

Evaluation of Water Productivity of Thailand and Improvement Measure Proposals

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1. Introduction

- Thailand had issued a national strategic development master plan with issues related to water resources and water security in the entire water management.
- The direction of national development in accordance with the national strategic framework for 20 years that requires the country to level up security level in terms of water, energy and food.
- To response to the proposed goals, there is a sub-plan to increase water productivity of the entire water system for economic development use by evaluating use value and to create more value added from water use to meet international standard level.

the past studies

1. From, the report on water resources security - Thailand and international (Koontanakulvong S. et, al 2013)
 - The production of water from the water was 3.59 usd/m³. When compared to ASEAN countries Thailand is ranked 6th, ranked 132th in the world level (world average).
 - In the agricultural sector is 0.32 usd/m³, which is ranked 124th in the world level (the average world level is 392 usd/m³) And in the 18th rank in Asia (Asian average is 33.8 usd/m³). For industry sector in 2007, water productivity is equal to 51.2 usd/m³, ranked 63th in the world level (world average is 169.1 usd/m³.), which is ranked 8th in Asia. (Asian average is 69.5 usd/m³.).
2. Water productivity of Thailand from the World Bank assessment in 2015 is equal to 5 usd/m³ (Source: Food and Agriculture Organization, AQUASTAT data, and World Bank and OECD GDP estimates, 2017).

2. Objectives and methods

- This study aims to evaluate the water productivity of Thailand in each provinces and all sectors such as agricultural sector, service and industrial sectors. The comparison of water productivity with other countries will also be conducted and in addition, the measures to improve water productivity in next 20 years will be explored to response to the National Strategic Master Plan goals.

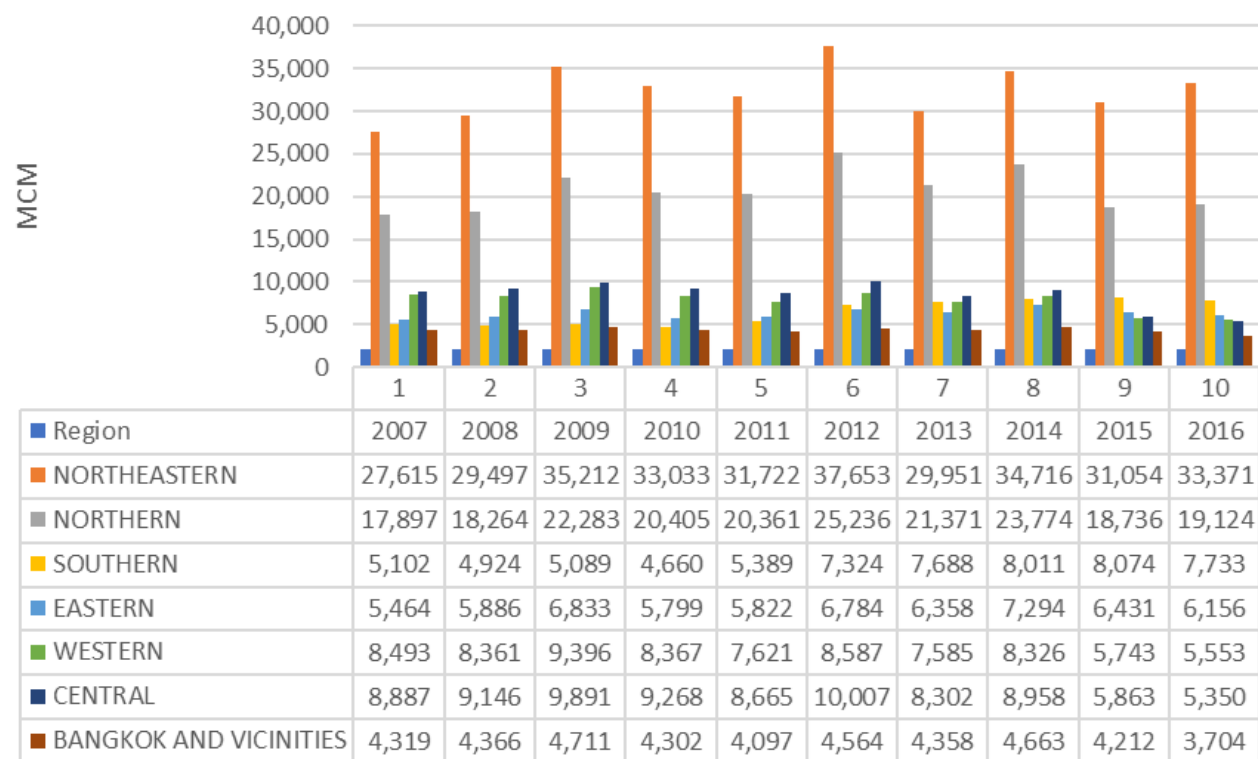
- Water productivity is defined as output per unit of water depleted. The simplest way to compare water productivity across different enterprises is in monetary terms. World Bank presents water productivity as an indication of the efficiency by which each country uses its water resources.
- There are two data sets used for water productivity analyses, the first is water use data at end users and the second is Gross Domestic Product.

