icsbe 2014
Third international Conference on Sustainable Built Environment
Faculty of Civil Engineering and Planning Islamic University of Indonesia

ISTECS
International Seminar on Tropical Eco Settlements
The Research Institute for Human Settlement Ministry of Public Works, Indonesia

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CONFERENCE PROCEEDINGS

3rd International Conference on Sustainable Built Environment (ICSBE)
"Resilience and Risk Reduction Towards Well-Being Society"

4th International Seminar on Tropical Eco-Settlements (ISTEcS)
"Bringing Coastal Cities Into The Future: Challenges, Adaptation, and Mitigation"

Editors:
Mochamad Teguh - Islamic University of Indonesia, Indonesia
Anita Firmanti - Ministry of Public Works, Indonesia
Thomas Boving - University of Rhode Island, USA
Akihisa Kitamori - Kyoto University, Japan
Thanongsak Imjai - Rajamangala University of Technology, Thailand

Inna Garuda Hotel
Yogyakarta, October 21-22, 2014

CONFERENCE PROCEEDINGS

The 3rd International Conference on Sustainable Built Environment (ICSBE)

RESILIENCE AND RISK REDUCTION TOWARDS WELL-BEING SOCIETY

In collaboration with:

The 4th International Seminar on Tropical Eco-Settlements (ISTEcS)

BRINGING COASTAL CITIES INTO THE FUTURE: CHALLENGES, ADAPTATION, AND MITIGATION

Inna Garuda Hotel, Yogyakarta, Indonesia
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Research Institute for Human Settlements
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International University Partners:

University of Rhode Island

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Kyoto University

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Welcome Speech

The Chairman of Organizing Committee

Assalamu'alaikum warrahmatullahi wabarakatuh,

The honorable;

- Rector of UII, Ir. Harsoyo, M.Sc., Ph.D.,
- Director General of Spatial Planning, Ministry of Public Works, Indonesia, Dr. M. Basoeki Hadimoeljono,
- Director General of Agency for Research and Development, Ministry of Public Works, Indonesia, Ir. Waskito Pandu, MSc.,
- The Head of Research Institute for Human Settlement, Ministry of Public Works Indonesia, Prof. Dr. Ir. Anita Firmanti, MT.,
- Dean of Faculty of Civil Engineering and Planning, Islamic University of Indonesia,
- Conference's Partners: University of Hawai'i at Manoa – USA, Univesity of Rhode Island – USA, Fatih Sultan Mehmet University – Turkey, Disaster Research Center Gadjah Mada University – Indonesia, Kyoto University – Japan, Rajamangala University of Technology – Thailand,
- Keynote speakers: Prof Thomas Boving, Ph.D., Prof. Farhad Atash, Ph.D., Prof. Mochamad Teguh, Ph.D., Dr. Dadang Rukmana, Prof. Dr. Ir. Anita Firmanti, MT., Prof. Aris Marfa'i, Thanongsak Imjai, Ph.D.
- Participants of the 3rd ICSBE 2014 and the 4th ISTEcS.
- Distinguished Guest, ladies and gentlemen,

Welcome to Yogyakarta!

The International Conference on Sustainable Built Environment (ICSBE) was first launched in 2010 with the theme "Enhancing Disaster Prevention and Mitigation". The second conference was launched in 2012 with the theme "Livable Cities in the Fast-Growing Countries". This year, the third ICSBE 2014 presents the theme "Resilience and Risk Reduction Towards Well-Being Society", which is a fine match with the position of Yogyakarta as the one of resilient cities in Indonesia due to its prone disaster location. A resilient city is able to survive a traumatic blow to its physical infrastructure, its economy, or its social fabric.

A resilient city bends but does not break; it absorbs impacts without shattering. Even if the bridges and roads are ruined and the buildings toppled, the resilient city's core institutions survive; its social fabric holds; and in time, its economy rebounds. Resilience can be difficult or even impossible to gauge a city's true rebound capacity until an actual disaster is at hand. A city"s degree of resilience can also change over time; the same kind of event can yield very different outcomes depending on prevailing socioeconomic conditions. The conference aims to better understand how resilient is perceived in the societies. What problems need to be tackled in the planning and design of the built environment in order to achieve such resilient? The conference presents five sub themes comprising urban/rural environments and settlements, building and constructions, infrastructures, policies and management, and coastal cities.

