Method to assess Water Scarcity of Product based on ISO14046 for Thailand : A case study of 44 products in Thailand

Project to assess groundwater use throughout the product life cycle (Water Footprint)

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Project to assess groundwater use throughout the product life cycle (Water Footprint)

Water and Environment Institute for Sustainability (WEIS) got funding from Groundwater Development Fund, Department of Groundwater Resources (DGR) to implementing the project to assess groundwater use throughout the product life cycle (or Water Footprint of Product)

Main objectives

- To promote Water Footprint Assessment in accordance with ISO 14046 to be concrete in the industry
- To develop water footprint specialists and establish the Water Footprint network in Thailand

Project to assess groundwater use throughout the product life cycle (Water Footprint)

Scope of work

(1) To appoint Project director committee, Working committee and Technical committee

(2) Public relation of the project and pilot industries recruitment

(3) Pilot industries selection (15 companies)

(4) Training and workshop on Water Footprint Assessment

(5) In-depth consultation to pilot industries

(6) Preparation of Water Footprint Assessment Report and guidelines of water use reduction

(7) Data verification from third party

(8) Water Footprint Certification

(9) Evaluating the value of the project. (environment, economic and social)

(10) Seminar to public the success of the project

Project to assess groundwater use throughout the product life cycle (Water Footprint)

In-depth consultation with pilot industries to assess Water Footprint

(1) Technical Committee Meeting

(2) Development of Water Footprint Assessment Guideline

(3) In-depth consultation

(4) Product Category Rule (PCR)

(1) Technical Committee Meeting

- The Technical Committee consists of 21 members, representatives from industry sectors, academics, educational institution and related organizations
- To develop guideline of Water Footprint Assessment and Water Footprint certification system in accordance with ISO 14046 for Thailand
- Discuss for the technical comments and suggestions about the Water Footprint Assessment

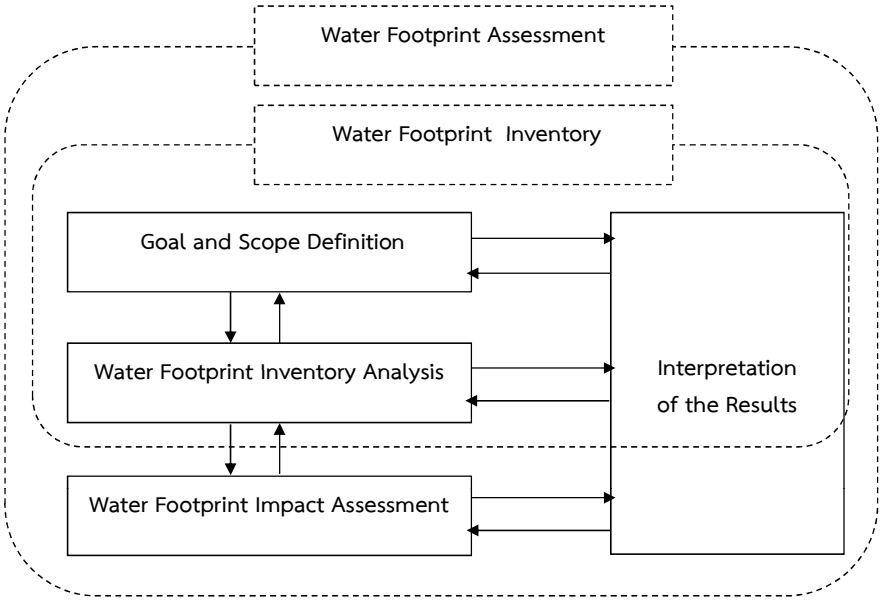
Project to assess groundwater use throughout the product life cycle (Water Footprint)

In-depth consultation with pilot industries to assess Water Footprint

(2) Development of Water Footprint Assessment Guideline

Accordance with ISO 14046 which consists of 4 main steps, similar to Life Cycle Assessment (LCA)

- Step 1 Goal and Scope Definition
- Step 2 Water Footprint Inventory Analysis
- Step 3 Water Footprint Impact Assessment
- Step 4 Interpretation of the Results



Ref : ISO 14046: 2014

Project to assess groundwater use throughout the product life cycle (Water Footprint)

