THE EFFECTS OF URBANIZATION ON URBAN HYDROLOGY CHARACTERISTICS

Ms.Chatsiri Klungniam
Phranakorn Rajabhat University
Bangkok, Thailand

ABSTRACT

Hydrology study on the water since the water falls to the earth, the water flows back to the sea and then evaporates back into the atmosphere. Hydrology is a story that involves both surface water and groundwater. Hydrology study is to understand the behavior of water. The study of the hydrology of the city, particularly in urban areas by studying the hydrological changes caused by urbanization. This study aims to understand the behavior of both the water and the importance of various factors affecting the water to change behavior The main changes of the physical pathways of the water cycles due to urbanization include: removal of natural vegetation drainage patterns; loss of natural depressions which temporarily store surface water; loss of rainfall absorbing capacity of soil; creation of impervious areas (e.g., rooftops, roads, parking lots, sidewalks, driveways) provision of man-made drainage systems (e.g., storm sewers, channels, detention ponds). Therefore, although the hydrological cycle consists of the same elements, their proportions in urban area are significantly different: interception of rainfall is reduced due to removal of trees; precipitation is usually higher than in rural areas; evapotranspiration is much lower; surface run-off is much larger; ground-water run-off, infiltration and recharge is small; water storage is much lower; runoff volumes and peak flows in rivers are higher; frequency of surface runoff is increased.

Urban development significantly increases the amount of storm water and the frequency of extreme hydrological events experienced by the watershed. The increased runoff causes more intense local flooding, while droughts during dry weather are deeper and longer. In case of Thailand has impact of urbanization on the hydrology cycle utilized in a plan to solve drainage problems in urban areas do not materialize. The urban area is actually considered part of the watershed affects the Urban Hydrologic Characteristics. The results of the study indicated that in order to water balance and prevent flooding in study areas has impact from Climate Change, it should have provided detention areas in the right proportion to the areas for Sustainable livelihood Approach .

Keyword: Urbanization, Urban Hydrologic**,** Sustainable livelihood Approach (SLA)

INTRODUCTION

Urban hydrology is a special case of hydrology applied for cities i.e., areas with very high level of human interference with natural processes. All hydrological sub-processes in urban areas must be considered in much smaller temporal and spatial scales than those in rural areas. This brings essential differences with respect to theory, data collection and calculation methods. Data collected by the national meteorological services are seldom adequate for urban hydrological applications and urban hydrologists usually must install their own data collection systems capable of delivering data on small spatial scale and short time resolution. These data are site specific i.e., must be collected locally. Data collection is costly and it takes long time before amount of data is sufficient for meaningful application.

Urban hydrology will have an increasing role to play in the sustainability of human societies. Urban population is growing at an accelerating pace and, simultaneously, sources of water supply decrease or, at the best, remain constant in quantity but decrease in quality. Growth of urban areas brings significant changes in physical properties of land surface. Due to increasing area of paved surfaces permeability of soil and infiltration decreases, and surface runoff accelerates. Channeling of natural streams results in fast runoff with high peak flows. Such changes of natural regime on a comparatively small area of a city bring significant and often disastrous effects on the whole river basin downstream of the city.

The Effects of Urbanization on Urban Hydrology Characteristics is a part on A Study of Sustainable livelihood Approach (SLA) and Climate Change Adaptation of Community : A Case Study of Karen Community at Lai-wo Sub-district Sangkhlaburi District Kanchanaburi Province in Thailand

This paper has Objective To study impact of urbanization or landuse change on the hydrological characteristics in Karen Community at Lai-wo Sub-district Sangkhlaburi District

a community that has settled in the Thung Yai Naresuan Wildlife Sanctuary, west, an area vulnerable. Easy to change if the problem of climate change. And local communities to be affected by drought during the rainy temperature change until the change over the course of cultivation. Crop growing household consumption is reduced. And the community is necessary to rely on the natural resources and environment in the area is huge. It is necessary to analyze the influence or driving force of climate change, the resulting economic and social changes that affect productivity and efficiency. Of the Community guidelines on risk management or the impact of climate variability and climate change today. The conditions that make a community alternatives. To cope with the risks of climate change or adapt to the change from the past to the present, however. In particular, changes in land use. Cycle to affect the hydrology of the area. The community still has the ability to live in a sustainable manner. To provide adequate housing and to preserve the future.

Areas of study

This research studies Effects of Urbanization on Urban Hydrologic Characteristics in. This Karen Community at Lai-wo Sub-district Sangkhlaburi District **Kanchanaburi Province**. covers an area of approximately 1,480 square kilometers.

