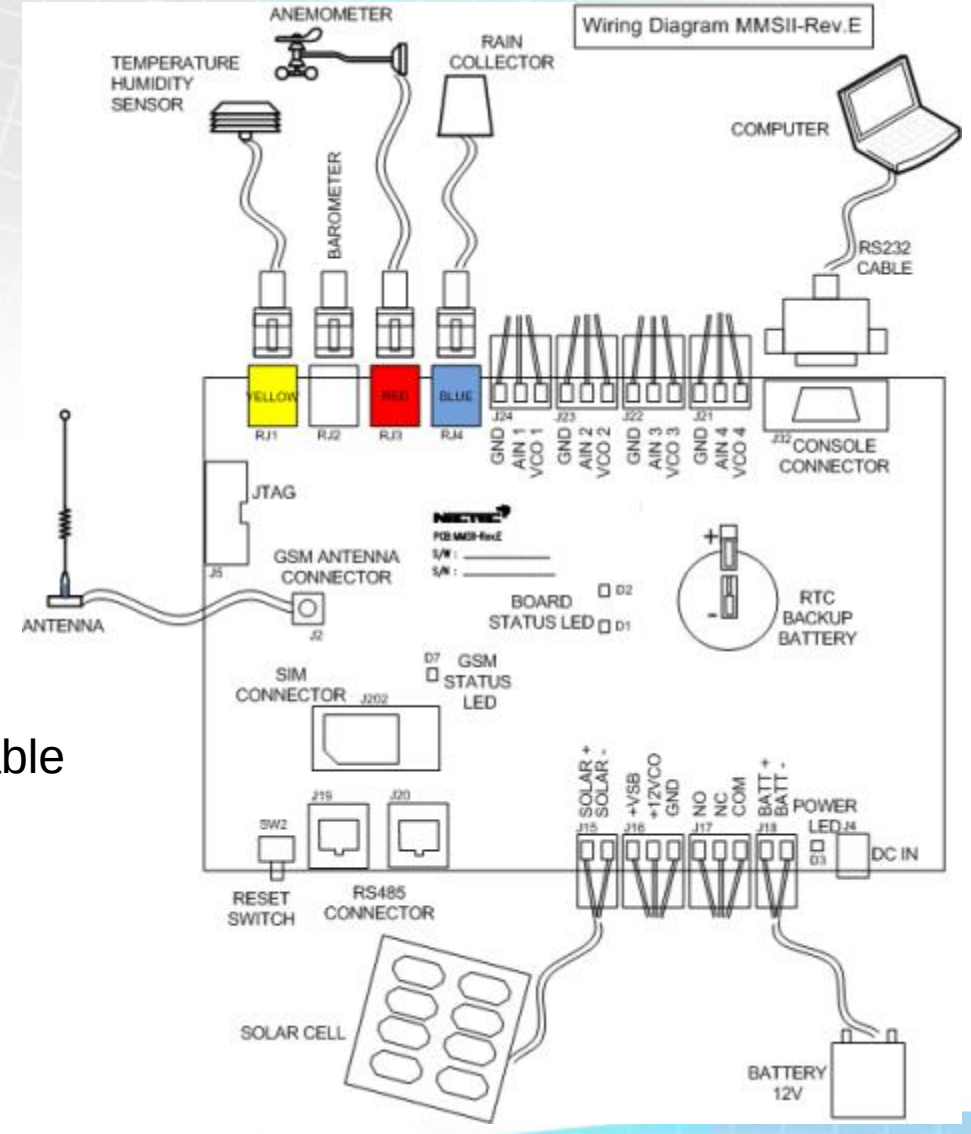
TanPibut Observation Stations



Station/Mainboard Features

- 512 Kbytes nonvolatile data memory
- GPRS/EDGE data connection
- Record interval : 1 minute to 24 hour
- Data transmission interval :
  15 minute to 24 hour
- On board 12 V Lead-Acid battery charger with voltage monitor
- Operate on 12 Volt 10 Watt Solar cell with

  7.8AH Lead-Acid Battery
- Supply voltage for sensor : 3.3/5V/12 selectable
- SMS warning : 3 levels of 24 Hr rain volume
- 5 SMS numbers can be programmed



