



► **New Initiative Project Proposal on “Transformation of STI and Indigenous Knowledge to SDGs”**

Water Energy Innovations and Cleaner Production of Tea for Sustainable Community Development on Highland Area



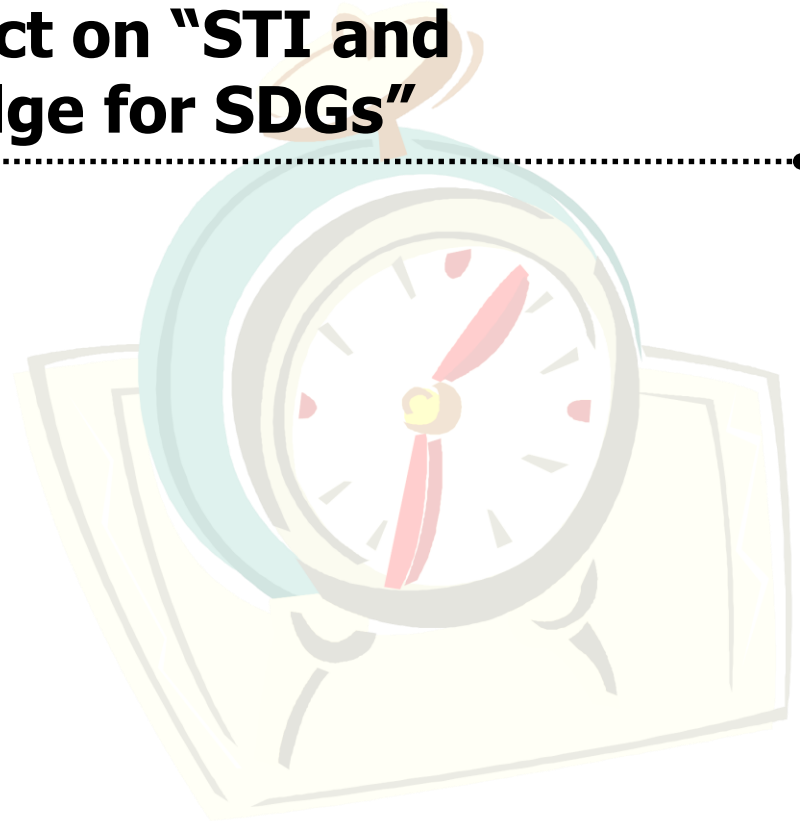
By
North-Chiang Mai University
Chiang Mai, Thailand

“Transformation of STI and Indigenous Knowledge to SDGs : Super Smart Community”
19 March 2019, Pullman Bangkok King Power Hotel, Bangkok, Thailand



Outline

- 1 **Successful results from our previous projects**.....
- 2 **New Initiative Project on “STI and Indigenous Knowledge for SDGs”**.....

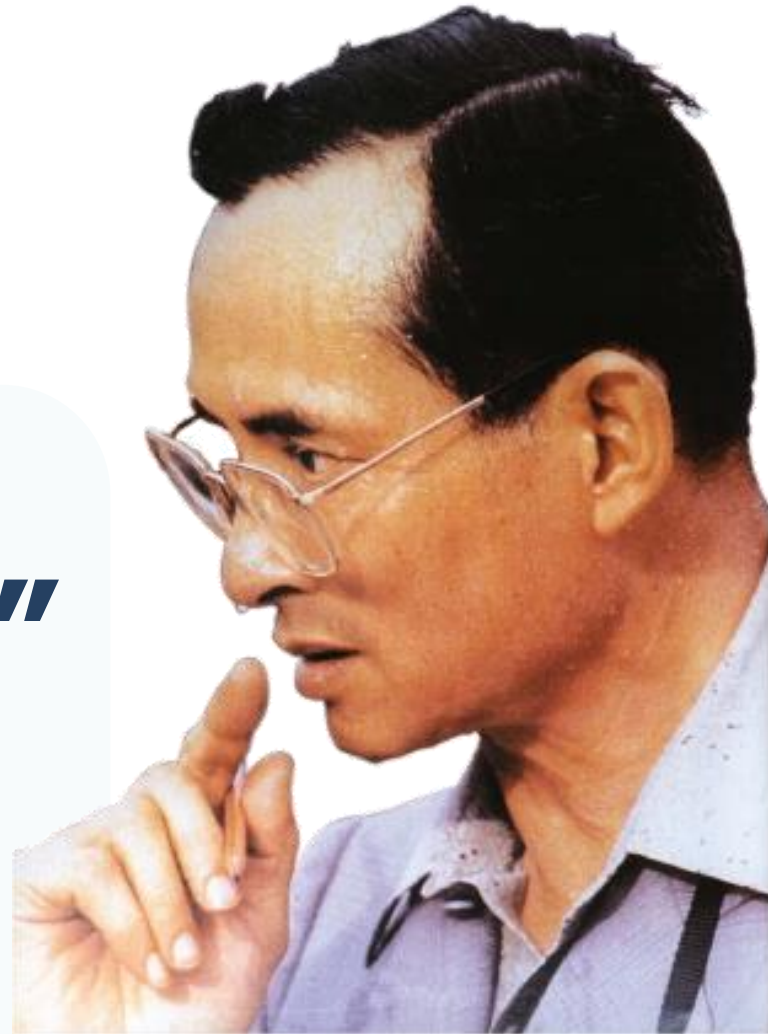


Successful results from our previous projects



“Water is life”