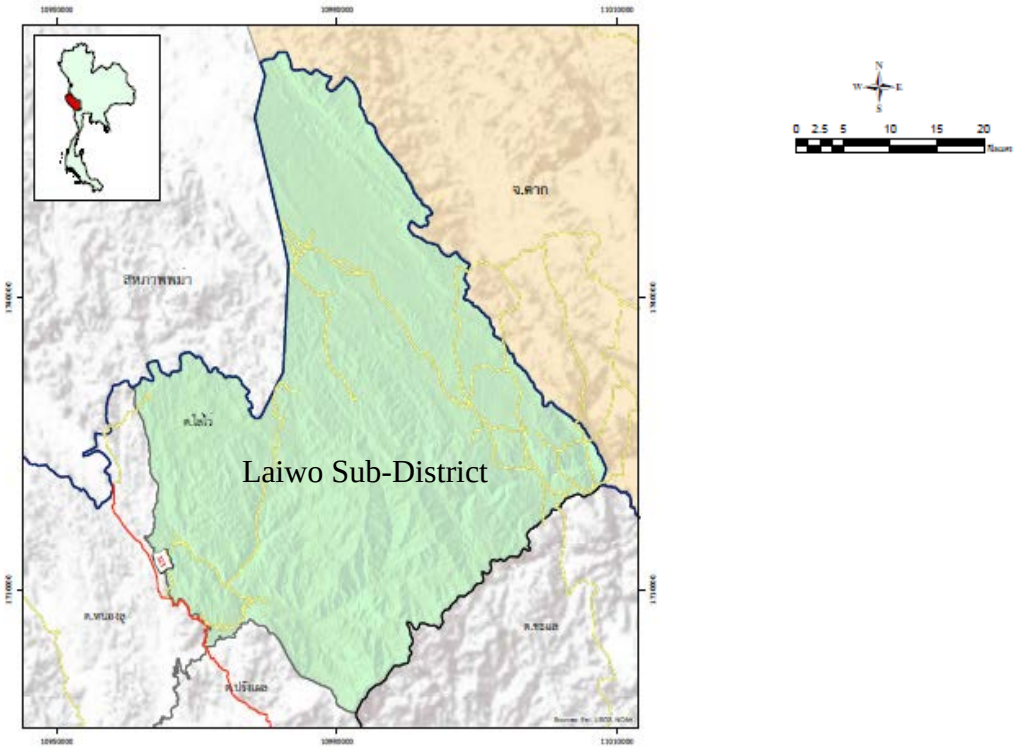

Fig1. Study area

Laiwo Sub-District Sangkhlaburi District Stay away from Kanchanaburi province, about 200 km away, about 23 kilometers Sangkhlaburi a village community. Located on the Thung Yai Naresuan Wildlife Sanctuary, west side has a farm animal without electricity, transportation inconvenient River flows through the city.

Topography

Lai-wo Sub-District some areas in the western Sanctuary Thung Yai Naresuan. And the Khao Laem A creek runs by hitting a boundary protected area with the second area is mountainous terrain between the mountains and the plains, where the Karen Community District Laiwo area of about 1480.66 square kilometers, There is a high mountain plateau.

Contact Area

North Border with. Mae Tha district oxytocin may smack. Tak.
South. Border with, Nong Lu and. Prang's behalf. Sangklaburi. Kanchanaburi.
East. Border with Chalae district Thong Pha Phum district. Kanchanaburi.
West Border with to Myanmar

The Definition of Urban Hydrology

From the time the earth was formed, water has been endlessly circulating. This circulation is known as the hydrologic cycle. Groundwater is part of this continuous cycle as water evaporates, forms clouds, and returns to earth as precipitation.Surface water is evaporated from the earth by the energy of the sun. The water vapor forms clouds in the sky. Depending on the temperature and weather conditions, the water vapor condenses and falls to the earth as different types of precipitation. Some precipitation runs from high areas to low areas on the earth's surface. This is known as surface runoff. Other precipitation seeps into the ground and is stored as groundwater

Think of groundwater as water that fills the spaces between rocks and soil particles underground, in much the same way as water fills a sponge. Groundwater begins as precipitation and soaks into the ground where it is stored in underground geological water systems called aquifers. Sometimes groundwater feeds springs, lakes, and other surface waters or is drawn out of the ground by humans. The water then can evaporate, form clouds, and return to the earth to begin the cycle over again