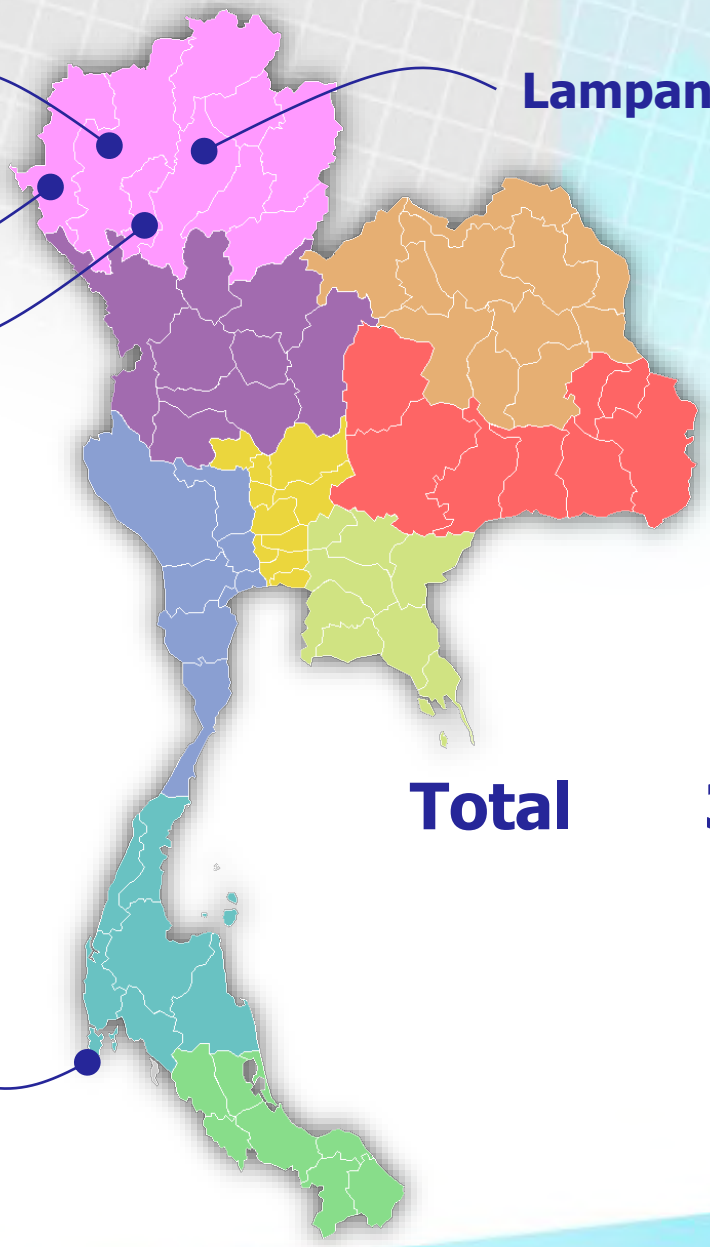
Deployed Weather Stations

Chiang Mai 250 stations

Maehongson 8 stations

Lampoon 12 stations

Lampang 15 stations



Total 301 stations

Phuket 16 stations

TanPibut System

Observation Station

temperature humidity rainfall

observation data stream

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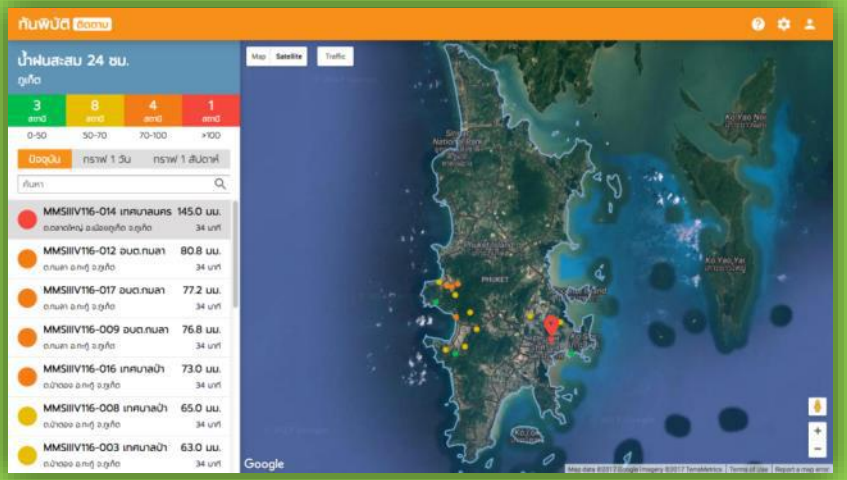
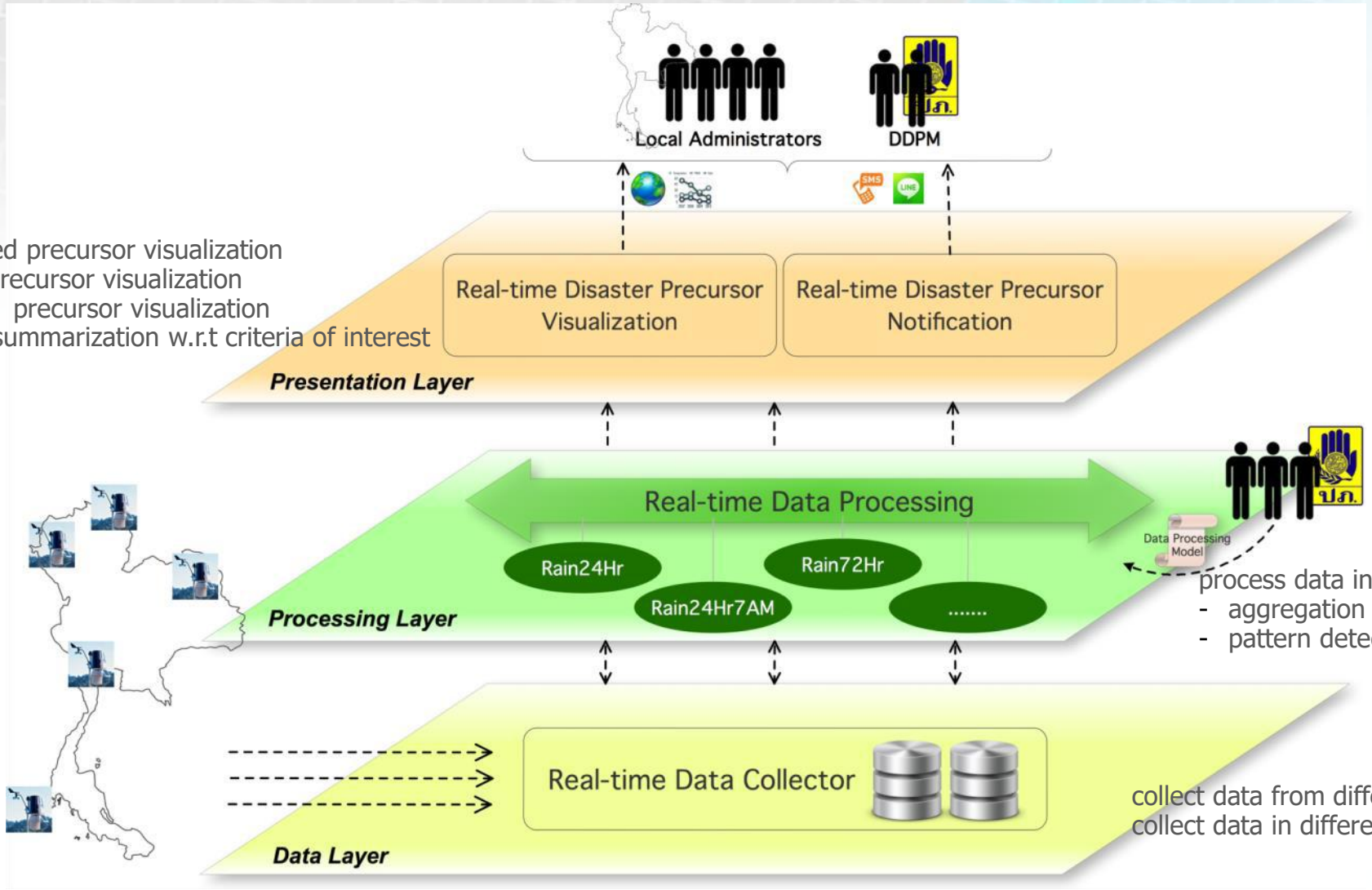


Software Ecosystem

Software Ecosystem

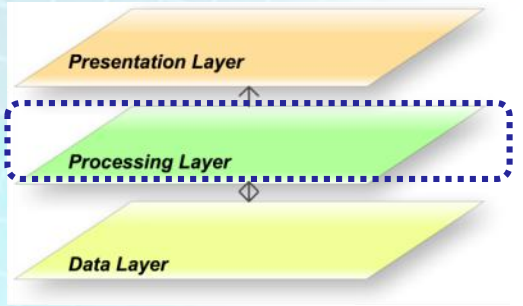


personalized precursor visualization
real-time precursor visualization
responsive precursor visualization
precursor summarization w.r.t criteria of interest

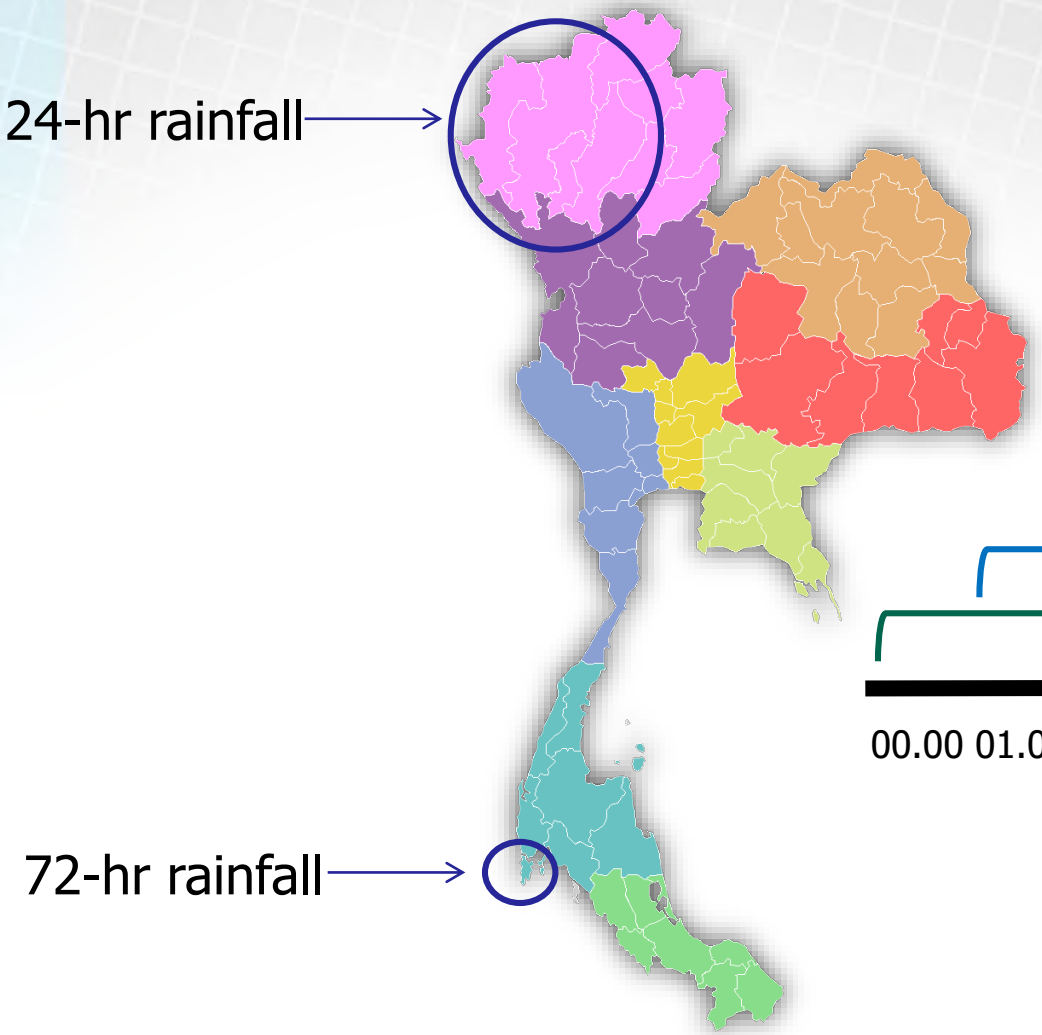
process data in memory
- aggregation
- pattern detection