- This study has 3 main steps, the first step is data collection. By collecting 4 main data groups, including meteorological-hydrological data, basic physical geospatial data, geographic information and provincial gross product data.
- The second is calculating water use at end users, which are estimated by water account method based on the System of Environmental-Economic Accounting for Water (SEEA-Water) concept of United Nations. The water account shows the analyses of the water balance between the use and supply of each water resource in physical terms.
- The final step is to determine the water productivity. It is calculated as Gross Domestic Product (GDP) divided by the water use which the result from the second step. The GDP data from Office of the National Economic and Social Development Council (NESDC) during the past 10 years (1996-2015).

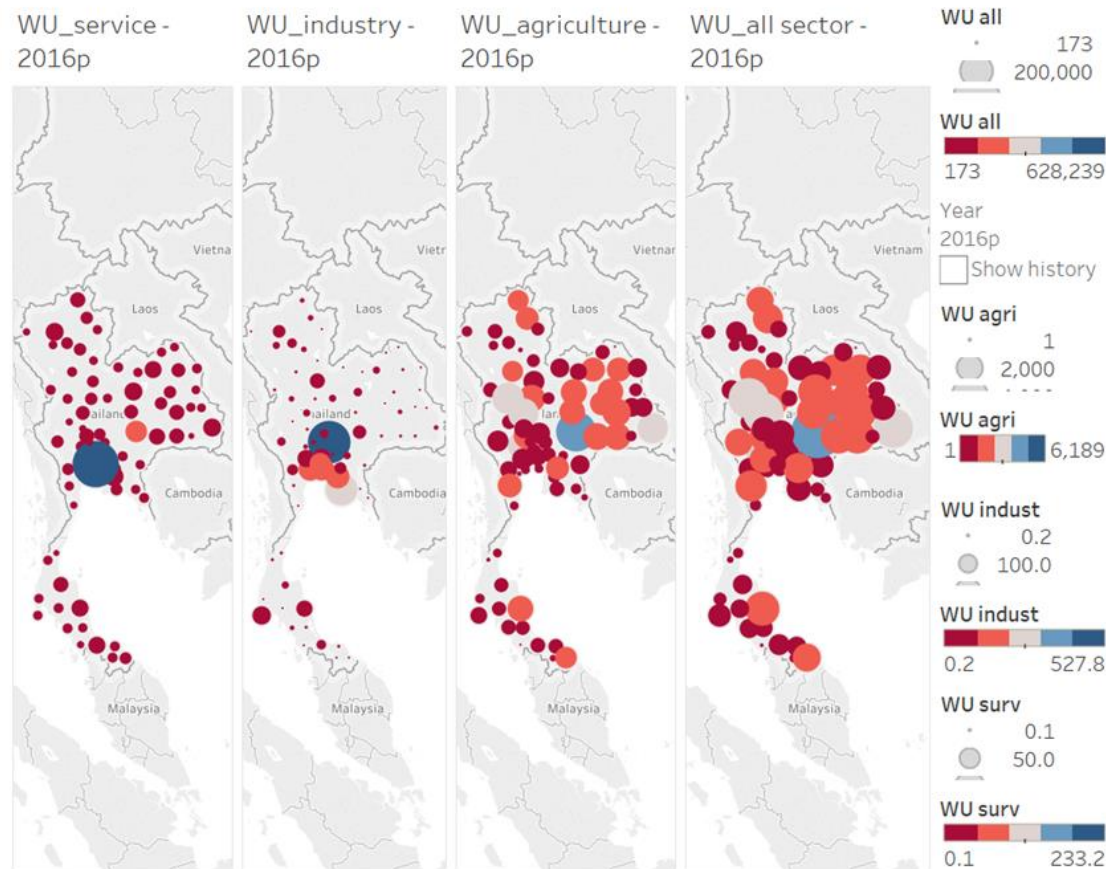
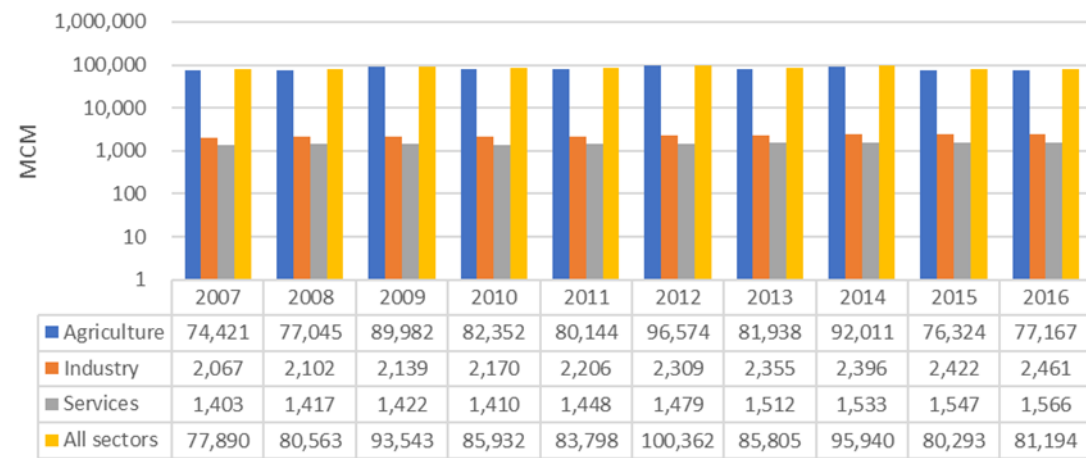
3. Results