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The Organizing Committee received 140 abstracts coming from 9 different countries and covering in 5 specified sub-topics. The scientific committee members blindly reviewed to all submitted abstracts and have provided technical comments to the author/s with regard to ensure that the submitted full paper is qualified. After reviewing process to overall submitted papers, the scientific committee has decided to receive 69 papers only and the authors were invited to present his/her paper in the conference. It should be noted that papers not presented in the conference session are excluded in the conference proceedings. Finally, there are 54 presented papers included in the conference proceedings covering the sub-topics as follows:

1. Urban/rural Environments and Settlements: 16 papers
2. Building and Constructions: 19 papers
3. Infrastructures: 8 papers
4. Policies and Management: 6 papers
5. Coastal Cities: 5 papers

This program will not take place without the generous support from our partners. Therefore, I would like to extend my gratitude to Bank Mandiri, Bank Syariah Mandiri, Bank Muamalat for co-sponsoring this event.

My gratitude also goes to our international invited speakers: Prof. Thomas Boving, Ph.D. and Prof. Farhad Atash, Ph.D. – University of Rhode Island (URI), USA, Prof. Mochamad Teguh, Ph.D. – Universitas Islam Indonesia (UII), Prof. Aris Marfa'i – Gadjah Mada University, Prof. Dr. Ir. Anita Firmanti, MT. – Ministry of Public Works (PUSKIM), Indonesia, Dr. Dadang Rukmana – Director of Urban Planning and Development, Directorate General of Spatial Planning and Development, Ministry of Public Works. Thanongsak Imjai, Ph.D. – Rajamangala University of Technology, Thailand. Finally, I must thank all members of the organizing committee for making this event possible.

Wassalamu'alaikum warrahmatullahi wabarakatuh

Yogyakarta, October 21, 2014

ICSBE General Chair of Organizing Committee

Suparwoko, Ph.D.

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Welcome Speech

Director of Research Institute for Human Settlements

4th. International Seminar on Tropical Eco-Settlements

"Bringing Coastal Cities into the Future: Challenges, Adaptation, and Mitigation"

It is a great pleasure to welcome you at the 4th. International Seminar on Tropical Eco-settlements (ISTEcS), which is held in the beautiful city, Yogyakarta. To our overseas participants, let me welcome you once again to our country, Indonesia.

The ISTEcS is a bi-annual event since 2006 with the only exception of 2008, hosted by Research Institute for Human Settlements (RIHS) Ministry of Public Works Indonesia. As previous seminars in the series that each had emphasis on specific issues related to tropical settlements, this year's ISTEcS will also focus on the sustainability challenges of coastal cities in tropical zones arising from sea level rise, climate change, and land subsidence. These phenomena have become a global concern as they could put populations of these cities at greater risk of flooding and other climatic disasters. Adaptation and mitigation are thus two fundamental terms within this context.

Efforts must be taken to bring coastal cities to the future. We believe all adaptative and mitigating measures require every stakeholder to hold hand together in collaboration. With this seminar, we therefore seek to establish a forum for government officials, researchers, academicians, industry practitioners, non-governmental and multinational organization staff members to share their views and experiences on managing sustainable coastal cities. No less important is an opportunity to build collaborative partnerships with experts of different scientific areas and country of origins.

The 2014's ISTEcS is also special in the way that this event is organized in collaboration with the 3rd. International Conference on Sustainable Built Environment (ICSBE), hosted by Islamic University of Indonesia (UII), following a previous cooperative agreement signed not long ago between UII and RIHS. Such a collaboration, rather than rivaling one another, would have benefited both institutions as well as prospective participants. Not only could we share our resources for mutual goal, we could also take advantage on enhanced networks for our future works.