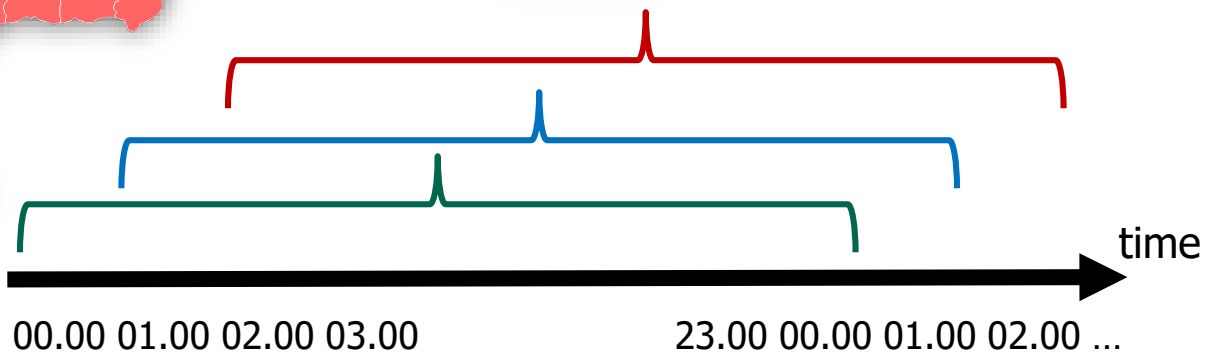
collect data from different sources
collect data in different formats

Processing layer - Landslide Precursor Measure

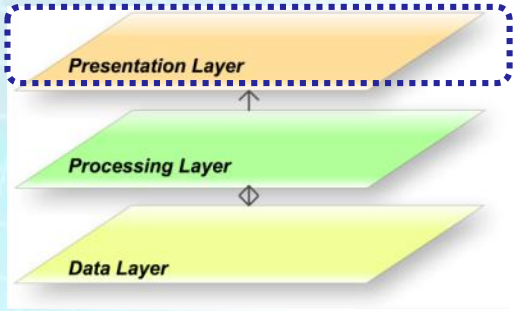


Accumulative Rainfall Model





Landslide Precursor Measure



Precursor Category/Level

	DDPM Default	Customization
4	≥ 100 mm.	≥ x_3 mm.
3	70 - 100 mm.	$x_2 - x_3$ mm.
2	50 - 70 mm.	$x_1 - x_2$ mm.
1	< 50 mm.	< x_1 mm.

