

## **EFFECT OF LARGE-SCALE HUMAN ACTIVITIES ON FLOW REGIME IN RIVER WATERSHED; A CASE STUDY IN CHAO PHRAYA RIVER**

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The water resources are seriously under pressure even at present in several regions of the globe, and it is anticipated that the situation will be worse during the first half of this century.

In order to mitigate the damage due to the water scarcity and overcome the difficulty induced by water issues, world water resources assessment will be carried out by utilizing a massive data base related to water both in nature and society coupled with a global hydrological cycle model. Water use and hydrological cycles in Asia, such as irrigation for paddy field, and also the water demand for ecosystem will be particularly focused and considered in the assessment.

This study proposes system models for assessing effects of social changes on hydrological cycle in river watersheds, as well as water movement and balance especially among Asian countries, which are expected to be still dynamically developing with population and economical growths, industrial transfer and urbanization, while Japan is going to be in a stable developed stage.

The models aim at quantitative assessment of interactions between meteorological-hydrological dynamics and social dynamism, and also of the availability and risk of freshwater resources in Asia.

Also discussed are Japan's future water resources policies in connection with food and industrial policies, and strategic perspectives concerning how to contribute to the world.

As mentioned above, this study intended to use the Chao Phraya River basin in Thailand as a case study.

The Chao Phraya River basin, the largest basin in the Kingdom of Thailand, is located in the central and northern part of Thailand. This basin has two large-scale dams: the Bhumibol Dam on the Ping River and the Sirikit Dam on the Nan River. These large reservoirs have contributed to economic development of the country by supplying increasing electricity and irrigation demands as well as flood mitigation in riparian areas along the Ping, Nan and the Chao Phraya rivers.

The following, are parts of the results obtained:

Analysis of comparing annual and monthly flow regime in downstream of the dams before and after dam construction shows a constant increase in low flow and a drastic decrease, of about 60% in high flow. As analysis of precipitation, shows no long-term increase and decrease tendency of the precipitation, it can be concluded that the reservoir operation is the main cause of the flow regime change.

Spectrum of flow was analyzed by using FFT for daily discharges in Nakhon Sawan and immediately downstream of the Bhumibol dam (Royal Irrigation Department's code P.12) after the Bhumibol dam construction. Flow in Nakhon Sawan has periodic characteristics of 3.5 days and 7 days, and the released water from the Bhumibol dam at P.12 has periodic characteristics of 2.5 days, 3.5 days and 7 days. Reservoir operation affected the hydrological cycle considerably.

Finally, the two large-scale dams promote irrigation in the dry season in the middle and the lower Chao Phraya River basin and cause the improvement of agricultural production quantity and now, there has been a considerable stabilization of agricultural production. Moreover, the utility form of water-use also has greatly changed.

It is not possible to absolutely disregard the effect of large-scale human activities, such as the large-scale dam construction, on water circulation. It can be clearly seen that the integration of an understanding of human activities with runoff and hydrological models is indispensable.

#### REFERENCES

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