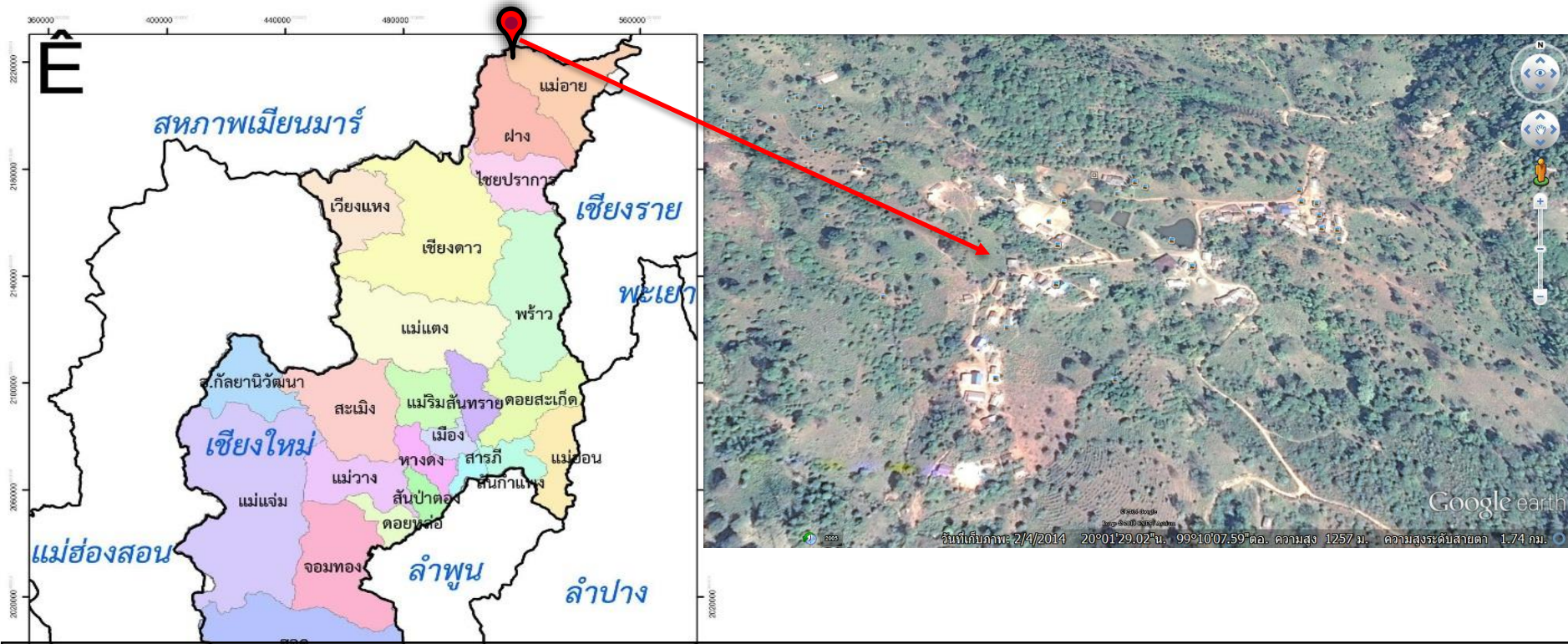
**His Majesty the King's remark,
March 17, 1986.**



General information of Doi Pu Muen Community



General information of Doi Pu Muen Community



General information of Doi Pu Muen Community

- > Location : Mae Sao Sub-district, Mae Ai District, Chiang Mai Province
- > Population : 550 people in 110 households of La Hu hill tribe people
- > Doi Pu Muen Community is situated on the highland area. Tea Crop (Assam tea) is the main community's incomes.

The Challenges



- In 1970, H.M. the King Bhumibol visited Doi Pu Muen Community. He gave advice to the villagers to change in cultivation product from opium to other economic crops such as tea.
- Previously, the diesel engines and firewood are used for driving rotation machines and roasting process, respectively.
- The deforestation issue, environmental problems and health problems
- The quality of the tea products are not standardized as a result they are not acceptable in the market.

The Approach

The project is classified into 4 issues:

1. Water Energy

- **S&T for development >>** Global Positioning System (GPS) maps water resources and water infrastructure.

