

ISBN 978-979-19795-4-2



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Bogor Agricultural University

# PROCEEDING

*The International Symposium of*



## “THE FUTURE CHALLENGE”

AUGUST 10-11, 2009

CONVENTION CENTER, BOGOR, INDONESIA



## EDITORIAL

**Proceeding of The International Symposium of Green City** is concerned with conceptual, scientific, and design approaches toward urban sustainability. The papers were presented on The International Symposium of Green City, August 10-11<sup>th</sup> 2009, held by Dept of Landscape Architecture Department at IPB Bogor, Indonesia. It emphasizes ecological understanding and a multi-disciplinary approach to analysis, planning and design of urban area. The paper also attempts to draw attention to ecological processes interacting within urban areas, and between these areas and the surrounding natural systems with specific problems such as social and cultural approaches to urban landscape issues.

**Proceeding** consists of papers dealing with Green City, Eco-City and Sustainable City; Green Infrastructure and Green Architecture; and Urban Rural Linkage. The topics might include but are not limited to landscape ecology, landscape planning and landscape design. Landscape ecology examines how heterogeneous combinations of ecosystems are structured, how they function and how they change. Landscape planning examines the various ways humans structure their land use changes. Landscape design involves the physical strategies and forms by which land use change is actually directed. The papers is based on the premise that research linked to practice will ultimately improve the urban landscape.

We wish this proceeding to be a useful for increasing our understanding toward urban sustainability and we also sincerely thank for sponsors, steering committee, organizing committee and paper contributors.

Bogor, November 2009

**EDITOR**

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## Opening Address

### International Symposium of Green City "The Future Challenge"

Assalamu'alaikum Warahmatullahi Wabarakatuh

Good Morning, Ladies and Gentlemen. First of all, please allow me on behalf of Bogor Agricultural University or IPB to welcome you all to IPB Campus. It is an honour for IPB to be a host of this very important event to discuss the future challenge of green city. I thank you very much, especially for the keynote speaker, the honorable Minister of Public Eork Republic of Indonesia visit to IPB campus to day. This visit is very important for IPB; because IPB has a long history in environment and agricultural studies related to public works. I thank you very much for invited speakers and participants from Indonesia and overseas to share their research progress related to green city in this symposium. This symposium is an initial meeting to develop understanding the context of problem sollution to address the future of green city. However, I am sure that this symposium will conclude very valuable results.

Dear Participants, Distinguished Guests,

Since December 2000, IPB has become an autonomous university. As a legal entity, IPB has been more independent in term of academic program, as well as resource management. IPB is the only state university in Indonesia that is focusing on tropical agriculture and bio-science as its core competence. Internationally, IPB is well recognized. IPB has been in a long standing cooperation with national as well as international institutions. IPB has nine faculties, one Postgraduate School, and one Vocational School. IPB has 36 departments and 16 research centers. Student body of IPB is around 25,000 students, 15,000 of which undergraduate students, 5,000 graduate students and the rest are vocational school students. IPB has 133 professors, IPB is capable of offering innovative programs including activities on green city research and development. There are some opportunities to develop research collaboration between IPB and national/overseas Universities, as well as other institutions, like Sentul City, Sampoerna Group on green city research and development.

Dear Participants, Distinguished Guests,

This symposium is aimed to be an exchange information event on research results related to green city and the implementation of green city concept in several housing area such as Sentul City. As we know that Sentul City introduce a new cluster with green building and green wall as a part of green infrastructure concept. The collaboration project between IPB and Sentul City was just signed by two parties on last month to show that IPB is very concerned to develop an integrated spatial plan for green city.

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Dear Participants, Distinguished Guests,

Through this symposium we do hope that the green city concept could be widely adopted by the government and the housing developer to prevent and even to increase green space in urban area. I thank you very much for all the participants and wish you a very succesful symposium. Finally, I hope this symposium will be very fruitfull and be a significant step in realizing green city concept. Thank you very much for your attention.

Wassalamualaikum Warahmatullahi Wabarakatuh

Bogor, August 10<sup>th</sup>, 2009

Rector,

Prof. Dr. Ir. Herry Suhardiyanto, MSc.