3.1 water use

Water use in all sectors

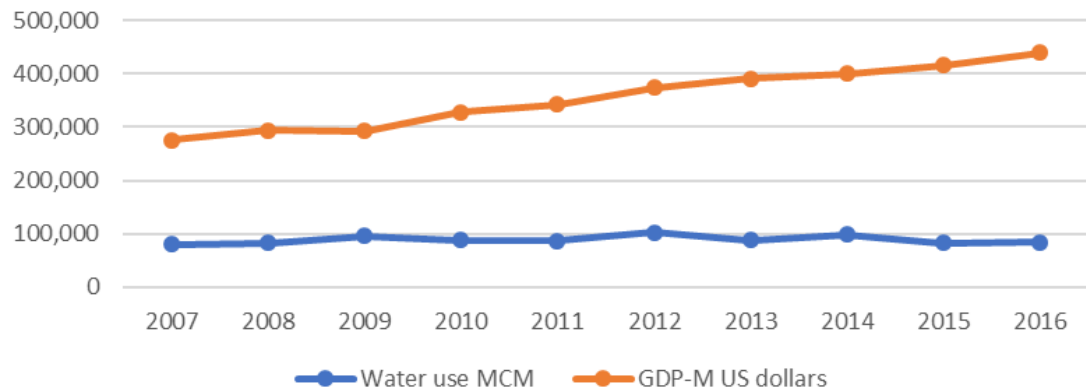


Water use in each sector:MCM

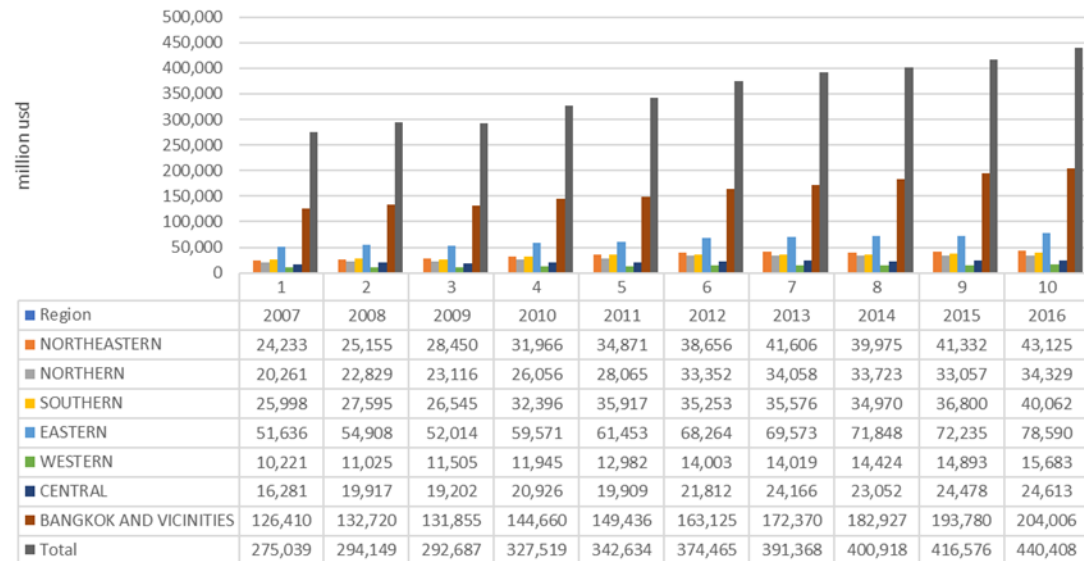