2. Check dam

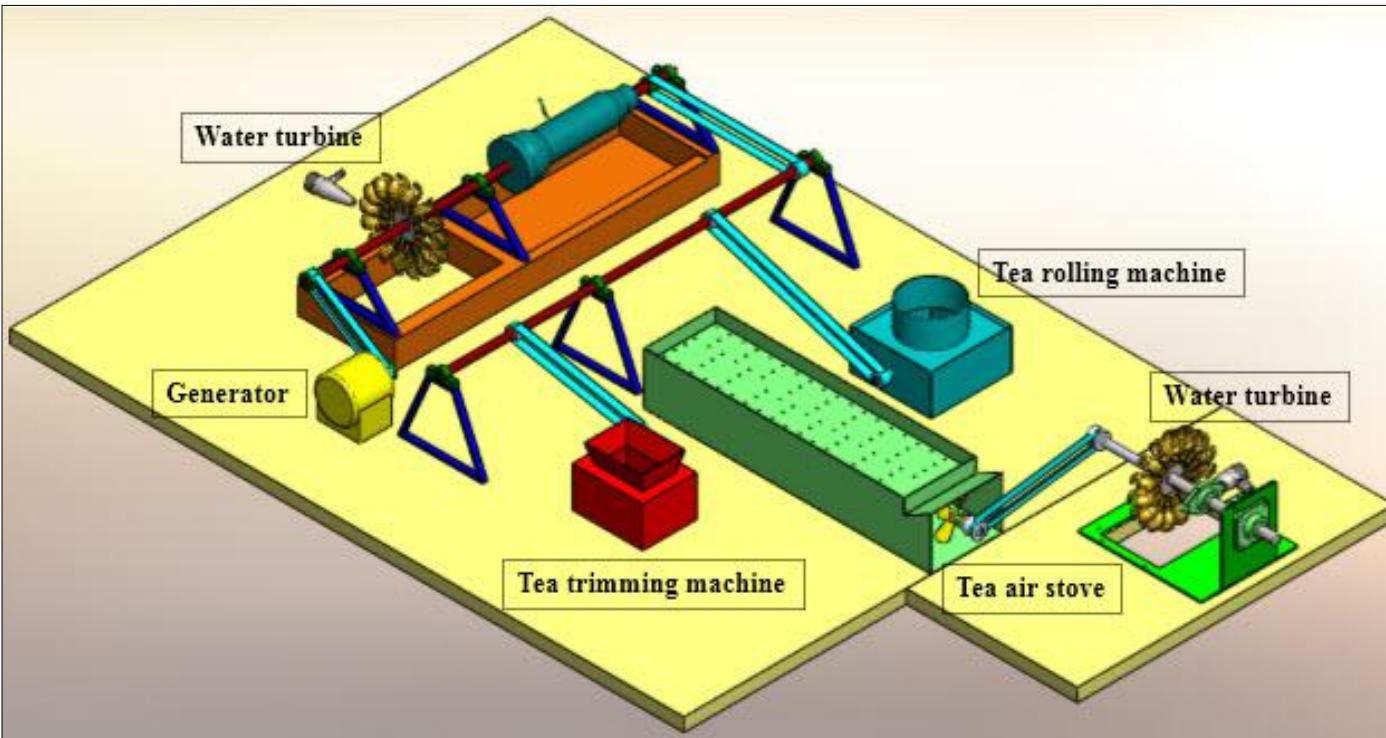
- Check dam systems and impounding dam increase the volume of water storage.



The Approach (cont.)

The project is classified into 4 issues:

3. Mechanical system



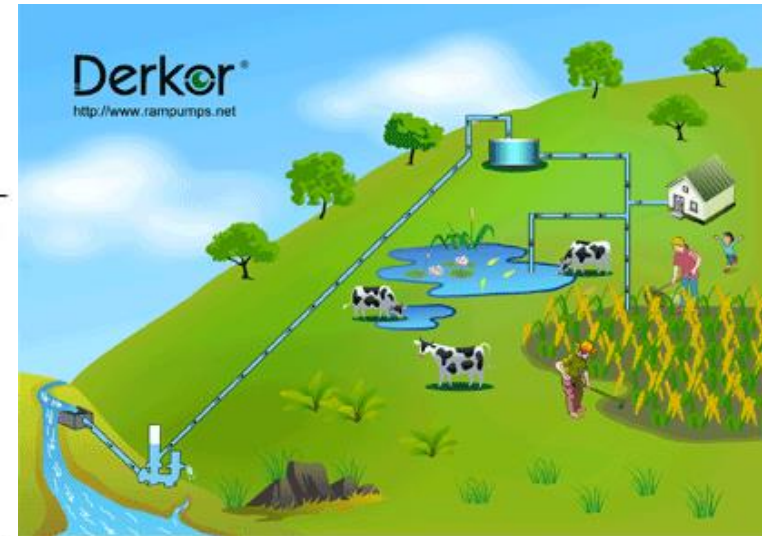
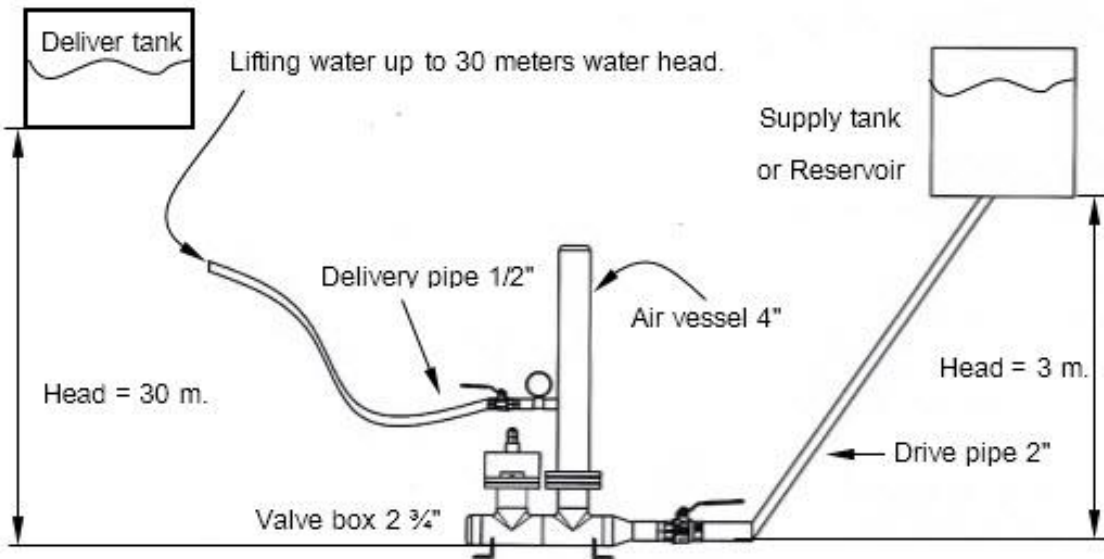
A plant layout for tea process driven by hydropower.



The Approach (cont.)

The project is classified into 4 issues:

4. Hydraulic ram pump



A diagram of hydraulic ram pump installation.