Although FIG. 2 is useful in imparting the essential features of a water cycle driven by the excess of incoming over and outgoing radiant energy, this representation fails to provide an adequate framework that can be obtained by adopting the so-called system notation, in which the paths of water transport link the major sources of moisture storage, as presented by Dooge (1973)

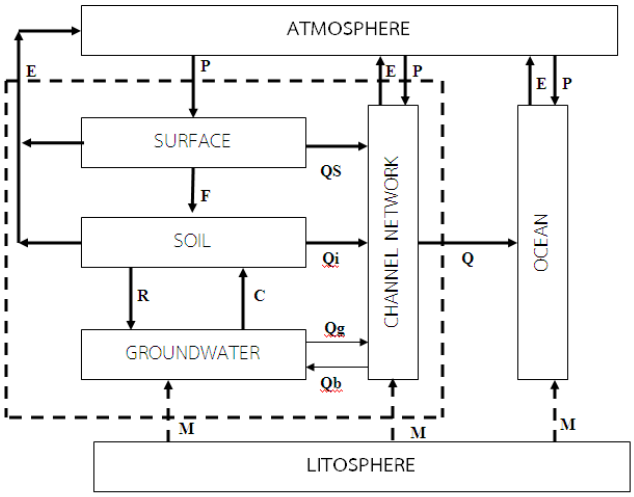

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Fig 2 The hydrological cycle

Since time immemorial, man has manipulated his environment, and therefore the land phase of the hydrological cycle, for his own purposes. Wildscape has been cleared for agriculture, forests have been felled,

swamps have been drained and, most important of all, towns and cities with all their associated infrastructure have been created in what were once rural areas. Over the last 25 years, increased attention has been devoted to the hydrology of land use changes in general, but only the process of urbanization has given rise to a new and recognizable branch of the subject – urban hydrology. Perhaps the most obvious definition of urban hydrology would be the study of the hydrological processes occurring within the urban environment.

The Effects of Urbanization on Urban Hydrology Characteristics at Lai-wo Sub-district

Land use Change resulting from urbanization process, causing problems with hydrological processes. Three study the impact by calculating the flow rate of a soil with Rational Method known as Lloyd - Davies Method which calculates Manila Water surface runoff of the areas that are directly related. rainfall equation

Rational Equation: Q=ciA

The Rational equation requires the following units:

Q = Peak discharge, cfs
c = Rational method runoff coefficient
I = Rainfall intensity, inch/hour
A = Drainage area, acre

When the coefficient of flow on the surface of the soil or c that will result in a Q or a maximum flow rate of the water change with it. The rainfall that fell to the ground, some being held on the ground surface Detantion some will seep into the soil and ground water Um. Rainfall land absorb them depends on the moisture content of the soil in which the rain has increased humidity. When rain falls on the surface of the soil to absorb the water. Water will start to put on the ground. Flows into the soil slowly becomes surface runoff to the sod will be seen that the flow coefficient on the surface is higher than when it rains. For more rainfall in the study area based on rainfall in the thirty-year period of the Meteorological Station Thong Pha Phum district. Karnchanaburi The average rainfall of 148.87 mm

Table 1 rainfall period of 30 years from 1981 to 2010 Meteorological Station Thong Pha Phum district. Karnchanaburi