3.2 The Gross Domestic Product (GDP)

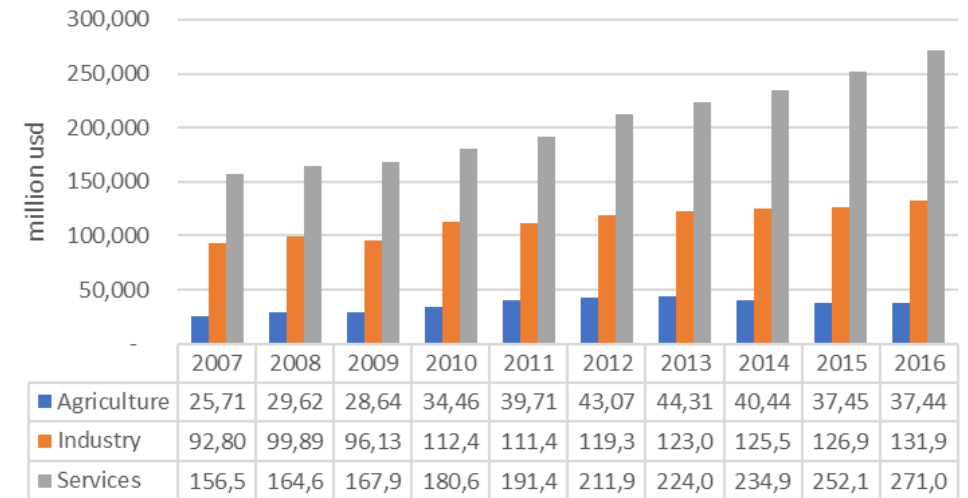
Water use and GDP



GDP in each region



GDP in each sector