In-depth consultation with pilot industries to assess Water Footprint

(3) In-depth consultation

- The 1st, visiting the production process, determining the scope of Water Footprint Assessment, identifying the information to be collected such as input-output material, determining the extent assessment which depends on the type of product (B2B or B2C) and Water Balance (water consumption mapping of surface water and groundwater)
- The 2nd, to provide technical advisory and technical support to collect non-collectable information or data and study ways to reduce water use from production processes.
- The 3rd, to inquire and understand the details of the information received. Describe the assumption that will be used to assess Water Footprint. Including the draft measures of water reduction in the production process
- The 4th, to summarize the Water Footprint Assessments of product and measures to reduce the use of water from the production process

Project to assess groundwater use throughout the product life cycle (Water Footprint)

In-depth consultation with pilot industries to assess Water Footprint

(3) In-depth consultation

Water balance (Overview)	- Balance of overview (Input / Output) - Elementary flow - Technosphere water - Meter (primary data) / Calculate
LCI	- Material, energy and water balance (Input / Out put) - Unit process / Utilities - Accuracy, calculation, assumption - Completeness of data
Water balance (Unit process)	- Input / Output - Type of water use (Withdrawal / Consumptive use / Degradative use)
Assessment (Calculation)	- Acquisition of raw material - Process - Transportation (Raw material, Waste from process) - Use phase / Disposal - Transportation (Waste of product) B2B, B2C
Water Stress Index (WSI)	- JGSEE WSI (Monthly) for Elementary flow / Direct water - JGSEE WSI (Annual) for Technosphere water / Indirect water - WSI (Specific)
Water Scarcity Footprint (WSF)	- MTEC WSF - Software program

Project to assess groundwater use throughout the product life cycle (Water Footprint)

In-depth consultation with pilot industries to assess Water Footprint

(3) In-depth consultation

Water Balance - Unit Process

From nature
- Precipitation
- Surface water *
- Ground water *
- Sea water *
- Brackish water *

From technosphere
- Processed water * (tap water, effluents that can be used, etc)
- Water incorporated into input material

Unit process

Reuse/recycle of water

To nature
- Evaporation
- Transpiration
- Effluent * to surface, ground, sea and brackish water
- Emissions to air, soil and water, heat to water

To technosphere
- Processed water * (tap water, effluents for treatment, etc)
- Water incorporated into output material

Remark : * Volume and quality (can include heat)

Project to assess groundwater use throughout the product life cycle (Water Footprint)

In-depth consultation with pilot industries to assess Water Footprint

(3) In-depth consultation

Thailand Database

- Water Stress Index (WSI) of 25 basins (average monthly and annual) that were provided by The Joint Graduate School of Energy and Environment (JGSEE),

- Water Scarcity Footprint (WSF) of 8 groups (129 databases) were provided by the National Metal and Materials Technology Center (MTEC)

WSI and WSF were used to support Water Footprint Assessment of Product in Thailand.

Project to assess groundwater use throughout the product life cycle (Water Footprint)

In-depth consultation with pilot industries to assess Water Footprint

(4) Product Category Rule (PCR)

Developed PCR, divided into 9 groups of product that covering pilot products.

- Group 1: Corrugating medium products
- Group 2: Drinking water products
- Group 3: Soft drink products
- Group 4: Alcoholic beverages products
- Group 5: Portland cement products
- Group 6: Rubber products
- Group 7: Sugar products
- Group 8: Fresh chicken meat and processed chicken meat products
- Group 9: Polymer Car Accessories

Project to assess groundwater use throughout the product life cycle (Water Footprint)

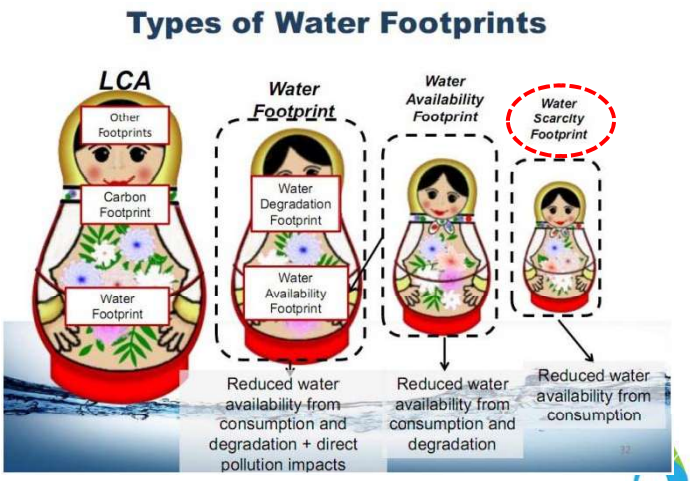
Data Verification

The Verification scope of the Water Footprint of Product (under certification by WEIS) is according to ISO 14001: 2006, Environmental Management - Life Cycle Assessment - Requirements and Guidelines based on the Life Cycle Assessment (LCA)