Achievements

The King's Philosophy of "Sufficiency Economy"

- 1. Water Resource** : The forest conservation is the main outcome from the non-used of the firewood and the biodiversity is plentifully.
- 2. Economic** : After changing from diesel to be water energy, the community's expenses decreased 109,620 THB/year. The products of Doi Pu Muen's Tea can be sold at a better price up to 30 folds higher than the traditional production.
- 3. Social and Environmental** : The water energy creates the clean environment to the community, including their health and livelihood. These results lead the community to be self-reliance and harmony.



New Initiative Project on “STI and Indigenous Knowledge for SDGs”

Water Energy Innovations and Cleaner Production of Tea for Sustainable Community Development on Highland Area



Objectives

1)

To integrate the water management initiated by H.M. the King Bhumibol with people in the community in order to promote the efficiency use of natural resources.

2)

To develop the community to be a smart community, STI and IoT are applied for the water management (data collection and monitoring for decision making in water management).

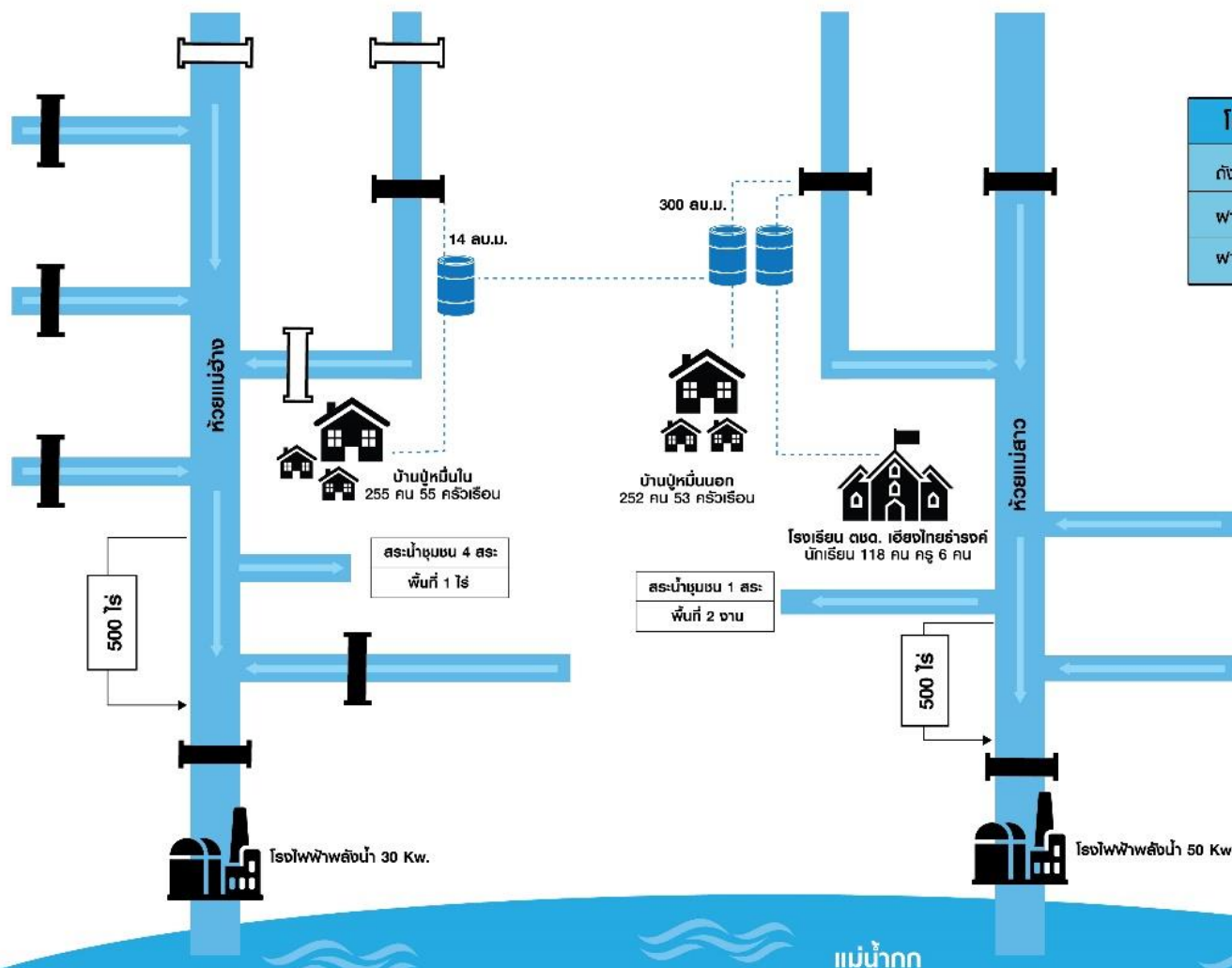
3)

To maintain and support indigenous knowledge in order to promote innovations of water energy and cleaner productions according to the concept of sustainable community development.