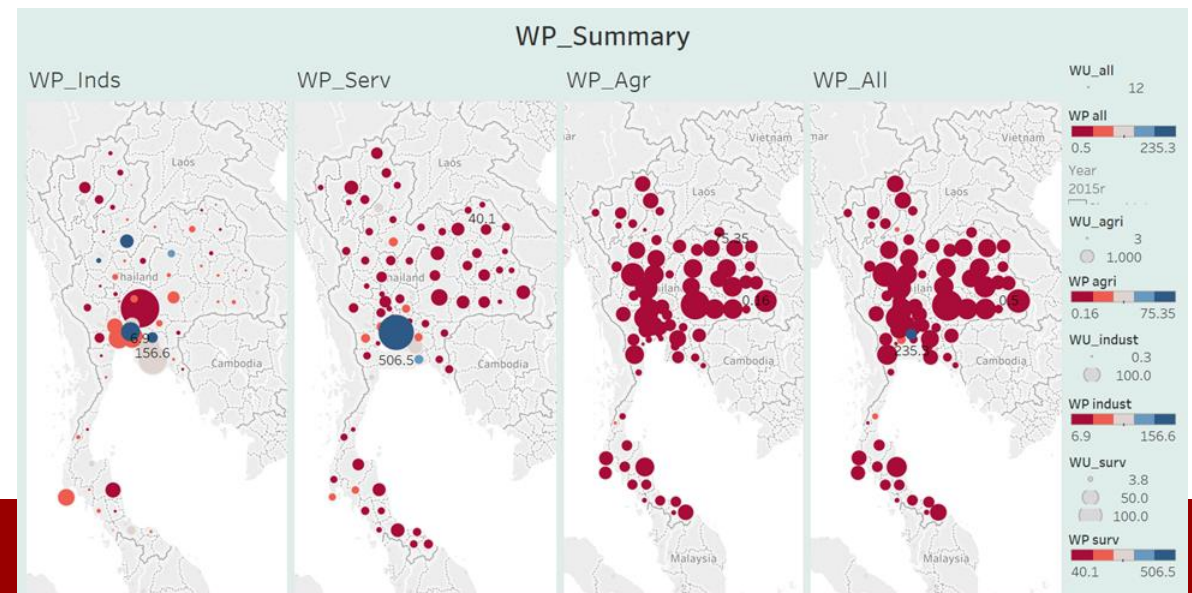
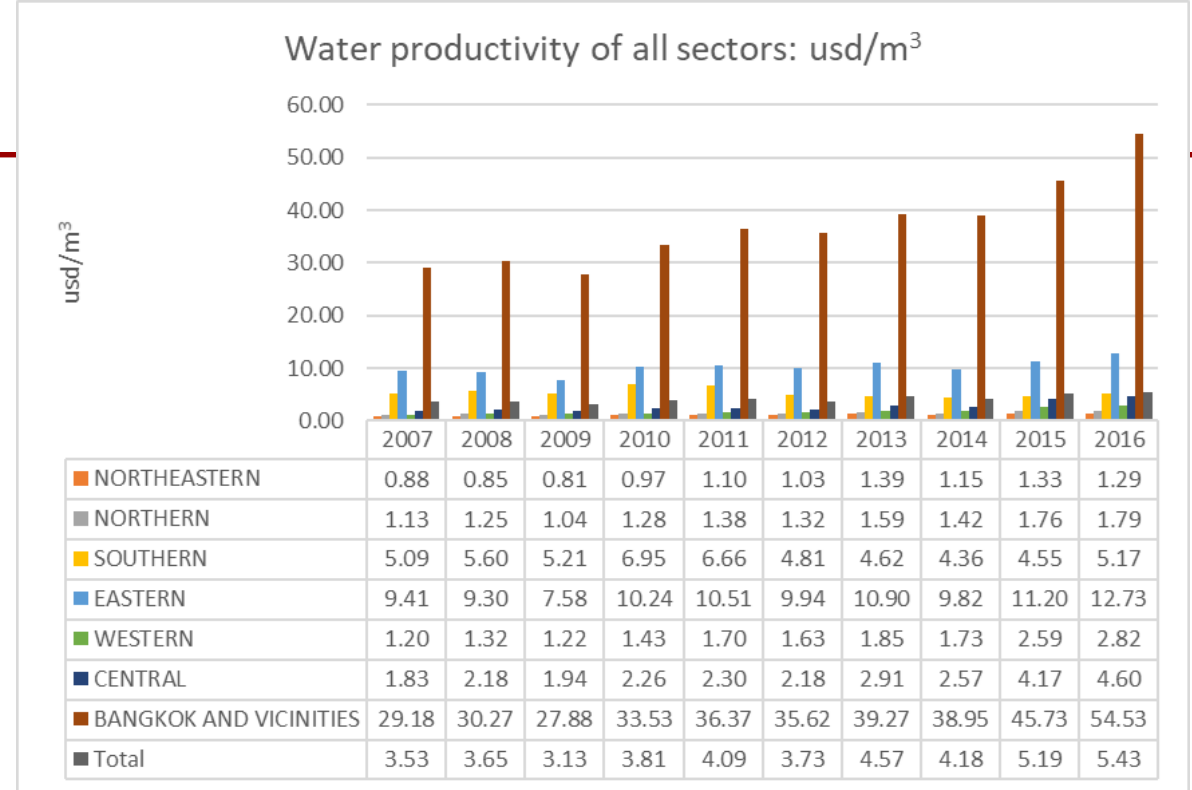
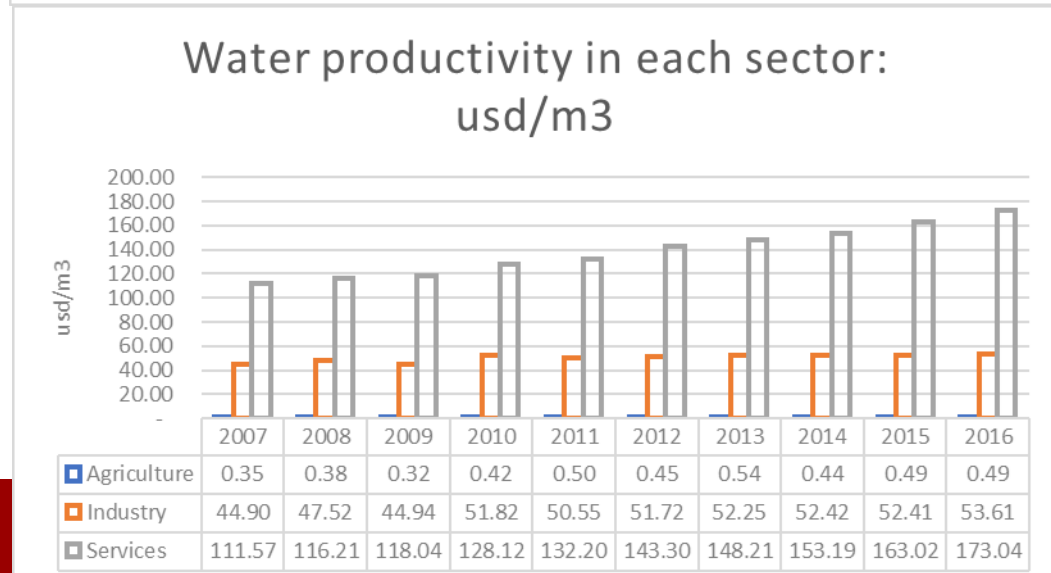
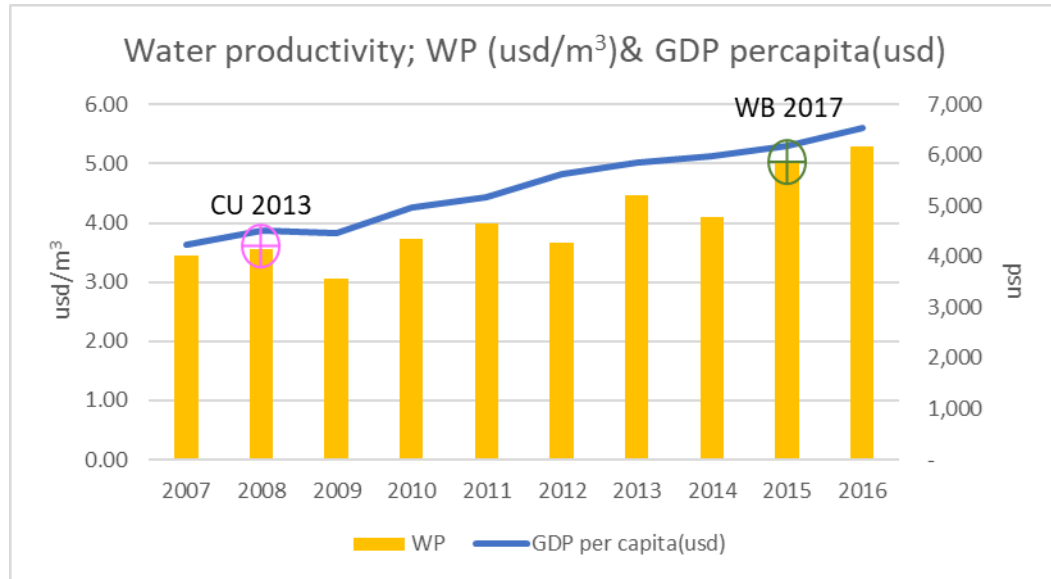