- Transparency
- Relevance
- Completeness
- Consistency
- Accuracy
- Comprehensiveness

Water Footprint Certification

- WEIS appointed Water Footprint certification committee to certify Water Footprint of Product
- Currently, certify only Water Scarcity Footprint because of the limitations of water database in Thailand, it will broaden the coverage of certification in the future
- Under this project there are 15 products from 15 pilot industries were certificated Water Footprint of Product and there are 29 products from 13 industries (outside this project) were certified



Project to assess groundwater use throughout the product life cycle (Water Footprint)

Water Scarcity Footprint of 44 products as follows

No	Product	Scope (B2B / B2C)	Water Scarcity Footprint (H_2Oeq)
Group 1 : Corrugating medium products			
1	Corrugated Medium (CA 105 gsm.)	B2B	10.8 m^3 H_2O eq
2	Corrugated Medium (KI 125 gsm.)	B2B	11.4 m^3 H_2O eq
Group 2 : Drinking water products			
3	Drinking Water (Crystal) PET bottle 1,500 ml.)	B2C	2.49 L H_2O eq
4	Drinking Water (Crystal) (PET bottle 1,000 ml.)	B2C	1.76 L H_2O eq
5	Drinking Water (Crystal) (PET bottle 600 ml.)	B2C	1.10 L H_2O eq
Group 3 : Soft drink products			
6	Coca-Cola (PET bottle 1.25 l.)	B2C	25.8 L H_2O eq
7	Coca-Cola (PET bottle 590 ml.)	B2C	29.1 L H_2O eq
Group 4: Alcoholic beverages products			
8	Chang Beer Classic (bottle 620 ml.)	B2C	8.16 L H_2O eq
9	Blend 285 (bottle 700 ml.)	B2C	64.4 L H_2O eq
10	Sangsom Gold Medallion (bottle 700 ml.)	B2C	55.7 L H_2O eq
11	Monsoon Valley Signature Red Wine (bottle 750 ml.)	B2C	250 L H_2O eq
12	HONG THONG (bottle 700 ml.)	B2C	44.4 L H_2O eq
Group 5: Portland cement products			
13	Portland Cement Type I (INSEE Petch) (Bulk)	B2B	329 L H_2O eq
14	SCG Portland Cement Type I (Bulk 1 ton)	B2B	341 L H_2O eq
Group 6: Rubber products			
15	Standard Thai Rubber 20 (STR20)	B2B	4.85 m^3 H_2O eq
Group 7: Sugar products			
16	Mitr Phol Refined Sugar 50 kg. (1 ton)	B2B	6.76 m^3 H_2O eq

Project to assess groundwater use throughout the product life cycle (Water Footprint)

Water Scarcity Footprint of 44 products as follows

No	Product	Scope (B2B / B2C)	Water Scarcity Footprint (H_2Oeq)
Group 8: Fresh chicken meat and processed chicken meat products			
17	Fresh Chicken (fillet bag 1,000 g.)	B2C	91.8 L H_2O eq
18	Tender Chicken Breast (CP Delight) (fillet bag 90 g.)	B2C	12.9 L H_2O eq
19	Jumbo Chicken Sausage (Betagro) 1 pack (13 pieces)	B2C	87.5 L H_2O eq
Group 9: Polymer Car accessories products			
20	Fog Lamp GARNISH COVER, Toyota Hilux Revo	B2B	221 L H_2O eq
Group 10: Electricity, steam and chiller products			
21	Electricity (1 MWh)	B2B	126 L H_2O eq
22	Electricity 500 kV (1 kWh)	B2B	0.20 L H_2O eq
23	Electricity 115 kV (1 kWh)	B2B	0.81 L H_2O eq
24	Electricity 115 kV (1 kWh)	B2B	0.66 L H_2O eq
25	Electricity 115 kV (1 kWh)	B2B	0.63 L H_2O eq
26	Electricity 115 kV (1 kWh)	B2B	0.30 L H_2O eq
27	Electricity 115 kV (1 kWh)	B2B	0.29 L H_2O eq
28	Electricity 115 kV (1 kWh)	B2B	1.33 L H_2O eq
29	Electricity 22 kV (1 kWh)	B2B	0.81 L H_2O eq
30	Electricity 22 kV (1 kWh)	B2B	0.66 L H_2O eq
31	Electricity 22 kV (1 kWh)	B2B	0.63 L H_2O eq
32	Electricity 22 kV (1 kWh)	B2B	0.30 L H_2O eq
33	Electricity 22 kV (1 kWh)	B2B	0.29 L H_2O eq