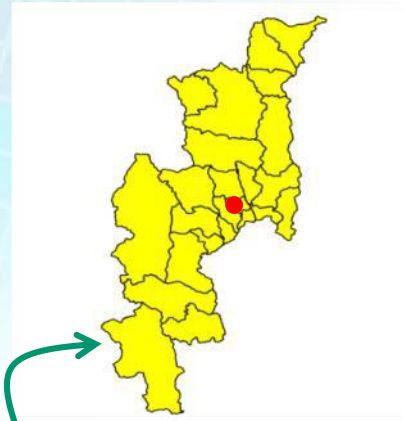
Landslide Precursor Measure

@CM-LS-001

Data Collector

Data Processor

Data Visualizer/
Notifier



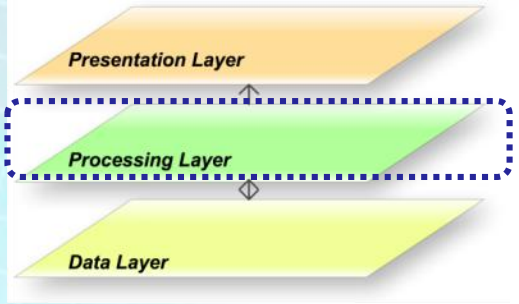
CM-LS-001

98.9

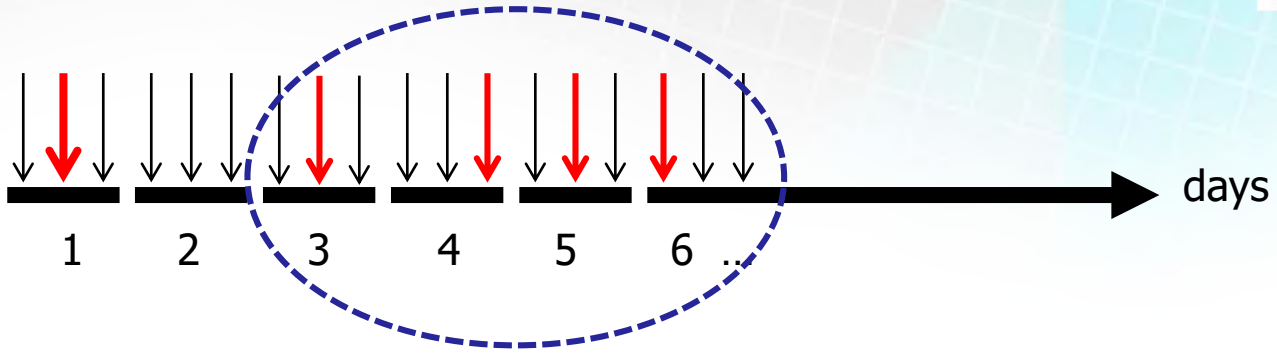
1 2 3 4 ... 23 time

SMS

Cold Wave Detection



Temperature < 8°C for 3 consecutive days



Disaster Category/Level

2

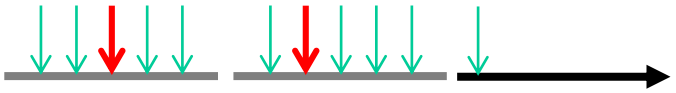
1

Cold Wave Precursor Measure

@CM-LS-001

Data Collector → Data Processor → Data Visualizer/ Notifier

CM-LS-001

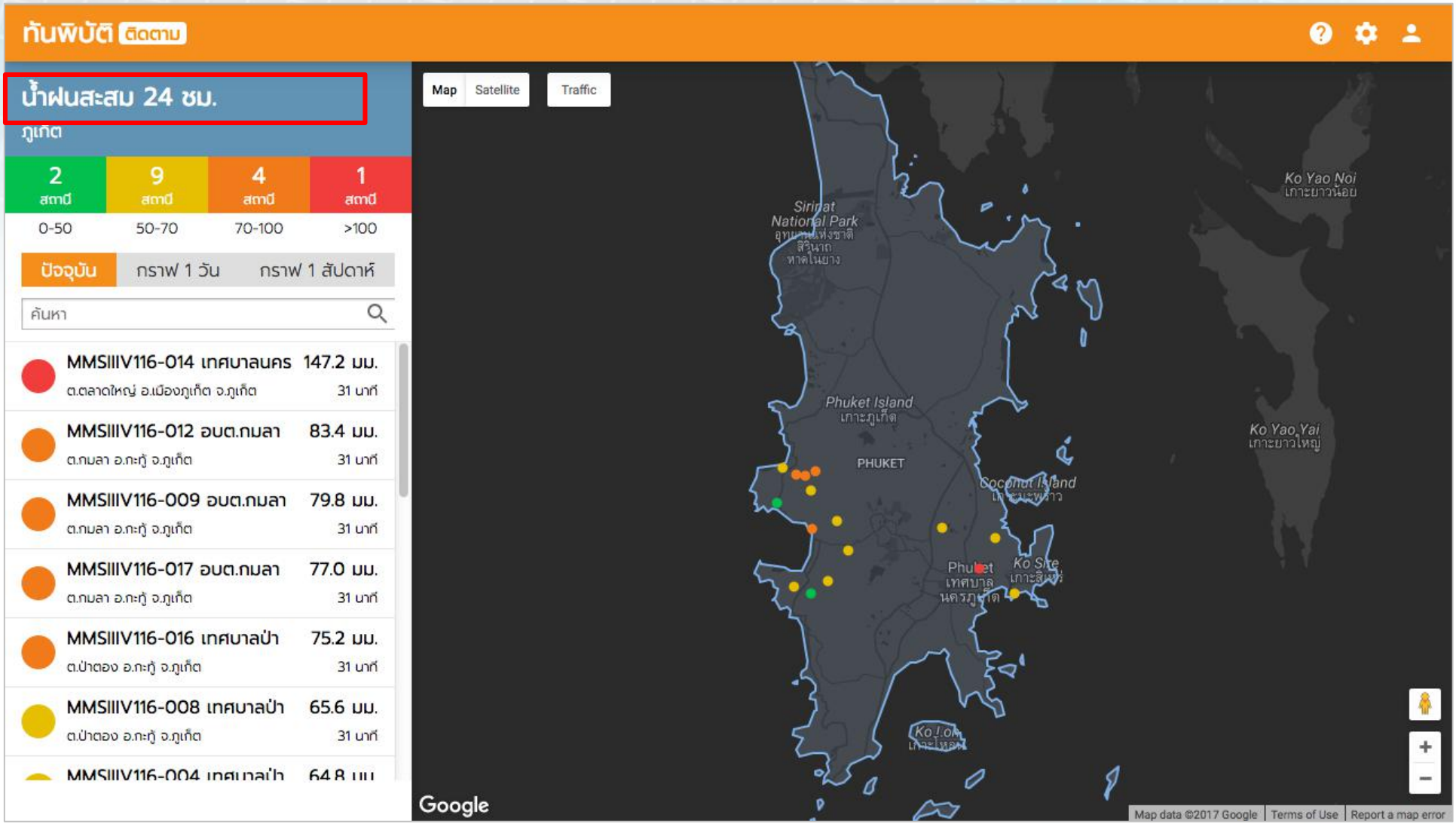


SMS

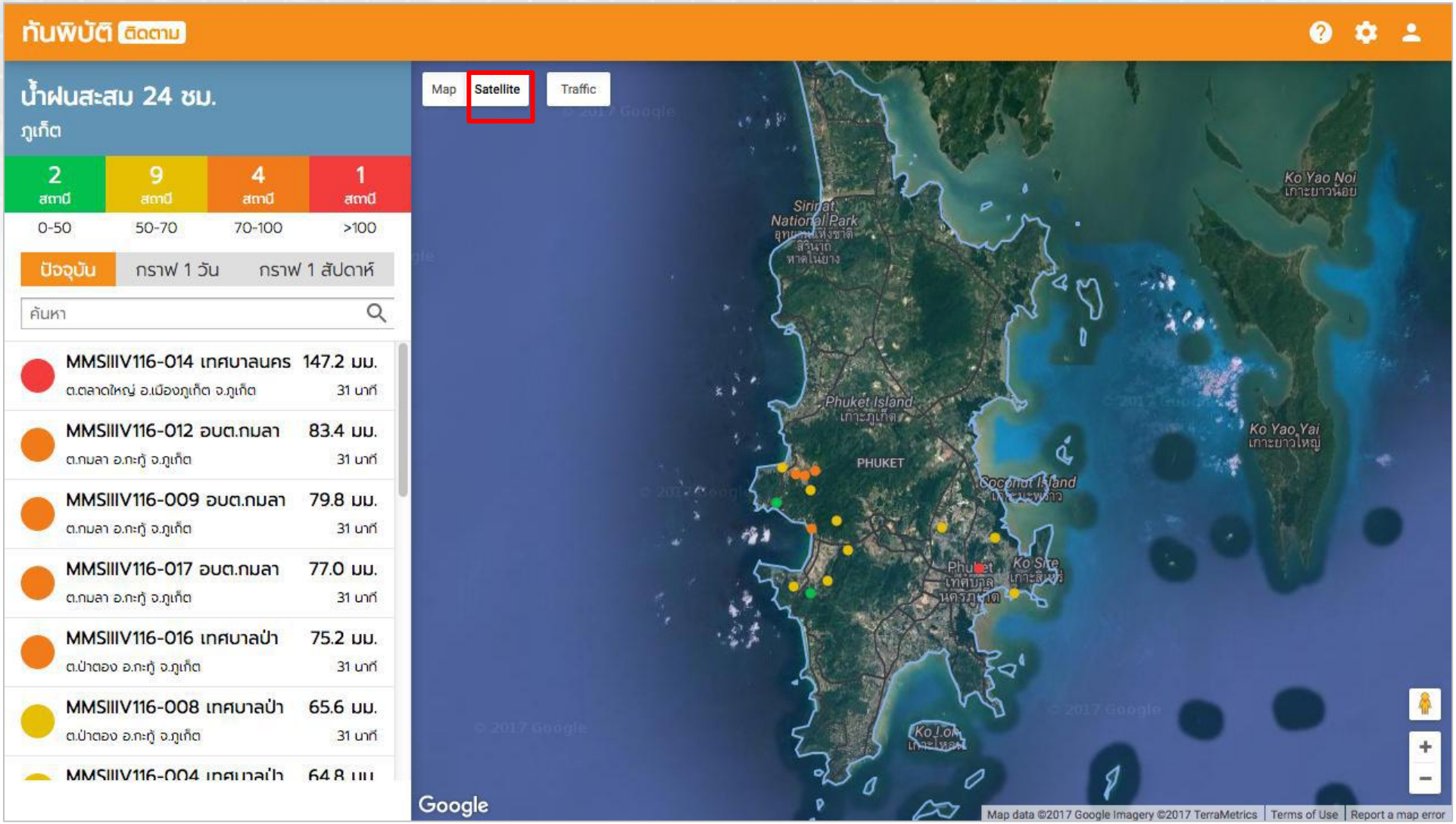
TanPibut-WATCH Features

- 3 type of disastrous precursors/events
  - Rainfall 24 Hours
  - Rainfall 24 Hours @ 7.00 am
  - Rainfall 72 Hours
  - Cold Wave
- 3 disastrous precursor visualization
  - Map: default & satellite
  - Table
  - Graph: 1 day & 7 days