Water Diagram of Doi Pu Muen Community



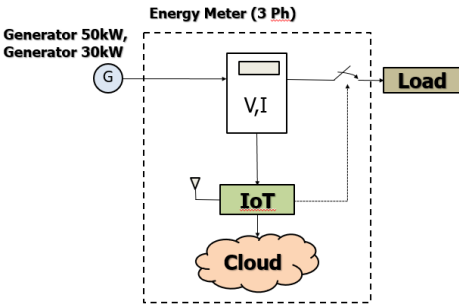
พื้งน้ำชุมชนดอยปู่หมื่น ตำบลแม่สาว อำเภอแม่เมาะ จังหวัดเชียงใหม่



โครงสร้าง	จำนวน
ถังสำรองน้ำ	3
พาย (ใช้จานใต้)	8
พาย (แพน)	3

สัญลักษณ์	
	แม่น้ำ/ลำห้วย
	ถังสำรองน้ำ
	พื้นที่รับประโยชน์
	พาย
	พาย (แพนปี 2560)
	แหล่งน้ำ
	ท่อส่งน้ำ

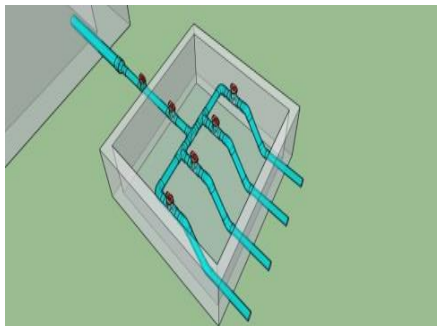
Applied IoT for monitoring



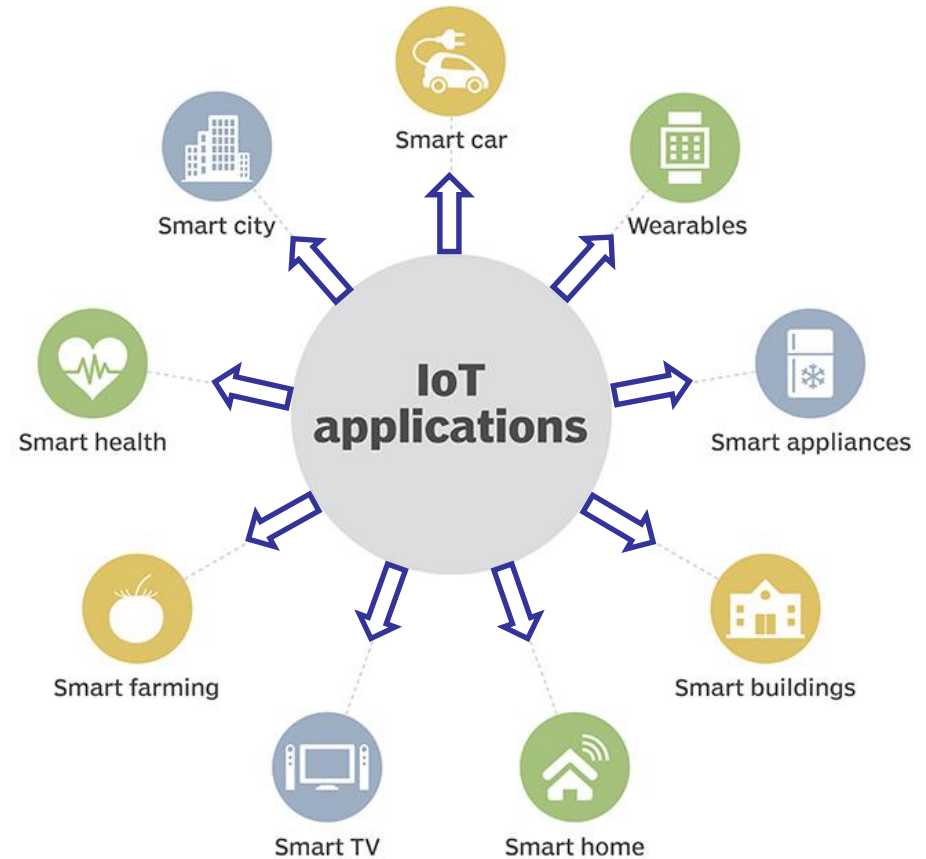
Electric power



Agricultural