Project to assess groundwater use throughout the product life cycle (Water Footprint)

Water Scarcity Footprint of 44 products as follows

No	Product	Scope (B2B / B2C)	Water Scarcity Footprint (H_2Oeq)
Group 10: Electricity, steam and chiller products			
34	Steam (1 GJ)	B2B	27.3 L H_2O eq
35	Steam (1 GJ)	B2B	67.8 L H_2O eq
36	Steam (1 GJ)	B2B	55.0 L H_2O eq
37	Steam (1 GJ)	B2B	52.1 L H_2O eq
38	Steam (1 GJ)	B2B	25.2 L H_2O eq
39	Steam (1 GJ)	B2B	23.7 L H_2O eq
Group 11: Industrial water products			
40	Service water 1 m^3	B2B	71.0 L H_2O eq
41	Demin water 1 m^3	B2B	145 L H_2O eq
Group 12: Aromatics products			
42	Benzene 1 kg	B2B	0.61 L H_2O eq
43	Paraxylene 1 kg	B2B	1.03 L H_2O eq
44	Orthoxylene 1 kg	B2B	1.03 L H_2O eq

Project to assess groundwater use throughout the product life cycle (Water Footprint)

Assessing value of project implementation (environmental, economic and social)

Worthiness of environmental

- Reduce the environmental impact because the industry has a way to reduce the use of groundwater & surface water in the production, which if implemented will help to conserve groundwater
- Can reduce the pollution of wastewater and discharge into public water source.
- Increases the potential for groundwater to be used in areas where industrial plants are located

Worthiness of economic

- Have Water Footprint expert in Thailand and reduce the cost of the foreign experts in the assessment
- Pilot industries can consider production units that use high volume of groundwater & surface water) and have ways to reduce water use. Industry can improve water efficiency and reduce production costs to enhance both domestic and international competitiveness.

Worthiness of social

- If the industry adopts the guidelines to reduce water use, it will reduce the water consumption and can bring the water which reduced to use for other areas such as consumption, agricultural and can help to reduce social conflict between industry and community, including agriculture.
- Groundwater which preserved can also be used as a reservoir for the community and agricultural sector during the drought crisis to reduce the impact on living and society.

Project to assess groundwater use throughout the product life cycle (Water Footprint)

The benefits that Department of Groundwater Resources receives from this project

- Network of industries that comply with the regulations of DGR, focuses on reducing the use of groundwater and improving the efficiency of groundwater use that help to regulate the responsibilities of DGR
- There is a preliminary reference on the water use of each industrial sector (but may not be representative) that can be used as a baseline for determining the demand of water and the proportion of groundwater use in various industrial sectors for use as groundwater management information
- Pilot industries have ways to reduce water consumption and improve water efficiency that will help to conserve groundwater and increase the potential of groundwater to be used in the area where the plant is located. It can also be used groundwater which reduced as a source of water in case of a drought crisis

Project to assess groundwater use throughout the product life cycle (Water Footprint)

Problems, barriers and limitations for Water Footprint Assessment in Thailand

- Water Footprint is relatively new to Thailand and the water database for the calculation is quite small
- Some products, such as wine, have a long production period. The wine must be fermented for a period of 20 months, so it is hard to keep track of all the information
- Restrictions on access to data, such as ingredients of beverages or alcoholic drink. This information is only formulated and confidential
- The industry has a lot of information to gather. Some have to gather information from the upstream factory in the supply chain
- Water Footprint Assessment must be established the water balance of the entire facility. Many industrial plants do not have fully equipped water meters wherever water is used. Most industries give priority to energy usage data rather than water use data because energy costs are significantly higher than water, it causes of no complete information to support the establish of water balance

Project to assess groundwater use throughout the product life cycle (Water Footprint)

The approach that should continue

- WEIS will be the main organization to certificate Water Footprint of Thailand and will encourage & expand the Water Footprint to cover all industrial sectors and continuity, so that the industry can consider the use of water in the production process thoroughly and use water efficiently
- Extend the Water Footprint to a greater area or industrial sectors. If there are enough industrial data and examples, it can be benchmarked for specific industrial sector and used as a reliable representative data. DGR can be used as groundwater management information to determine the demand of groundwater and the proportion of groundwater use for specific industries and also used as surface water management information, leading to overall water management in the country

Thank you

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