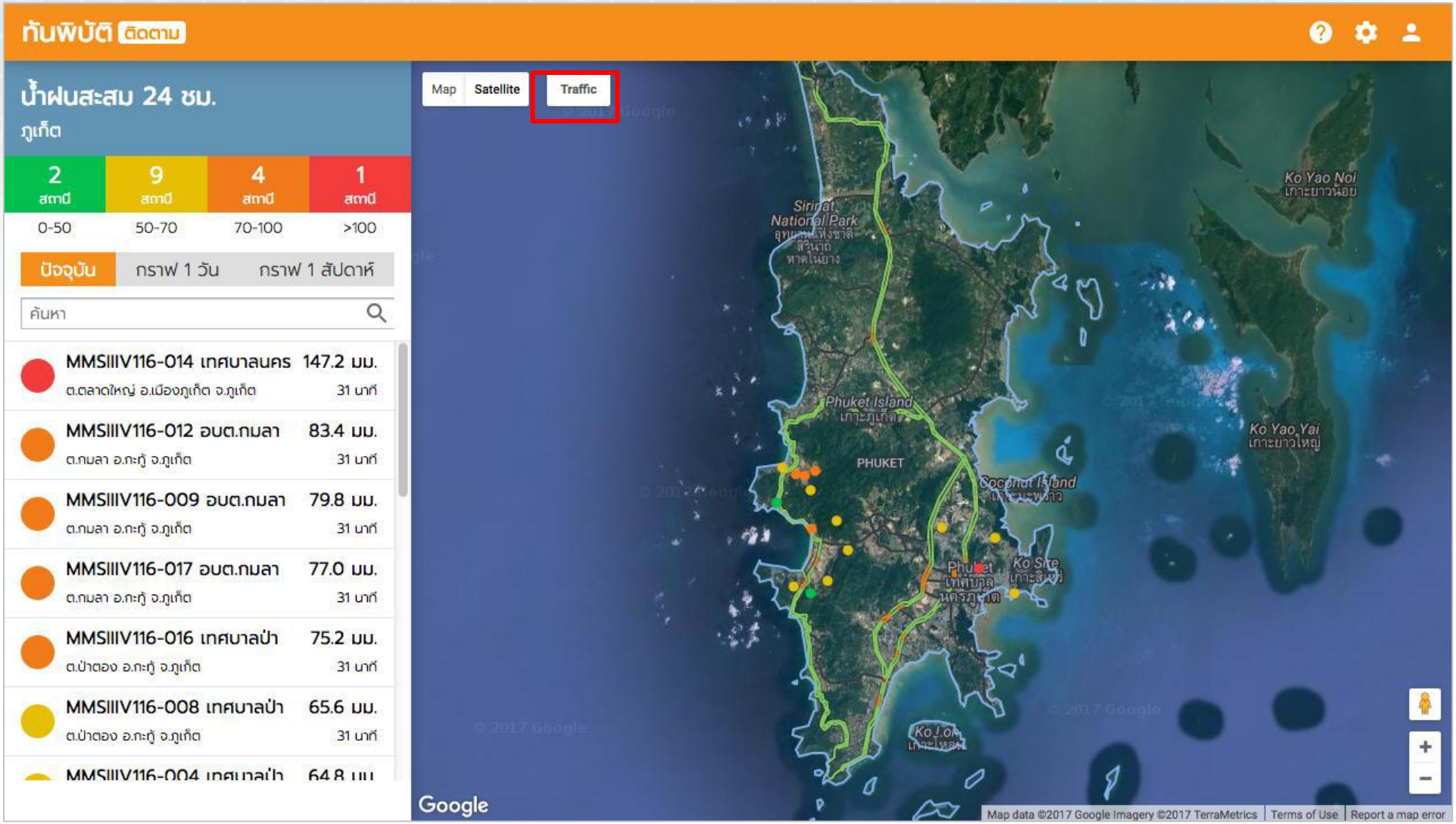
TanPibut-WATCH (default map)



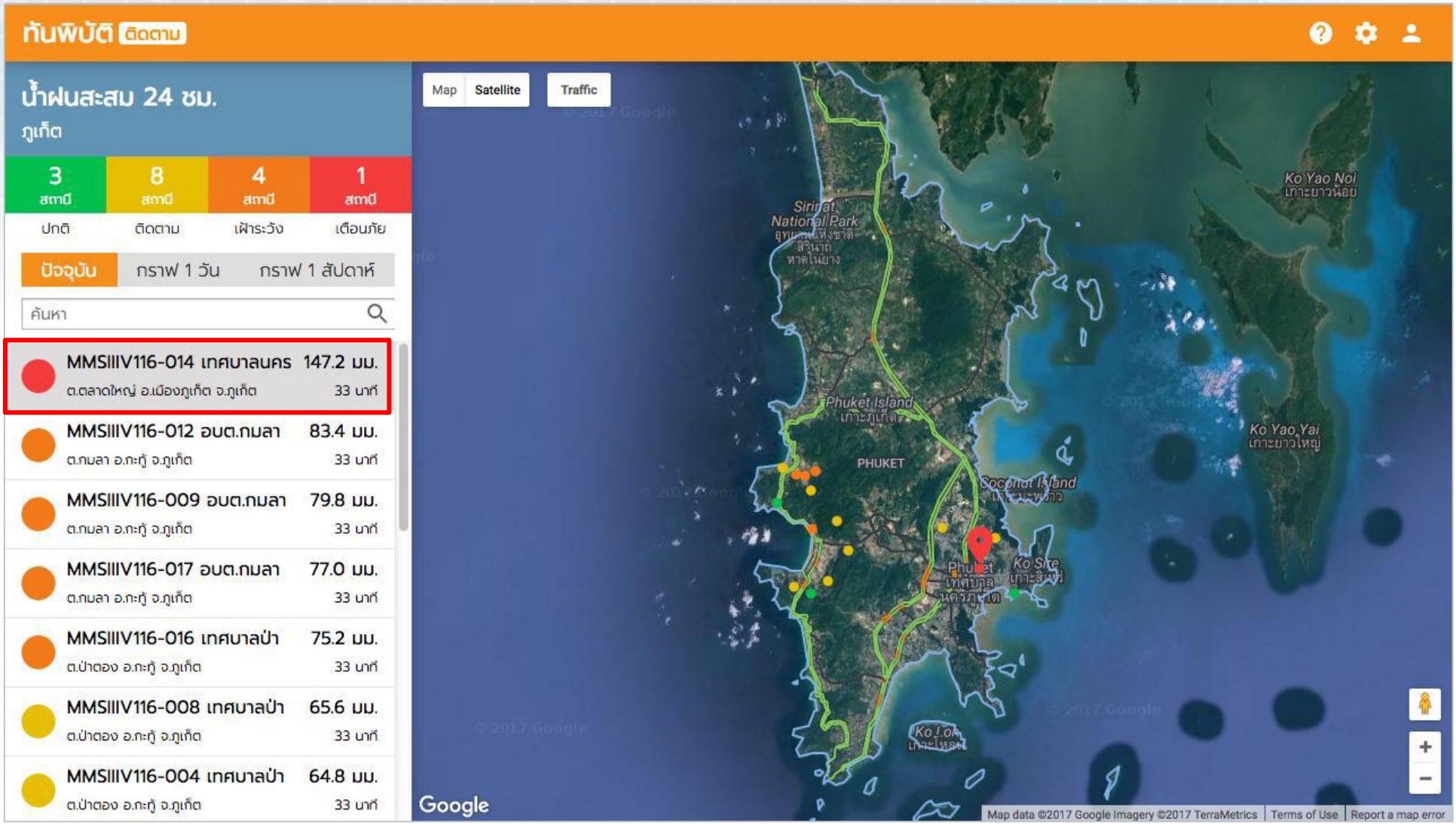
TanPibut-WATCH (satellite)