Our secretariats have received about 60 technical papers covering different aspects of urban/rural settlements, including coastal cities as a special issue of the joint seminars. To ensure the quality of papers to be published in the conference proceedings, all accepted papers have undergone a blind review process by our scientific committee members and professionally been edited in accordance with the given template. These papers will be presented in parallel sessions for two consecutive days.

We sincerely hope that these joint seminars will prove beneficial and valuable for you, all the seminar participants. Besides attending the seminars, you may also find time to visit many local attractions of Yogyakarta.

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Finally, as the RIHS Director, I wish you productive discussions during paper presentations and a very pleasant stay in Yogyakarta.

Yogyakarta, October 21, 2014

Director of Research Institute for Human Settlements

Prof. Dr. Ir. Anita Firmanti, MT.

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Welcome Speech

The Dean, Faculty of Civil Engineering and Planning, Universitas Islam Indonesia

Assalamu'alaikum warrahmatullahi wabarakatuh

The honorable:

- Rector of UII, Ir. Harsoyo, M.Sc., Ph.D.,
- Director General of Spatial Planning, Ministry of Public Works, Indonesia, Dr. M. Basoeki Hadimoeljono,
- Director General of Agency for Research and Development, Ministry of Public Works, Indonesia, Ir. Waskito Pandu, MSc.,
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- Participants of the 3rd ICSBE 2014 and the 4th ISTEcS.
- Distinguished Guest, ladies and gentlemen,

First of all, praise is to Allah, the Cherisher and Sustainer of the world, for His blessing for all of us. He who has provided us a chance so that we could be here to share knowledge, ideas, solutions and experiences in the Third International Conference on Sustainable Built Environment (ICSBE) 2014. To the academic, our colleagues from the overseas universities, guests, participants, students and so on, please accept our gratitude, warm welcome and appreciation.

In the last decade, there were several disasters occurred in Indonesia. Yogyakarta, as one of big cities in Indonesia, had been facing two great disasters in 2006 and 2010. The first disaster was an enormous M 5,9 earthquake, the victims was very devastating, more than 5.700 deaths and 37.000 injuries. The total financial losses was USD 3,1 billions. The second disaster was Merapi Volcano Eruption, which killed hundreds of people in 2010. These disasters have given us extra experiences how to protect our communities and the environment.

Resilience and risk reduction has been a really important part in order to overcome the disasters in future, and then societies have the key role to play that. The disasters were causing many casualties, injuries, and financial losses because the societies do not know the proper action. Many parties take involve in activities of resilience and risk reduction, they teach the resilience and risk reduction to societies living in the prone disaster areas. A city with a robust, diversified economy, for example, will rebound much more quickly than a city with a narrowly specialized or weak economy. Planning, too, can dramatically bolster a city"s resilience. Well-rehearsed evacuation and emergency management plans can enable a city to endure a crisis with minimal loss of life. Cities that invest in hazard mitigation planning and action can also reduce their vulnerability.

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The Third International Conference on Sustainable Built Environment (ICSBE) 2014 takes issues in this urgent agenda of "resilience and risk reduction towards well-being society". The conference takes role as the media to share wisdom and experiences, and develop knowledge as well as skill and recent technologies on applied built environment sciences and technologies. This conference conducted with participants from different background study is expected to have integrated solution of resilience and risk reduction towards well-being society. We will discuss five sub themes comprising urban/rural environments and settlements, building and constructions, infrastructures, policies and management, and coastal cities.

Let me deeply state a special appreciation to the Research Institute for Human Settlement, Ministry of Public Works (PUSKIM) who has fully support this conference so that joint host of this conference between FCEP UII and PUSKIM is well managed. It is a great pleasure to acknowledge the invited speakers; Prof. Thomas Boving, Ph.D. and Prof. Farhad Atash, Ph.D. – University of Rhode Island (URI), USA, Prof. Mochamad Teguh, Ph.D. – Universitas Islam Indonesia (UII), Prof. Aris Marfa'i – Gadjah Mada University, Prof. Dr. Ir. Anita Firmanti, MT. – Ministry of Public Works (PUSKIM), Indonesia, Dr. Dadang Rukmana – Director of Urban Planning and Development, Directorate General of Spatial Planning and Development, Ministry of Public Works, Thanongsak Imjai, Ph.D. – Rajamangala University of Technology, Thailand. I also would like to extend my special thanks and high appreciation to our sponsors: Bank Mandiri, Bank Syariah Mandiri, Bank Muamalat for their generous support to take place this conference. Our appreciation is also for all participants who have actively written excellent research papers.