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## Welcoming Speech Dean of Faculty of Agriculture

Ladies and gentlemen,

First of all we would like to express our gratefulness to Allah for all the blessings we have received. It is our pleasure to welcome you all to this global awareness symposium. Will our city be chaos or controlled? We believe our city should be controlled. Our future city should be a green city, eco-city, and sustainable city. We invite our colleagues representing academicians, professionals, government and community members to give enhancement and to share their experiences on three sub themes of our discussion i.e. (1) green city, eco-city and sustainable city (2) green infrastructure and green architecture; and (3) urban-rural linkage. Therefore we would like to thank to Prof Yoritaka Tashiro from Chiba University; Diane Wildsmith, MSc Arch Visiting Assistant Professor of University of Indonesia, Prof Joeri Rekittke Director of MLA Program, National University of Singapore; Deni Ruchiyat from Ministry of Public Work; invited speakers and practitioners and developers who had pioneered local and community based sustainable development and management in the city.

Our landscape architecture competencies, originating from horticultural and environmental sciences that later will be developing into green and aesthetic spatial engineering competencies that will inspire our colleagues from Department of Landscape Architecture to develop concept of green city. We believe such competencies will be complementary and needed in our complex future.

I intend my address on how city as a living and dynamic entity, should be developed in sustainable ways. As an analogy to a biological organism, a metabolic process in which material is consumed and transformed, complex growth and development occurs in a city. Therefore as generically outlined by Sarosa (2004) green city development and management is subject and in respect of (1) intergeneration orientation, (2) spatial dynamic (3) socio-economic viability, (4) political and policy power and arena, (5) interspecies interaction, and (6) intermedium transformation. Moreover, benefits of such development and management for its inhabitants not only socio-economic and environmental benefits, but also cultural vibrancy in which the community inclusively participates. Starting by this symposium we invite you all to engage in efforts of "green" enhancement in respect to Lynch's (1980) fundamental criteria: (1) vitality of the infrastructure and function; (2) sense of place; (3) fit or sense of competence; (4) competence; (5) control; and (6) meta criteria (equality, justice) to create a better livable city.

Have a success symposium. Thank you.

**Prof. Dr. Ir. Didy Sopandie, M. Agr.**  
Dean of Faculty of Agriculture  
Bogor Agricultural University

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## Welcoming Speech

### Head of Landscape Architecture Department

Distinguished Ladies and Gentlemen, all participants of Green City International Symposium,

The rapidly growing world population is exerting great pressure on the land, waters, and energy resources that are essential to productive tropical agriculture-rural communities and its bio-resources. By 2030, more than 60 percent of the world population will live in cities, up from almost half now and just a third in 1950. The growth poses huge problems ranging from clean water supplies to trash collection. Already, one of every three urban dwellers lives in a slum in the present time. Let us create green cities. Adding the United Nation goal of halving poverty by 2015 would not be met unless city planning was less haphazard.

Green city (*kota hijau*) is a term used for sustainable city or ecological city. Activists mark June 5, the date of the first environmental summit in Stockholm in 1972, as the UN World Environment Day. The 2005 theme is Greener planning for cities, many of them hit by air pollution, fouled rivers and poor sanitation. In San Fransisco, the main host of the 2005 event, mayors from more than 50 cities including Shanghai, Kabul, Buenos Aires, Sydney, Phnom Penh, Jakarta, Rome and Istanbul planned to sign up for a scheme setting new green standards for cities. Cities would be ranked from zero to four stars according to compliance with a set of 21 targets. And around the world, from Australia to Zimbabwe, activists staged rallies, cleaned up litter, organized poetry competitions or planted trees.

Green City is related to Urban Enviromental Management and ISO 14001 at the level of a City. The development and implementation of the EMS at the level of a city is a complex task involving a myriad range of tasks and actors. UNEP's International Environmental Technology Centre recommends three steps in extrapolating the ISO 14001 to the level of city:

- **Step 1 (Promotion of Eco-office):** Reduction of energy use; Reduction of water use; Reduction of solid wastes; Promotion of recycling; Green Procurement;
- **Step 2 (Promotion of Eco-Project):** Using e-friendly materials; Using e-friendly equipment; Accelerate use of recycled materials; Green public engineering works; Develop green technology; Promote greening
- **Step 3 (Green City Planning):** Set green guidelines for public works; Set green guidelines for housing; Enhance public transportation; Capacity building; Apply EMS to the whole city

Through the Green City International Symposium that is being conducted in IPB International Convention Center (IICC), Bogor, Indonesia on 10-11 August 2009, we wish all the stake-holders from academic institution, professionals, companies, government, and communities can sit together to have excursion in the second day in the objects of Sentul City, Puncak Highland, Taman Bunga Nusantara, and Kota Bunga.