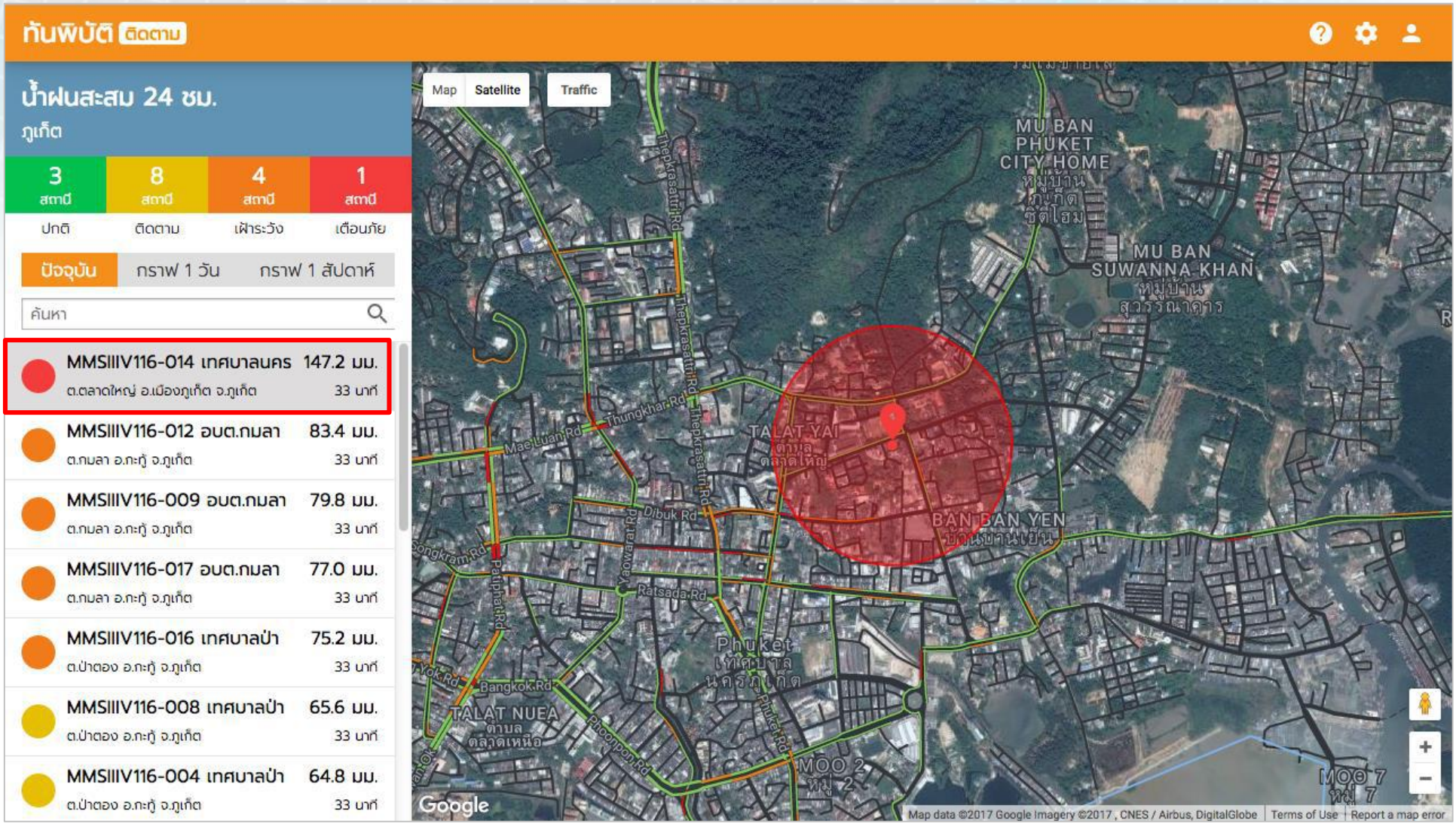
TanPibut-WATCH (traffic)



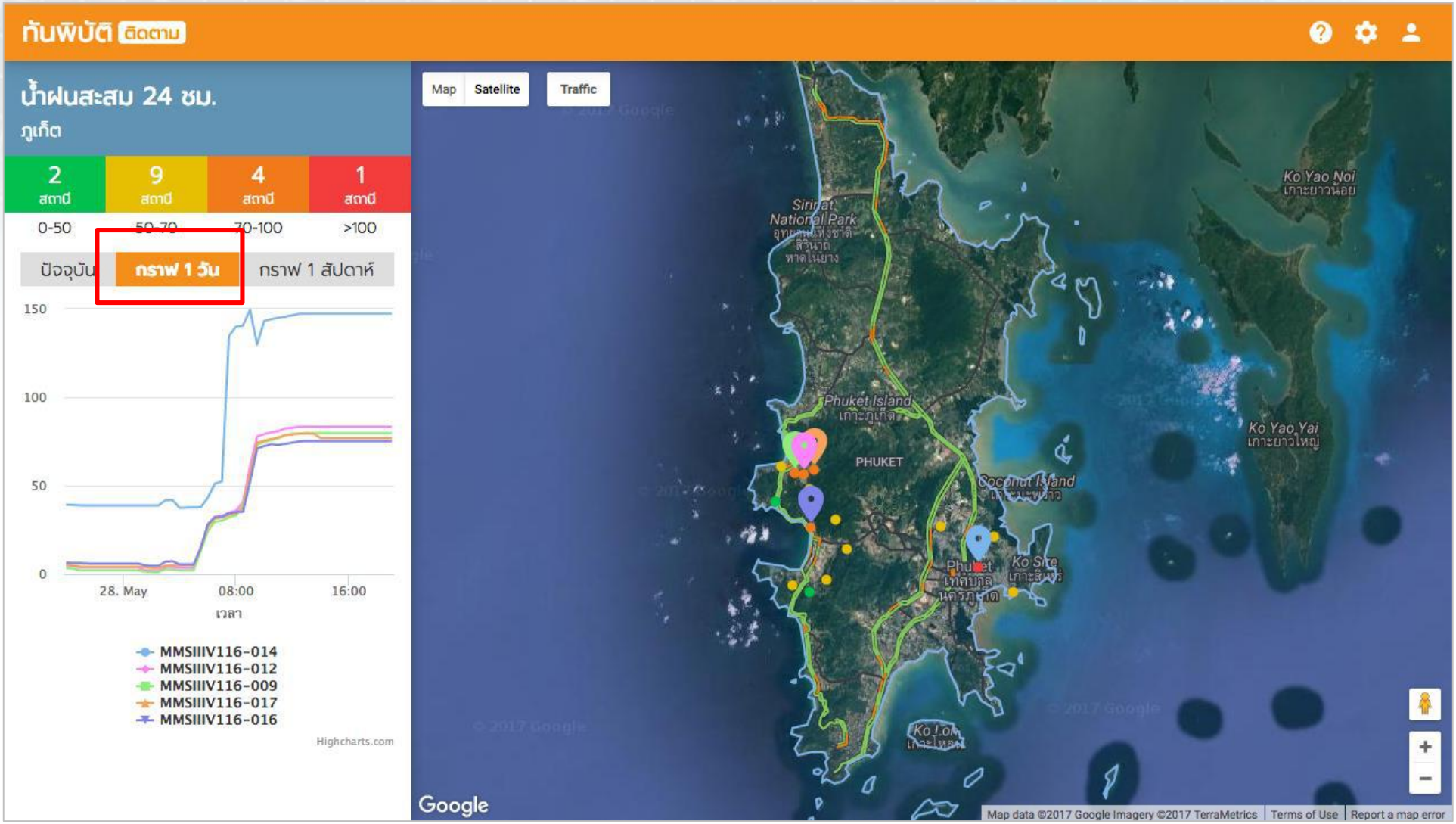
TanPibut-WATCH (locate station)