Finally, my special thanks go to Rector of UII, all the steering and organizing committees for making this conference possible. It is desired to have a sustainable conference to be held continually in future times, as we are challenged by daily minor and major disasters to make a well-being society.

Wassalamu'alaikum warrahmatullahi wabarakatuh

Yogyakarta, October 21, 2014

Faculty of Civil Engineering and Planning (FCEP)

Universitas Islam Indonesia

The Dean

Dr.-Ing. Widodo Brontowiyono.

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Welcome Speech

The Rector of Islamic University of Indonesia

Assalamu'alaikum Warahmatulahi Wabarakatuh

- The Honorable, Dean of Faculty of Civil Engineering and Planning Universitas Islam Indonesia, Dr.Ing. Widodo Brontowiyono,
- Director General of Spatial Planning, Ministry of Public Works, Indonesia, Dr. M. Basoeki Hadimoeljono,
- Director General of Agency for Research and Development, Ministry of Public Works, Indonesia, Ir. Waskito Pandu, MSc.,
- The Head of Research Institute for Human Settlement, Ministry of Public Works Indonesia, Prof. Dr. Ir. Anita Firmanti, MT.,
- Respectable all of the keynote speakers and participants,

Distinguished guests, ladies, and gentlemen,

On this special occasion, let us offer our praise and gratitude to Allah SWT for it is with His mercy and grace that we are able to attend the 3rd International Conference on Sustainable Built Environment (ICSBE) today.

On behalf of the university, we are honored and very pleased to have your visit today especially to the keynote speakers and all participants. It is also a pleasure for me to extend everyone a warm welcome to Universitas Islam Indonesia (UII), the oldest national university in the country.

Distinguished speakers, ladies, and gentlemen,

We are also honored to inform you that this program is jointly hosted by Faculty of Civil Engineering and Planning, UII and The Research Institute for Human Settlements, Agency of Research and Development Ministry of Public Work, Republic of Indonesia (PUSLITBANGKIM KEMEN PU RI). We hope that this activity will establish closer ties and cooperation between the two institutions in the future.

This 3rd International Conference on Sustainable Built Environment (ICSBE) is conducted under the topic 'Resilience and Risk Reduction towards Well-Being Society' in association with the 4th International Seminar on Tropical Eco-Settlement (ISTEcS) under the theme 'Bringing Coastal Cities into the Future: Challenges, Adaptation and Mitigation.

Distinguished guests, ladies, and gentlemen,

We are fully aware that the population growth in the last centuries grows rapidly. A growing population leads to several environmental issues as well as social problems. This means that a better setting of the settlement is very important to make a city become livable. Inspired by that notion, this conference in one hand is aimed to better understand how livability is perceived in the fast-growing cities.

In the other hand, this conference will provide the opportunity to government officials, researchers, academicians, industry practitioners, non-governmental and multinational organization staffs and other stakeholders to share their views and experiences to build

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international collaborative networks on managing sustainable coastal cities. Some important issues that will be presented on this seminar are about how to handle all the problem of the urban/rural environment, how to assess the risk of building and construction, infrastructure, politics management, and coastal cities. All that issues are intended to build a well-being society with a good reduction of risk and reliance.

Distinguished speakers, ladies, and gentlemen,

To conclude, once again I extend everyone my warm welcome to this conference. I hope that this conference will inspire us to enhance our awareness to explore any possibilities in building resilient society. Also, I look forward to fruitful discussions and hope we can be inspired by the best practices we will hear from our distinguished speakers.

I thank you.

Wassalamu'alaikum Warahmatullahi Wabarakatuh.