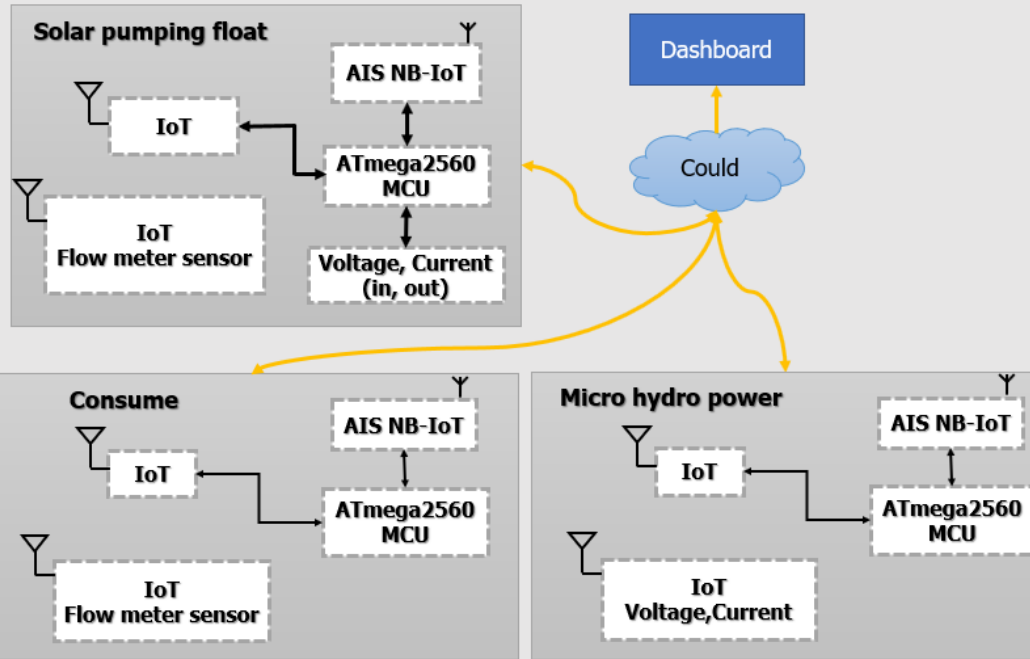


Consume



source : <https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>

Overview of IoT



Long Range (LoRa) an emerging wireless standard

Voler SYSTEMS
VolerSystems.com

10 years

Ultra-low power nodes with battery lifetime up to 10 years

Scalable

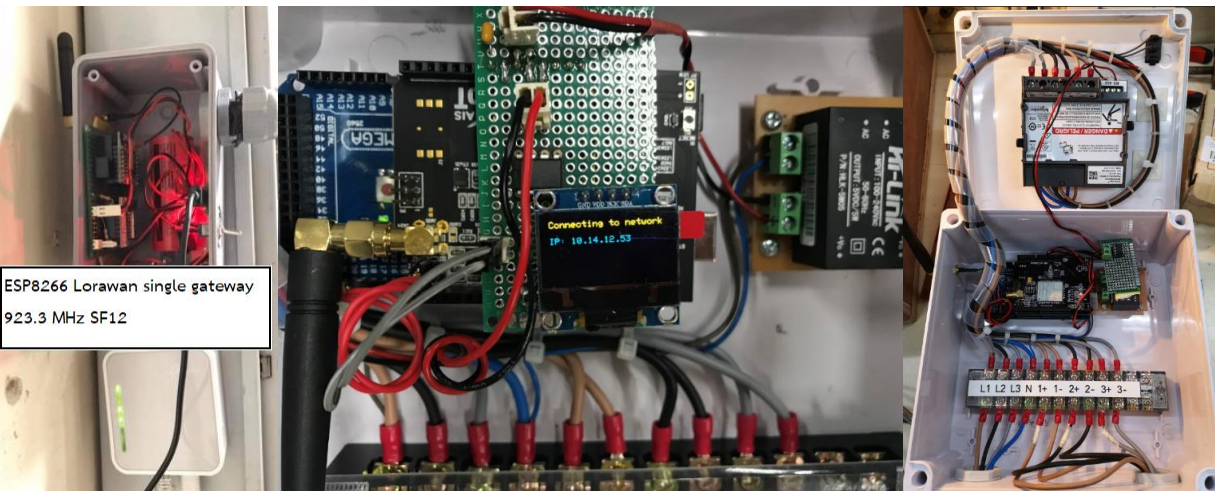
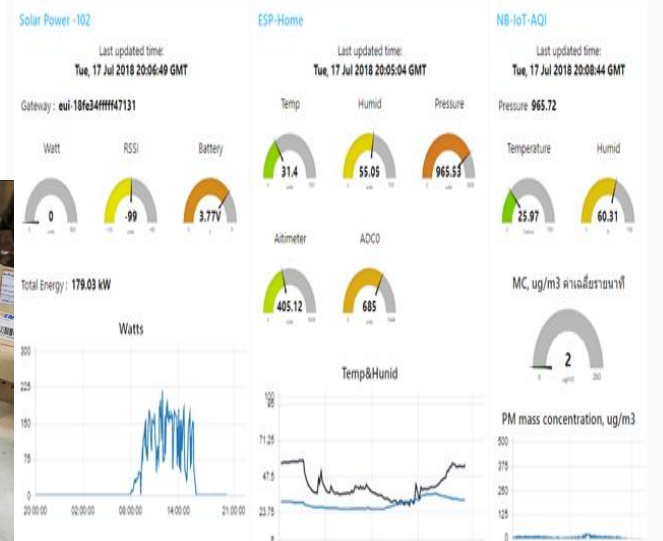
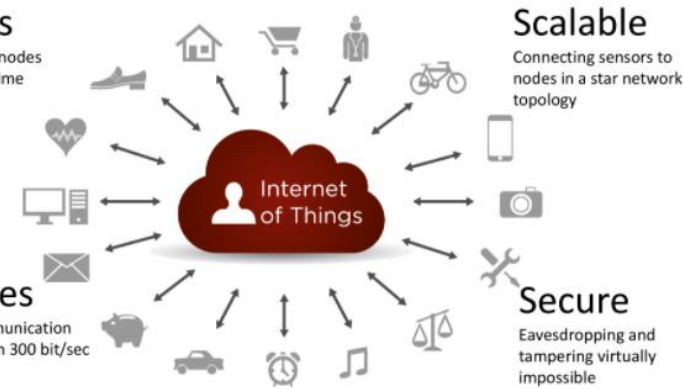
Connecting sensors to nodes in a star network topology