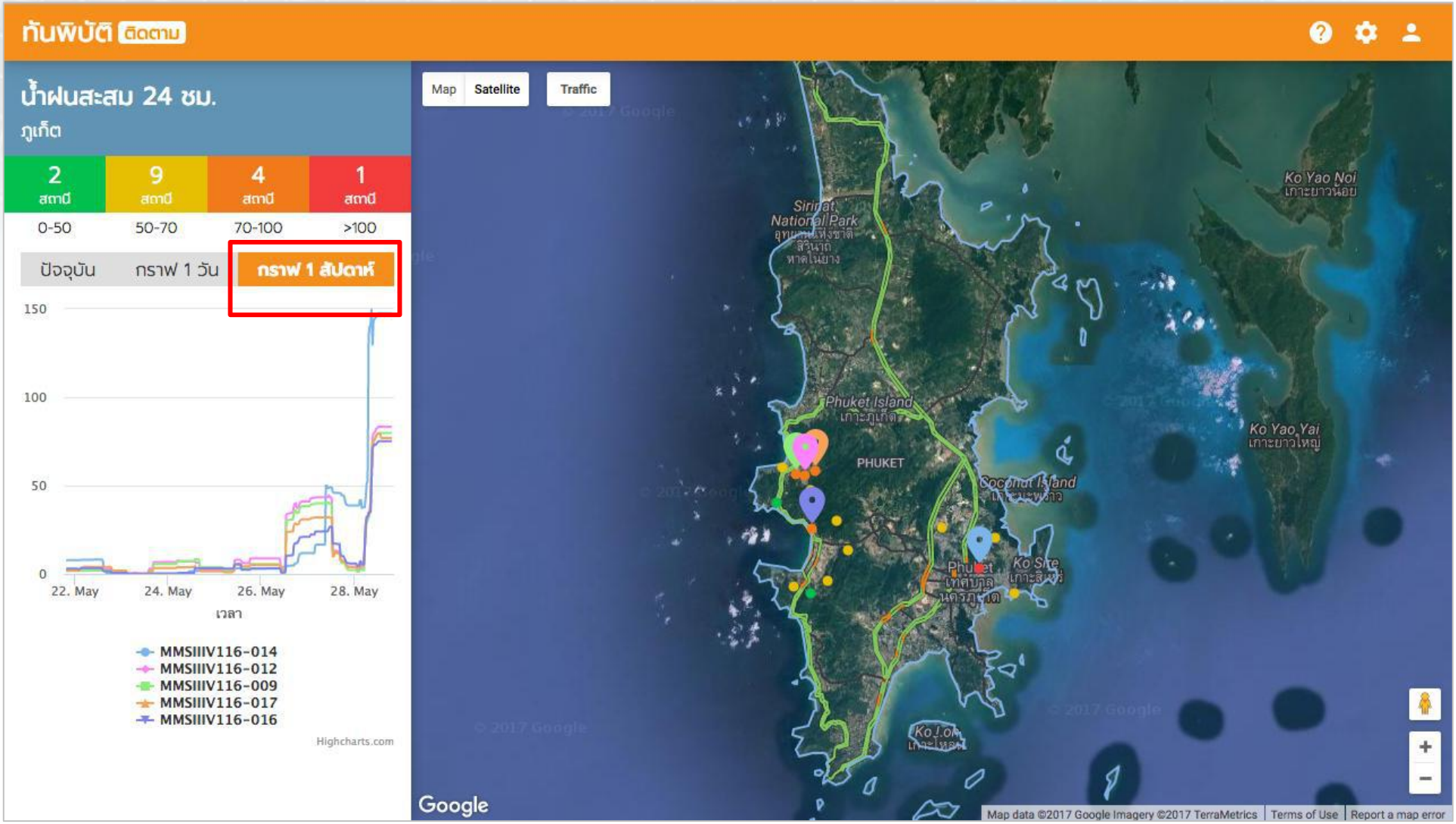
TanPibut-WATCH (radius)



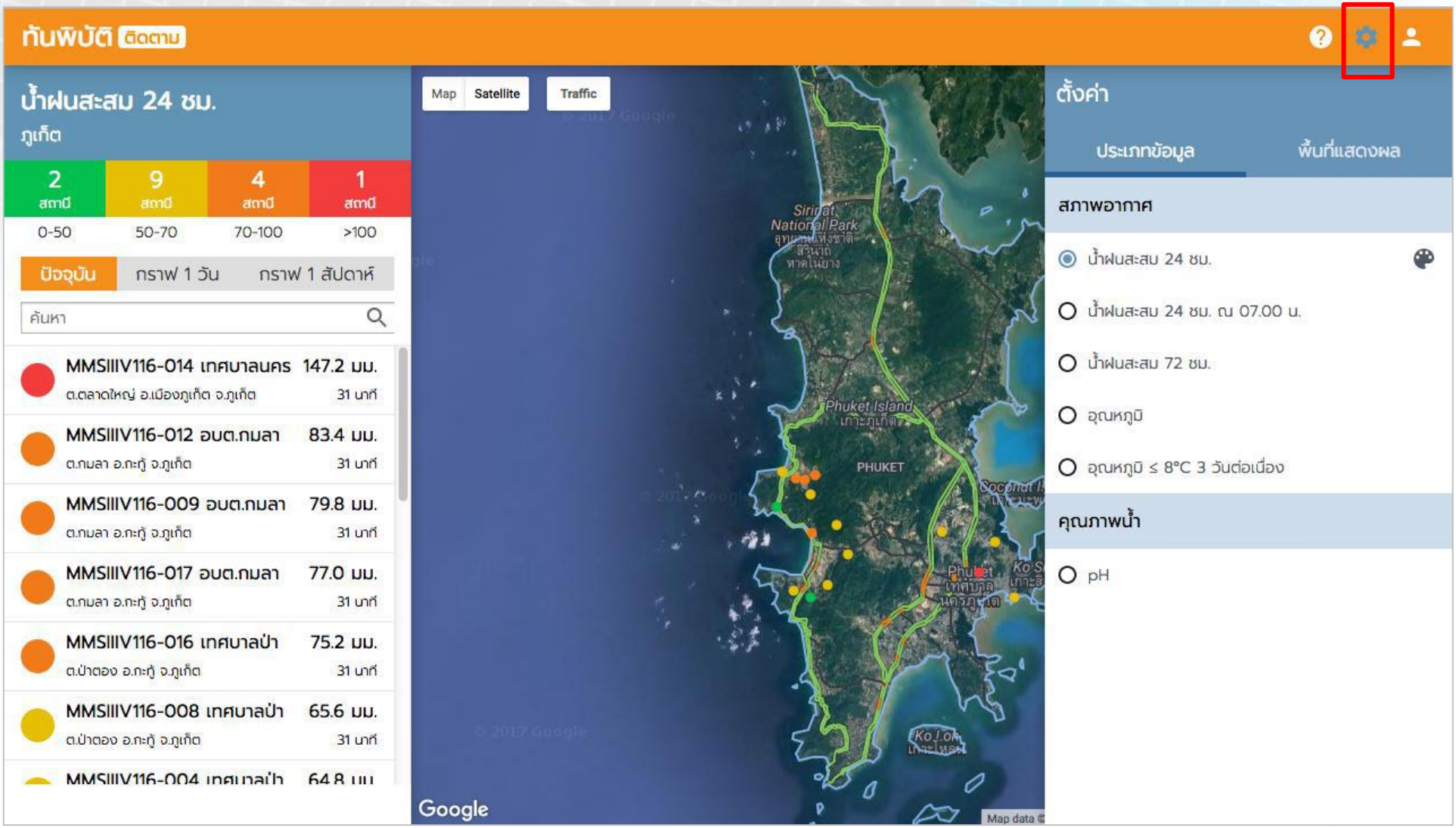
TanPibut-WATCH (daily graph)