Yogyakarta, October 21, 2014

Rector

Dr. Ir. Harsoyo, M.Sc.

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ISTECS International Seminar on Tropical Eco Settlements

EFFECT OF DENSITY SOIL TO WATER RECHARGE (INFILTRATION) IN URBAN OVERLAND FLOW

Dian Noorvy KHAERUDIN[1]

ABSTRACT: Soil has different conditions depend on its formation in the past and their treatment in the period of running time. The process of the hydrological cycle is also influenced by soil conditions, namely the rain fall on the surface of the ground. Land has undergone many changes due to the treatment needs of human activity. The process of soil influence on the hydrological characteristics is the presence of drainage and water infiltration into the soil that affect the water balance in the soil and on the surface of the earth. This study aims to determine the effect of soil density on water infiltration (infiltration) of several types of land in urban areas. In this case, the transactions are carried out research on some soil types with different densities to obtain the effect of soil density on soil type influence on infiltration. According Halidin Primary Arfan & Abraham (2012), the value of infiltration will decrease if the slope of the land surface increases. Infiltration value will increase if the rainfall intensity increased. Infiltration value will decrease if the density of the soil increases. This study is based on the study of some of the research that has been done and the result thus obtained the novelty from literature review of studies that have been done. This study as a basis for determining the time of concentration on mathematical models of urban land drainage. That is the time of concentration in the timing of the concentration of urban drainage planning with environmental (eco drainage).

KEYWORDS: eco drainage, infiltration, soil density, soil type

1. INTRODUCTION

Discharge of water flowing in the earth is a modification rain that falls to the earth's surface into a discharge. The rain that falls to the earth's surface will be infiltrated into the ground and there were melimpas above ground level. Factors affecting runoff divided into two groups, namely the meteorological elements and physical properties of elements (characteristics) the drainage area (Sosrodarsono & Takeda, 1978: 135).

The influence of rainfall intensity on surface runoff is highly dependent on the rate of infiltration, surface runoff will occur in line with the increase in rainfall intensity, however, the increase in surface runoff is not always proportional to the increase in rainfall intensity due to flooding at ground level. Rainfall intensity effect on the discharge and runoff volume. The total runoff from a rain directly related to the duration of rainfall with a certain intensity.

Development of a city demands on the local infrastructure. The level of technological development of the city also is more advanced. Urban development carried out on land. Soil has different conditions depending on the formation of the past and their treatment in the period running time. The process of the hydrological cycle is also influenced by soil conditions, namely the rain fall on the ground. Land has undergone many changes as a result of the treatment activities of human needs. The process of soil influence on the hydrological characteristics is the presence of drainage and water infiltration into the soil that affect the balance of water in the soil and on the surface of the earth.

Treatment of land for building is related to the stability of the buildings built on the land. Soil conditions that affect the calculation of the structure of the building. The structure in question

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is from the foundation, floors, columns, up to the roof of the building. The purpose of compaction is to increase the strength of the soil and improve its carrying capacity, and reduce compressibilitas and soil permeability. Compaction will be implemented during the construction of a building. Changes compaction occurs when soil is compacted volume of air in the soil pores will be reduced, so that the soil becomes more dense, the shear strength and bearing capacity increases, as well as the compressibility of the soil.

The concept of environmentally sustainable drainage (eco-drainage) requires completion with sustainable systems approach. Constraints faced by a planner is the determination of the discharge plan. Determination of drainage discharge plan on the concept of environmentally sound also expected to collect rain water that falls to the ground, but can be managed and accommodated soak into the ground and continue the hydrological cycle.

2. LITERATURE REVIEW

Precipitation that falls in an area will flow on the surface of the ground as surface runoff or get into the soil layer. According Sosrodarsono, 1993 understanding of infiltration is the process of entry of rain water into the surface layer down to the surface of the soil and ground water or ground water.