10+ miles

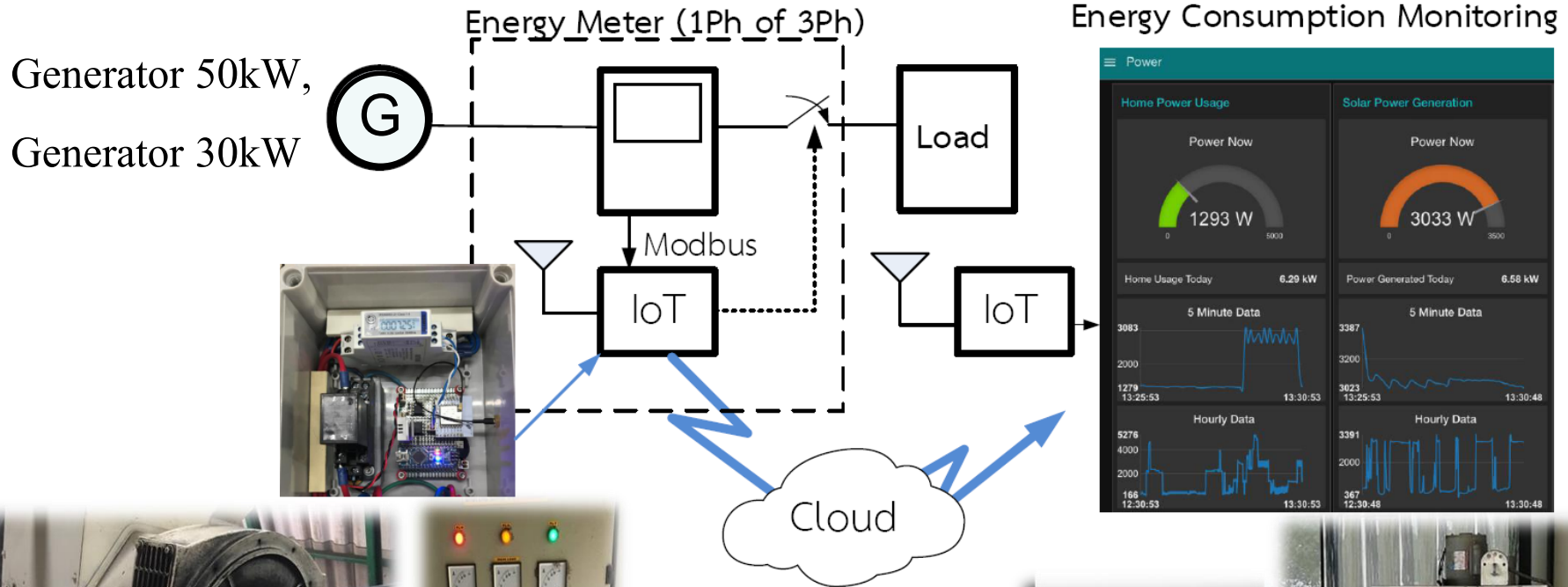
Long range communication at data rates from 300 bit/sec to 50 kbit/sec

Secure

Eavesdropping and tampering virtually impossible



Implementation with Energy Meter & IoT



- Energy Consumption Monitoring
- Situation Monitoring Reports

Floating Solar Water Pumping & IoT

Weather Station

Weather Station (IoT Sensor)

- Ambient Temperature (°C)
- Ambient Humidity (%)
- Wind Direction (1 - 360°)
- Wind Flow (m / sec.)
- Light Lux sensor (lux)
- Light Irradiance (w / m²)
- Rain

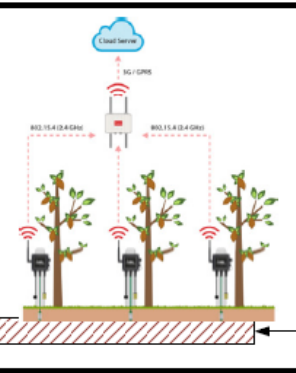
Smart Farm Field

(IoT Sensor)

- Ambient Temperature
- Ambient Humidity
- Light Lux sensor (lux)
- Light Irradiance (w / m²)
- Air Flow (m / sec.)
- Soil Moisture (%)

(IoT Sensor)

- Water
- Liquid Flow Rate
- N, P, K, PH
- soil moisture

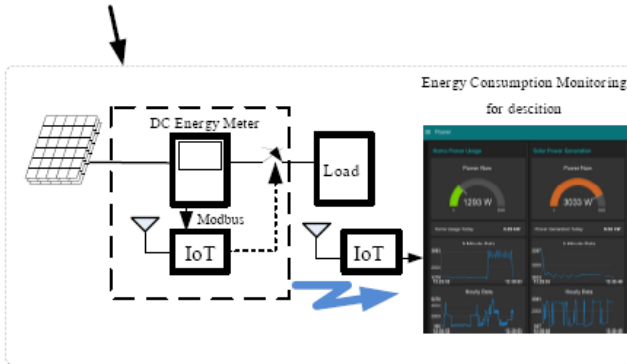


(IoT Sensor)

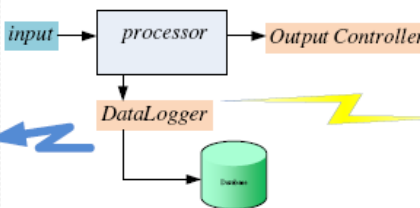
- Water level

Energy Consumption

(IoT Sensor)



Smart Farm Controller



(IoT Sensor)