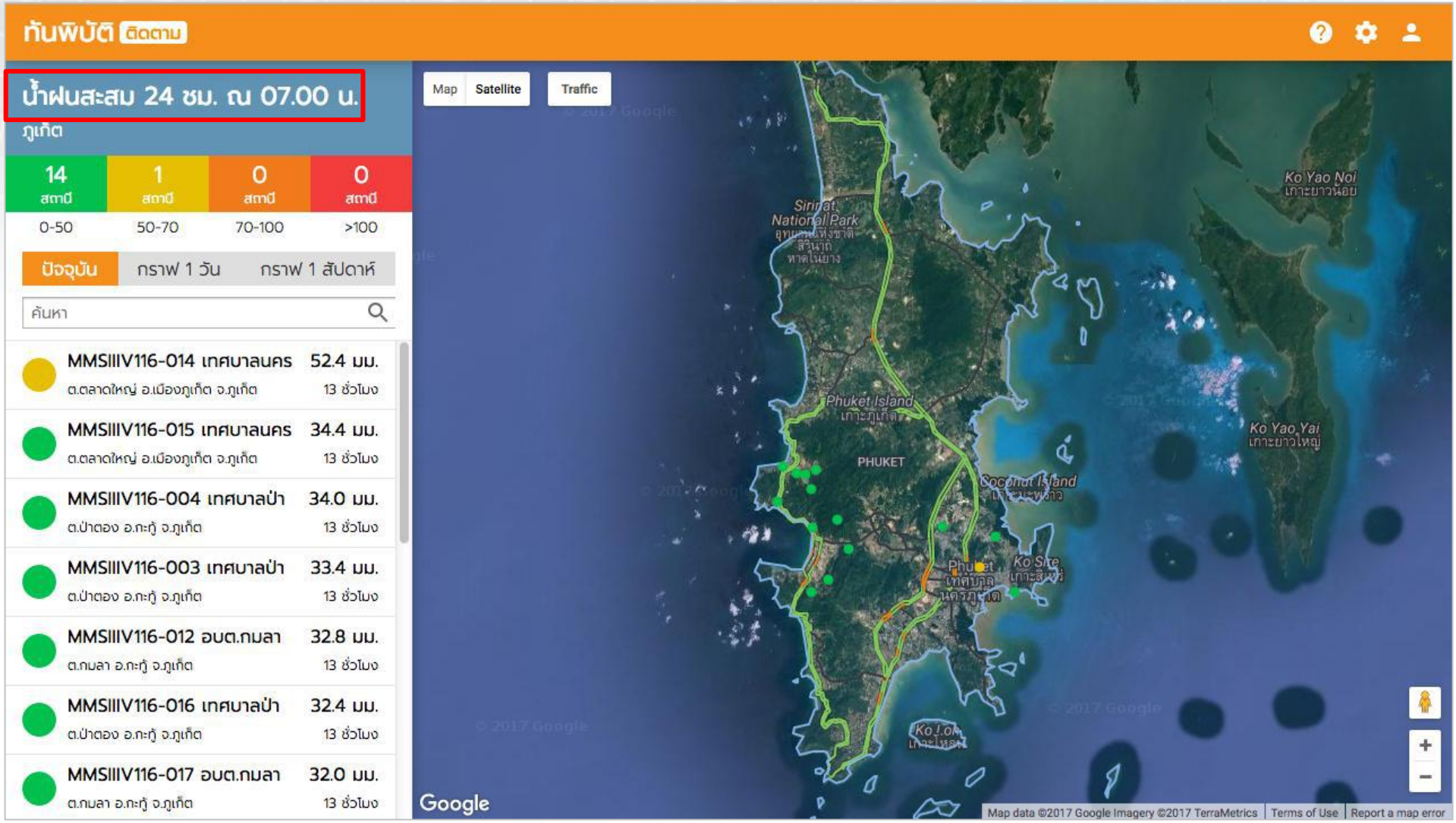
TanPibut-WATCH (weekly graph)



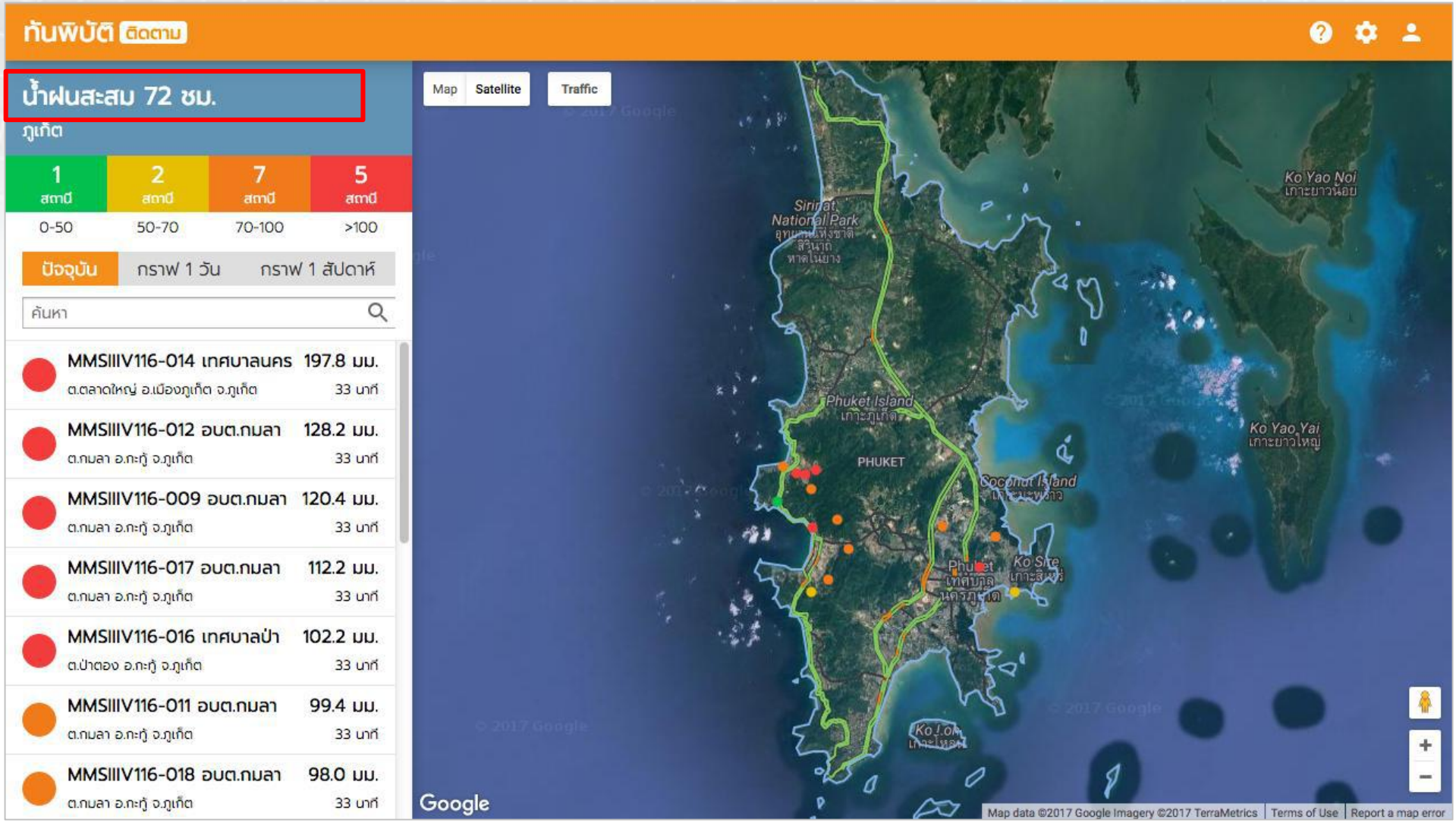
TanPibut-WATCH (precursor/event menu)



TanPibut-WATCH (daily rainfall)



TanPibut-WATCH (72-hr rainfall)



Future Plan

Current Works

- update station mainboard to newer version (2g->3G, WSN, more sensor connections)
- integrate observation data from Royal Irrigation Department (>1000 stations)
- research on station health (eg. sensors, battery, mainboard)

Long-term Future Works

- Integrate or Connect to more sophisticate early disaster detection model.
- More disaster type (Fire, Windstrom…)

Mainboard – current version.

- 8 Analog Channels
- GSM/UMTS/HSPA+ networking
- Local wireless communications (WSN) for

  Display Panel and Warning Unit @ village

  Extend service to out of mobile signal area

Q&A

Thank you

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