According Asdak (2002), infiltration can be defined as the process of entry into the soil as a result of capillary forces (water movement laterally) and gravity (water movement in the vertical direction). After a state of saturation in the upper soil layer is exceeded, a portion of the water flowing into the deeper soil sebgai due to gravity and is known as the percolation process. Maximum rate of water movement into the soil is called infiltration capacity. Infiltration capacity occurs when the rainfall intensity exceeds the soil's ability to absorb moisture in the soil. Conversely, if the rainfall intensity is less than the infiltration capacity, the infiltration rate equal to the rate of rainfall.

Surface conditions, such as pore properties and low water levels, largely determines the amount of rain water that is infiltrated and the amount of runoff. Thus, a high infiltration rate not only increases the amount of water stored in the soil for plant growth, but also reduces flooding and erosion bersarnya activated by runoff. Blows rain beads on the surface of the open land destroys soil aggregates and disperse the resulting blockage of soil pores in the surface. This will decrease the rate of infiltration. The decline in the rate of infiltration can also occur due to overgrazing and soil compaction due to the use of heavy equipment (Judge, et al, 1986).

In the soil, the water was in the pore spaces between soil solids, if the ground water in the saturated state, the pore space occupied by water. In this state is called "maximum water storage capacity" ". Furthermore, if the soil is allowed to run into the drying partly filled with water. In this state the land said to be saturated (Islami and Wani, 1995).

According to (Indarto, 2010), infiltration is the movement of water down through the soil surface into the soil profile. Based on the conceptual model of hydrologic that rain will terinterprestasikan be discharge runoff and infiltration, the infiltration will affect the amount of rain that falls to the surface teralihragamkan urban land becomes runoff discharge.

Several factors affect the rate of infiltration is soil structure, soil density, intensity of rainfall, slope, roughness of the land. Events increased the dry weight of the load volume is called dynamic compaction. By a result of dynamic load, soil grains move closer to one another as a result of reduced air cavity. The purpose of compaction can be achieved by the selection of

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soil material stockpiles, compaction ways, the selection compactor machine, and the amount of the corresponding trajectory.

Quantitatively measured soil density of the dry weight of the volume of soil, which is heavy or dense granular soil oven dry weight divided by the overall volume of the soil (ie soil volume including the volume of solid grains and pore cavity). Total soil volume (V), in general, relatively fixed by changes in water content, except on expansive clay. If as a result of changes in soil water content of the total volume (V) fixed, while the dry weight of the soil grains (Ws) also does not change, then the value of the volume of dry weight (density) $\gamma_d = W_s/V$ konstant, although the water content changes.

3. METHODS OF RESEARCH

The study was conducted with the implementation of field observations by testing the soil structure, soil density, slope of the land at the same rainfall intensity. Observations infiltration by using a Tec Turf, soil density by using a Proctor. As for the statistical analysis using experimental design and is supported by the mapping of data fields. The loop consists of several types of soil (soil structure), the intensity of rain and some slope, as well as for the carrying out of the experiment is to treat the land, namely the density of mild, moderate and severe.

4. ANALYSIS AND RESULTS

The process of infiltration is the process of entry of rain water through the pores of the soil surface, tertampungnya the rainwater in the soil, and the process flow of water to another place (bottom, sides and top), though not interconnected but these three processes are interrelated (Asdak , 2002).

In the process of rain falling on the ground sparks of water, the strength of the volume of water, is able to compress the soil surface to the water sparks close the pores of the soil. Closing of the pores of the soil will affect the rate of infiltration. Treatment of soil compaction on soil structure will affect some degree of infiltration. This was stated by (Halidin Arfan, December 2012), that there is the influence of density, rainfall intensity and slope of the land to the value of the recharge (infiltration). From the experimental results in the laboratory is that the recharge value is proportional to the intensity of rainfall, the infiltration will be more in line with the rainfall. However, the value of the recharge will go down along with the dense soil, and infiltration will increase at a decreasing slope.