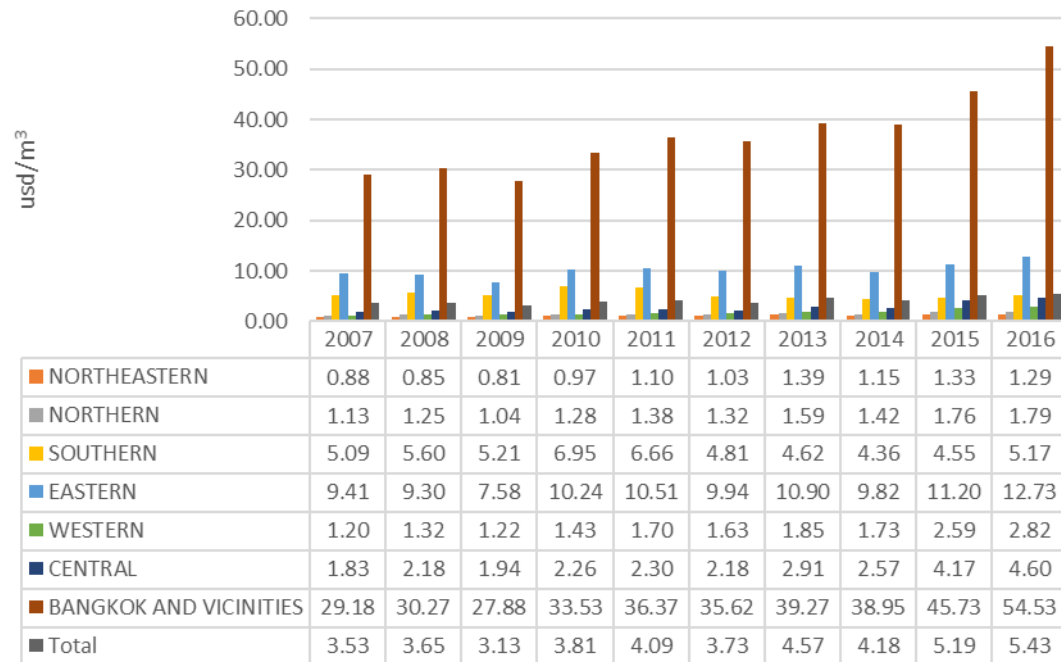
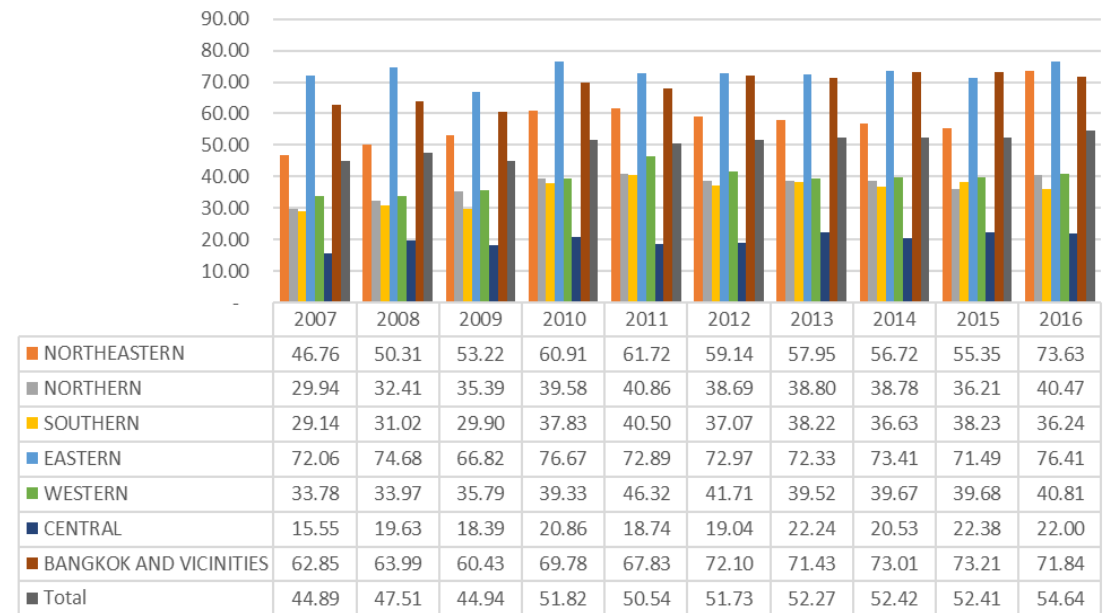