- Water level
- N, P, K, PH

Pump

Water source

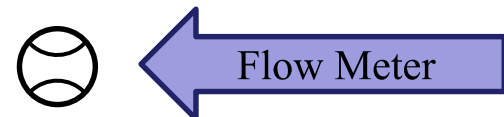
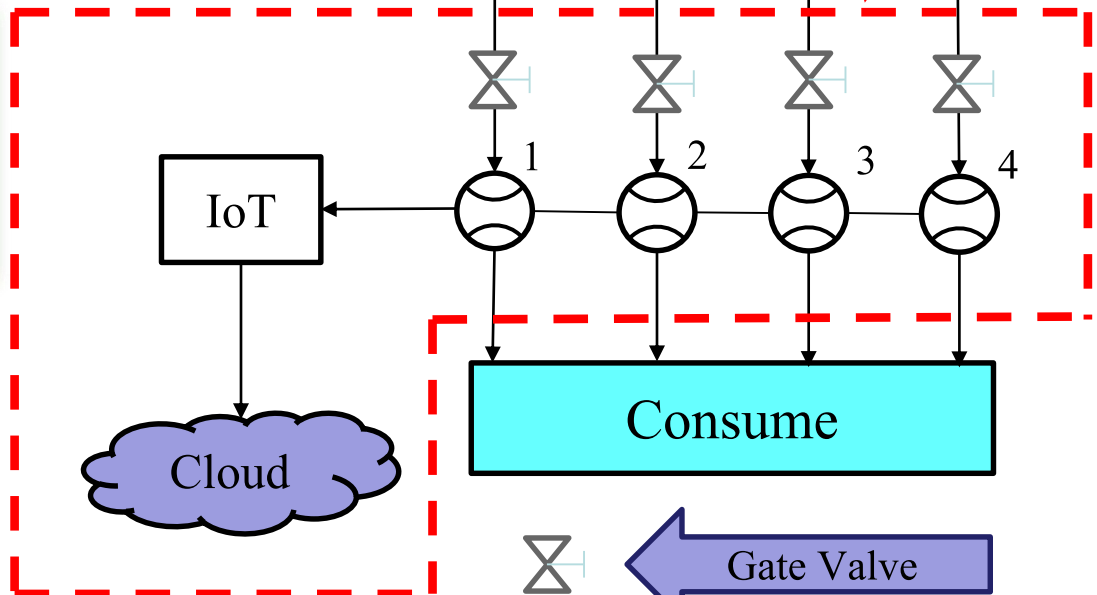
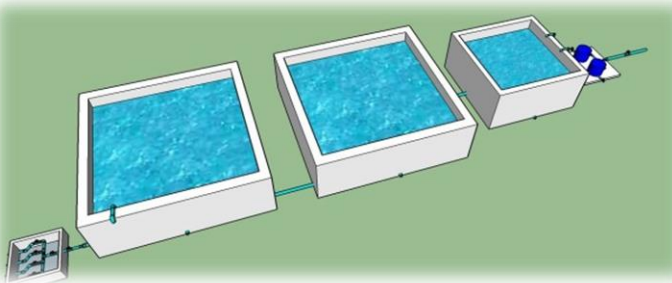
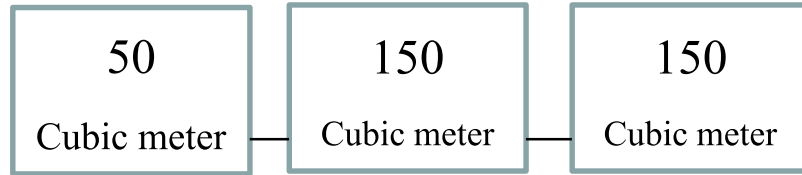
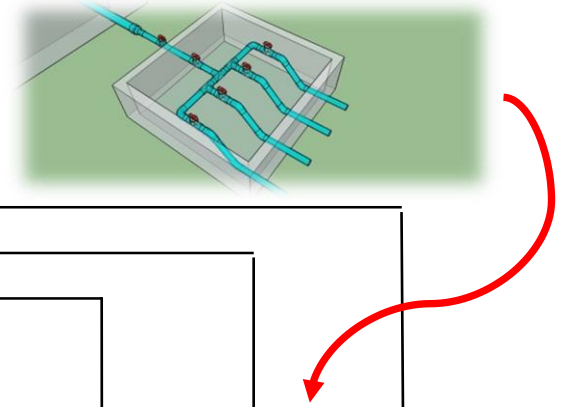


Benefits of floating solar water pumping & IoT

- Save space
- Increase efficiency for solar cells
- Useful for the growth of aquatic animals
- Situation monitoring reports on water consumption

Implementation with Flow Meter & IoT

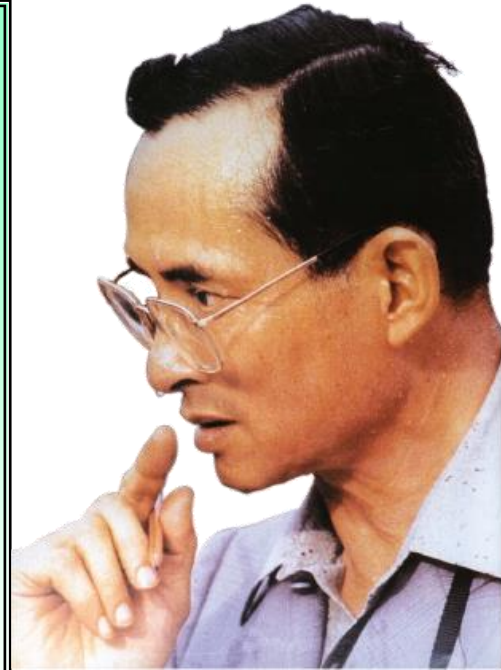
Water Tank



Beneficial

Water management following H.M. the King's initiative

1. **Water Resource** : To support the water management in community in which the methods follow the Royal Initiative and water-energy innovations for sufficient water usage.
2. **Economic** : The results from applying the STI and IoT in managing data and monitoring the volumn of water will help the community for decision making the use and manage water and extend to the other communities.
3. **Social and Environmental** : The cleaner production combining with indigenous knowledge creates the clean environment to the community, including their health and livelihood. These results lead the community to be self-reliance and harmony. Also to share and broaden community's learning and good practices through active networking and collaboration.



Partnership

Japan, Thailand and Laos PDR

STI Cooperation



- ▶ **North Chiang-Mai University, Thailand**
 - Faculty of Engineering and Technology



- ▶ **Department of Innovation and Technology, Laos PDR**
 - Exchange knowledge between countries in terms of theory and practice about water energy innovation and STI.



- ▶ **University of Tokyo, Japan**
Dr. Seishi Ninomiya
 - Provide new knowledge and innovations in water energy development and IoT which comprises with sensors, actuator and other new technologies.

The Approach to Sustainable Community Development

- **Strengthen Public – Private and People (Community) Partnership (PPPP)**
- **Maintain and support the way of life in the community while by using suitable technology.**





**Thank you
for your attention**