Soil density caused by the presence of dynamic load that occurs in the soil. Dynamic loads that can occur because there is a process of natural and man-made processes. Soil density that occurs due to natural processes usually occur on land that is not utilized as a land use. And compacting process occurs naturally due to the sparks rain, the presence of motion of the earth, natural compaction of the soil due to the closure of the ground grains carried by wind and rain, and can also occur due to the natural movement of the lifting and shifting crop soil structure to pores of the soil cover each other. While the process is made by humans is due to the utilization or land use. Ground that there would be enabled to human needs. Like many urban areas in the land, the land use or land into residential use, high rise buildings and other urban facilities (shop, mall, college, etc.).

Density of land in urban areas will reduce the ability of land to absorb rainwater. The concept of environmentally sustainable urban drainage (drainage eco) functioning of urban areas to be able to manage the rainwater that falls to be back on the ground and in the ground then

flows expected to be a backup groundwater or seep back into the ground and flows back into the river as the flow base (base flow).

Infiltration rate is also influenced by soil structure. The structure of land for building urban infrastructure by assessing the size of the known density of the soil. Construction of a building to make certain the soil density to support the soil bearing capacity. The density of the soil to absorb water from the rain water is the density of the soil that occurs at ground level on urban land.

According to (Sucipto, 2007), a higher density of soil erosion, the land will be greater until at a certain optimum point then erosion will be reduced. This means that the higher the density of the soil of the land, the infiltration that occurs will be smaller. Then according Sucipto 2007, the intensity of 80mm / h erosion that occurs in soil test greater than the intensity of 60mm / h. This is due to the higher intensity of rainfall, the soil will receive more rain falling so that the erosion is also getting bigger. It also means that the greater the intensity of the rainfall will increase the infiltration rate.

Based on the above statement about the growing influence of the growing intensity of rain and an average slope of land against the infiltration rate, the effect of soil density on infiltration (infiltration) will have a decrease and an increase of the value of infiltration rate different from the rainfall intensity and slope of the land is different-also vary. Because of the ability of the land to be affected by soil structure have treated soil density, respectively. So the value of the ability of the infiltration rate will vary on soil structure and soil bulk density. So the infiltration rate when performed on soil structure and soil density mild, moderate, and severe with rainfall intensity and slope of the land will have the same value infiltration different. That is the solid ground, then the value of the lower infiltration rate. And when some observations on the land with rain intensity enlarged and reduced slope, then the infiltration rate should be greater, but in this case there is the effect of soil density and soil structure. So that changes depending on the influence of soil factors.

Change the basic shape of ground can be caused by strength or carrying capacity. Change the basic shape of ground will soon change as the carrying capacity is low (ground easily collapse), development, shrinkage and densification and consolidation of subgrade soil under subgrade. These things depend on the type of soil, dry bulk density and water content (soil density). This soil is very important role in the planning or execution of the building because the land serves to support the existing load on it.

If the urban infrastructure and has an average density is the density of the soil is the carrying capacity of land for building houses, shops and buildings, for example, the ability of urban land would also be possible to have the average being. But if the soil bearing capacity of the soil density is high, the ability to infiltrate urban land will be low.

This connection the influence of soil density on infiltration is to design the concept of environmentally sound urban drainage (drainage eco). In this case, if high density, the ability to infiltrate the soil is low then the dimension of the analysis is as follows:

$$[V] = \frac{[S]}{[t]} = \frac{[L]}{[t]} \quad (1)$$

$$[t] = \frac{[V]}{[L]} \quad (2)$$

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With :

$[L] = [S]$ = dimensions of length, units of meters (m) which is the path length of the flow of water that infiltrated into the soil

$[V]$ = dimensional velocity, unit m / s, m / h, length / time, the infiltration rate.

$[t]$ = dimensions of time.

Low level of infiltration rate due to the influence of high soil density, but the time taken will be long. The concept of the infiltration rate can be expressed in mm / h. In a state of constant inifltrasi rate it will reach the minimum conditions or critical time. With this in mind, the time derivative of the concentration will be obtained from the kinematic wave equation that occurs in the relationship between speed, flow length, and time. Where is the critical time can be a time when the concentration reaches a constant infiltration rate. And there is a concentration that can become a reference in planning the design of the building environmentally sound urban drainage.