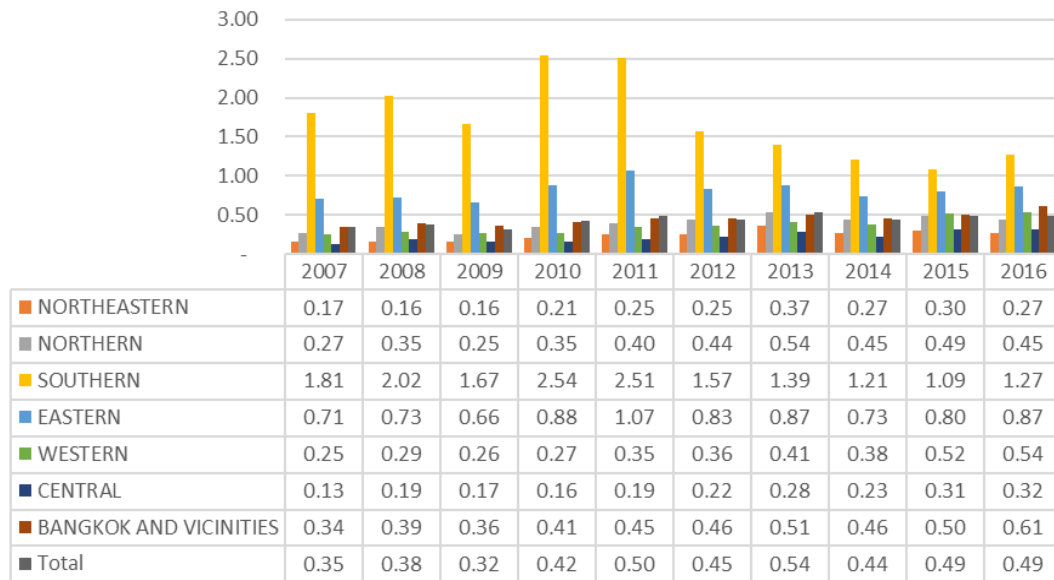
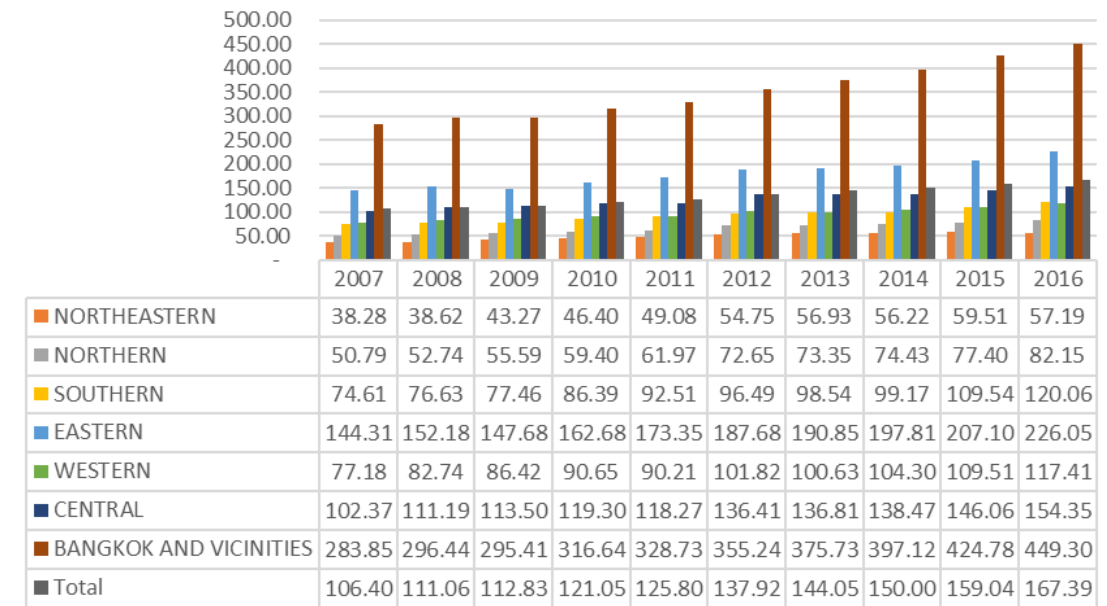
GPP All sectors: million USD