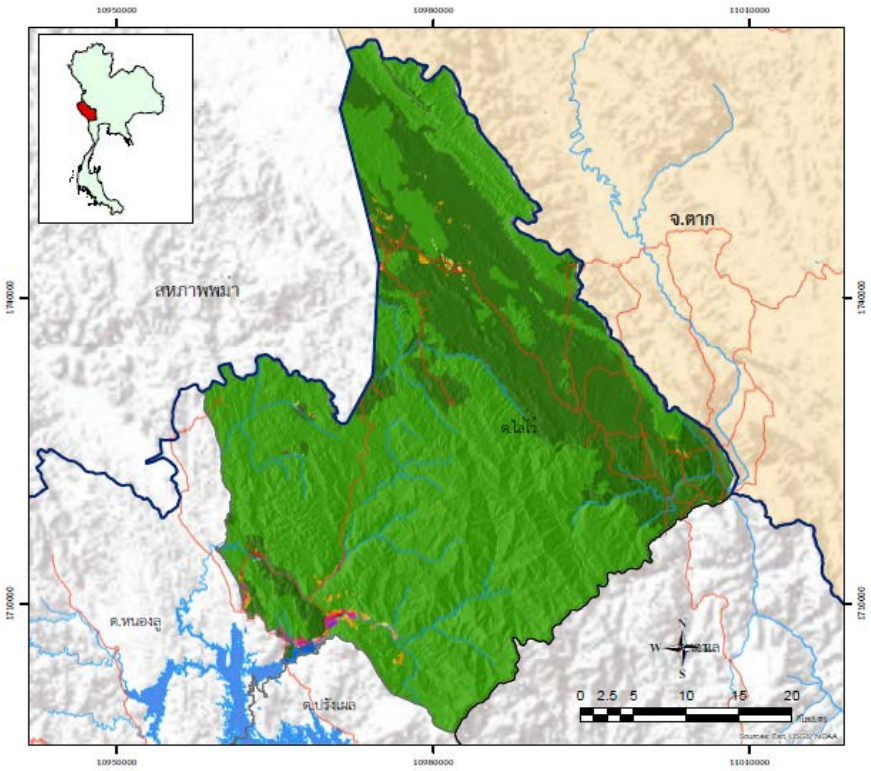
Month	**Rainfall (mm)**
January	5.4
February	16.4
March	46.4
April	101.8
May	227.5
June	278.3
July	323.2
August	343.7
September	241.2
October	172.3
November	25.6
December	4.7
Average	148.87

Land Use of Lai-wo District

Land of Use District Laiwo. Found that urban and rural areas combined, accounted for 0.97 percent of the forest area with up to 99 percent.

Table 2 Land Use of Lai-wo District

	Land use	Area	percentage
1	urban	1.75	0.11
2	Rice Fields	1.91	0.12
3	agricultural plants	8.75	0.57
4	fruit	2.65	0.17
5	timber	0.75	0.04
6	Evergreen forest	1001.09	68.53
7	deciduous forests	459.81	30.17
8	Surface water	3.27	0.21
9	Other	0.68	0.04
	Total	1480.66	100



In the study, The Effects of Urbanization on Urban Hydrology Characteristics at Lai-wo Sub-district have studied the dynamics of urbanization in areas that affect the cycle hydrological make all changes to the original valuation. Coefficient of water flow on the surface of the land use types in the study area, using a coefficient of flow of surface water from the water resources Department has the following results.

Table 3 Coefficient of water flow on the surface of the land use types

	Land use	C	Area	Q
1	urban	0.22	1.75	0.06
2	Rice Fields	0.88	1.91	0.28
3	agricultural plants	0.05	8.75	0.74
4	fruit	0.10	2.65	0.04
5	timber	0.10	0.75	0.01
6	Everygreenforest	0.12	1001.09	20.42
7	deciduous forests	0.10	459.81	7.81
8	Surface water	0.02	3.27	0.11
9	Other		0.68	
	Total		1480.66	29.49

Q = 3.68

Considering the Q or the flow of surface water. It found that there were differences according to the type of land use. The study does not settle down in the city. Are taking advantage of the built-up area less than 1 percent will not see the changes of the hydrological cycle in the flow of surface water by the Peak discharge was 3.68 mm per hour.

CONCLUSIONS

Hydrology study on the water since the water falls to the earth, the water flows back to the sea and then evaporates back into the atmosphere. Hydrology is a story that involves both surface water and groundwater. Hydrology study is to understand the behavior of water. The study of the hydrology of the city, particularly in urban areas by studying the hydrological changes caused by urbanization. This study aims to understand the behavior of both the water and the importance of various factors affecting the water to change behavior The main changes of the physical pathways of the water cycles due to urbanization include:

1. removal of natural vegetation drainage patterns;
2. loss of natural depressions which temporarily store surface water;
3. loss of rainfall absorbing capacity of soil;
4. creation of impervious areas (e.g., rooftops, roads, parking lots, sidewalks, driveways)
5. provision of man-made drainage systems (e.g., storm sewers, channels, detention ponds).

Therefore, although the hydrological cycle consists of the same elements, their proportions in urban area are significantly different:

1. interception of rainfall is reduced due to removal of trees;
2. precipitation is usually higher than in rural areas;
3. evapotranspiration is much lower;
4. surface run-off is much larger;
5. ground-water run-off, infiltration and recharge is small;
6. water storage is much lower;
7. runoff volumes and peak flows in rivers are higher;
8. frequency of surface runoff is increased.

Urban development significantly increases the amount of storm water and the frequency of extreme hydrological events experienced by the City's catchments. The increased runoff causes more intense local flooding, while droughts during dry weather are deeper and longer.

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