Planning for drainage in a city, there are many who use the conventional concept because the land is still widely available, climate change and human demands will influence land use change is still balanced (Noorvy, 2013). But now, the ratio of the population birth and death of a large population, and demand for housing needs, facilities, infrastructures population is increasing, so the conventional concept is no longer possible to accommodate excess water. Excess water is discharged into water bodies already have a condition that does not allow longer covered by water with slope engineering made. This is due to changes in environmental conditions include changes in land use, climate change, environmental policy changes, and changes in lifestyle of the people so that the carrying capacity of the environment are already experiencing criticality.

Under the deal the world, saving the environment which includes the soil, water and air began in earnest. It is also beginning to be applied in the cities, such as Surabaya and surrounding areas who have applied the concept of environmentally sustainable drainage.

Based on research (Yoon, 2009) states that one way to determine the time of concentration for the design of hydraulic structures is the observation in the field and finishing with the relationship between rainfall and runoff discharge (hydrograph). Hydrograph method is by using the concept of IUH (Instanoneus unit hydrograph) or with the concept of Model Clark and Nash models. These concepts becomes easier when faced with the constraints of availability of secondary data available, especially in Indonesia, which is still in the stage of completion of hydrological data collection system. Then Will, 1986, stating that the time of concentration can be done with basic physical method using the concept of the balance of water flow (kinematic wave). The concept of this study combines the concepts of Green Ampt infiltration models on the concept of balance of water flow (kinematic wave). Effect of infiltration is assumed to be the only loss of the rainwater that falls to the ground. Concentration time models that have been developed by Chen, 2002, with a combination of a concentration of kinematic wave equation with Darcy Weisbach equation. Chen stated that the temperature and viscosity affect the flow time of concentration, ie with the flow is laminar, turbulent using the Reynolds number. Furthermore, studies of Tommy, in 2005, to develop research in the study of Chen before but this Tommy, rain intensity factors included in the equation of time of concentration. In 2008 by Ming-Han Li and Pamaiit Chibber in his research stated that the time of concentration is affected by rainfall, soil conditions, and land cover. The equation is made has included the effect of soil moisture and land cover through n (Manning coefficient value), slope and rainfall intensity. Based on the analysis of the

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research that has been done, then factor that into the variable soil conditions in the equation does not include the condition of the soil density.

The influence of density of soil, slope and rainfall intensity to infiltration has been done, but not until the influence of the time of concentration. The resulting concentration time on urban drainage land in Indonesia is still not represented by existing equations from previous studies. Its application is made for planning the design of environmentally sustainable urban drainage.

This study aims to create a model of concentration by combining the concept of balance of water flow in the area with the concept of water loss due to infiltration. The concept of infiltration that is made separately using the influence inifltrasi rate for soil treatment. Soil treatment in this case is the density of the soil that is linked in the use of land as land use that design to avoid inundation occurs is through planning environmentally sustainable urban drainage.

Infiltration rate is also influenced by the physical condition of land that make up the type of soil, such as void ratio, soil porosity, water content, and degree of saturation. Furthermore, according to research (Pratt, 2012) that the infiltration in addition affected the physical condition of the soil, is also influenced by rainfall intensity and average slope of the land. Thus, in this study, there needs to be an adjustment and modification time of concentration to overcome drainage plan design with environmentally friendly concept that is by adjusting the conditions in the field. The adjustment is the physical condition of the soil-forming soil types with treatments that affect the density of the soil infiltration rate, which is then applied in a mathematical equation concentration time.

5. CONCLUTION

a. The concept of environmentally sound drainage has an important role to improve the urban hydrology. Urban in Indonesia is advancing along with the increasing number of urban population is also growing lifestyle and needs of the population.

b. Rainwater that falls on the surface of urban land management time to be back so that the rain water that falls can be reused directly or indirectly.

c. With the needs of the population will be in line with the needs of facilities, and infrastructure, it is also associated with land use that requires a strong capacity of the soil. Carrying capacity is strongly associated with the Traffic ground to soil density. The density of the soil will affect the design concept of environmentally sound drainage.

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