Sheet 1 - 2016p

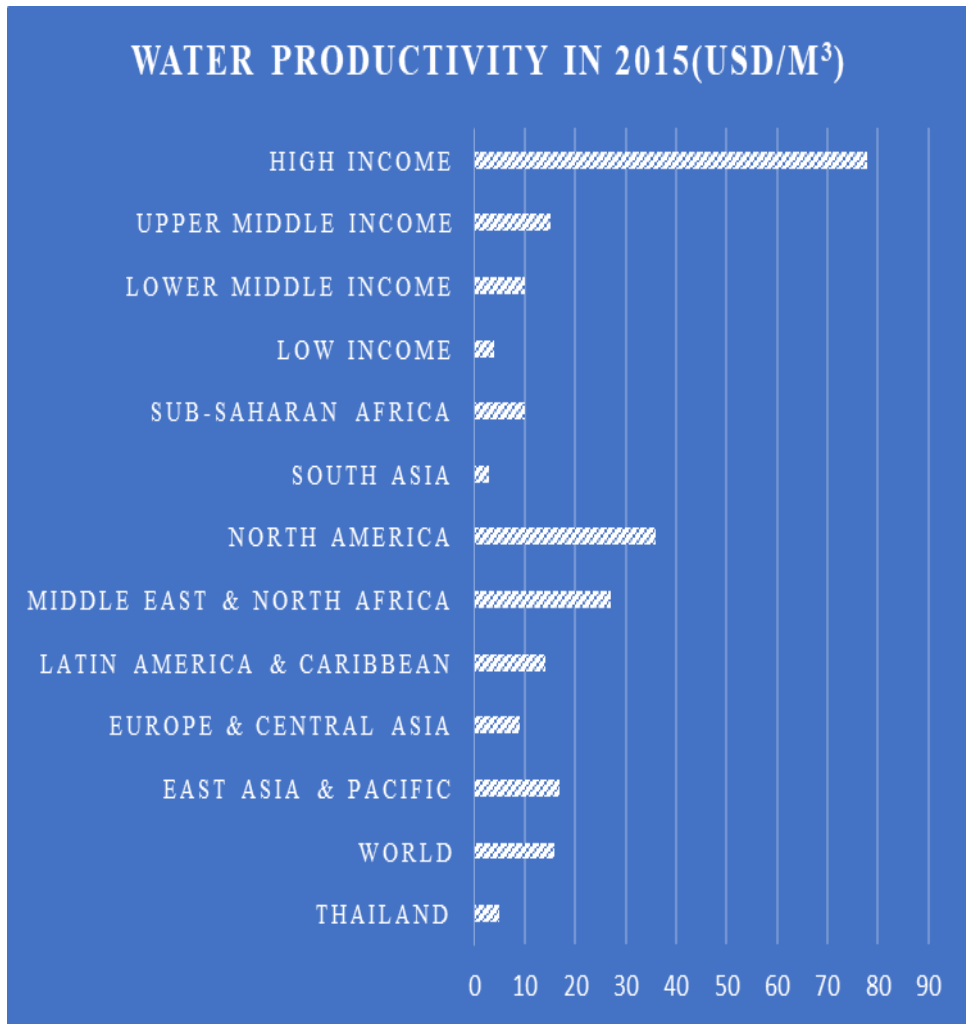


3.3 Water productivity



Water productivity of all sectors: usd/m^3 Water productivity in industry's sector: usd/m^3 Water productivity in agriculture's sector: usd/m^3 Water productivity in service's sector: usd/m^3 

3.4 Comparison with other countries



- The water productivity of Thailand was higher than South Asia, but lower than East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, North America and Sub-Saharan Africa.
- When consider in income level, Thailand is higher than lower income but lower than lower middle income, upper middle income and high income.

3.5 Improvement measure recommendations

The improvement measure recommendations to achieve the goals in the water master plan of the National Strategic Framework on water production increases 10 times from the current year are as follows

- There are measures regarding policies and plans for increasing water use and restructure the water use, such as measures to reduce or refrain from planting second rice, using technology to grow rice that uses less water, promotes wet and dry rice cultivation seriously.
- Linking the plans of the Ministry of Tourism and Sports, such as the action plan to drive sustainable and creative community-based tourism development that will increase the value of the service sector, specific marketing promotion programs to attract tourism and stimulate spending among various tourist groups.

- Linked to the Ministry of Agriculture, which plans to promote high value crops, but uses less water to replace rice, which will help increase agricultural product value and reduce water use
- Linking with the water development and management plan in the special economic zone of the country that will drive the value of industrial production and services
- Promote irrigation technology research that helps reduce water loss and reuse water in systems to increase water efficiency in production.

4. Conclusions

- The water productivity of Thailand from 2007-2016 are 3.1-5.2 usd/m^3 .
- The water productivity of service sector from 2007-2016 are 111-173 usd/m^3 . The water productivity of industry sector from 2007-2016 are 44-53 usd/m^3 . The water productivity of agriculture sector from 2007-2016 are 0.3-0.5 usd/m^3 .
- This study propose improvement measure recommendations to achieve the goals of the water master plan of the National Strategic Framework on water production increases 10 times from the current year and this study give some measure recommendations to achieve the goals.

5. Acknowledgements

- The article could not be concluded without data from various government agencies such as Thai Royal Irrigation Department (RID), Thai Meteorological Department (TMD), the National Economic and Social Development Council (NESDC) etc. This research has been partially support by Office of Thailand Research Fund (TRF). The research also done under the Water Resources System Research Unit (CU_WRSRU) of Department of Water Resources Engineering, Faculty of Engineering, Chulalongkorn University.

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your attentions**