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After the symposium, you could enjoy Bogor City and its vicinity by yourself. We suggest to visit Bogor Botanical Garden, Ethno-botany Museum, Zoology Museum, culinary tour, etc.

Finally, welcome to Bogor and have a good and fruitful time attending this symposium.

**Prof. Dr. Ir. Hadi Susilo Arifin, MS**  
Head of Landscape Architecture Department  
Faculty of Agriculture-IPB

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## Welcoming Speech

### Chairperson of Organizing Committee

Assalamu'Alaikum Warahmatullahi Wabarakatuh

Good Morning, Ladies and Gentlemen.

First of all, welcome to distinguished guest Rector IPB, Keynote Speaker, Dean Faculty of Agriculture and other Faculties, Invited Speakers, Head of Department Landscape Architecture and other Departments, and all participants in this Symposium of Green City organized by Department Landscape Architecture, IPB. It is a great honor for me to explain a brief report about these two days symposium with the theme.

Dear Participants, Distinguished Guests,

As we all know the loss of urban green space became a trend of urban development in all over the world. However, global warming, high pollution, flooding, etc. have become hot issues recently in big cities, including in Indonesia. We need to give our energy to revitalize the existence of urban green space to reduce these problems. Urban green space strongly plays an important role to improve ecological sustainability of urban landscape, beside increase the aesthetics of the city.

The new Spatial Planning Act 26/2007 gives us a bright future for urban sustainability commitment. One of the important provisions of the Spatial Planning Law 26/2007 is the requirement of at least 30% of urban areas for open spaces. The open spaces can be public and private open spaces. More specifically, public open spaces account for at least 20% urban areas. In addition, this law stipulates that forest areas must be accounted for at least 30% of river stream areas. Such provisions were not included in the previous spatial planning law.

Dear Participants, Distinguished Guests,

With these all in mind, we selected "The Future Challenge of Greencity" to become a theme of this symposium. The symposium will be held on two days. On first day, we will learn deeply about greencity concept from honorable invited speakers, and experience learning from private sectors in the morning; and after lunch time we will share our research progress related to green city which is divided into 3 parallel sessions: Green city, Eco-city and Sustainable city; Green Infrastructure; and Green Architecture and Urban-Rural linkages. For these parallel sessions, we grateful all to 30 oral presenters and 9 poster presenters. It is great honor for us as an academic society to share our research experience through this Symposium.

On second day, we will hold a field excursion. We will visit Sentul City, the beautiful satellite city within Jabotabek area with excellent MURI awards of 2009 for their streetscape design, and Kota Bunga Nusantara, one of well designed flowers city in Puncak Area. Through this field excursion, we do hope that we could learn how to realize a greencity not only based on theory based but also from real practice.







Dear Participants, Distinguished Guests,

Finally, we do hope that this symposium become a valuable time for our learning process to reach our dream: "Greencity". Many thanks to head of Landscape Architect Department, Steering Committee, and Organizing Committee, without you all, we could not hold a big event. Also highly appreciation for all studentd, with their big effort to spend the time and energy for symposium preparation.

On behalf of organizing committee, we kindly ask your apology for some any weaknesses during these two days event and symposium preparation.

I do hope that ALLAH SWT bless all of us

Thank You

Wasalamualaikum Warahmatullahi Wabarakatuh

**Dr. Ir. Alinda F.M Zain, MSi.**  
Chairperson of Organizing Committee

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## EDITORIAL

ii

## OPENING ADDRESS

iii

## WELCOMING SPEECH

Dean of Faculty of agriculture (Prof. Dr. Didy Sopandie)

v

Head of Landscape Architecture Department (Prof. Dr. Ir. Hadi Susilo Arifin)

vi

Chairperson of Organizing Committee (Dr. Alinda F.M Zain)

viii

## CONTENTS

x

## KEYNOTE SPEECH

Green Cities: Challenges Towards Sustainable Urban Development  
(Djoko Kirmanto: Minister of Public Works of Republik Indonesia)

1

## PLENARY SESSION: "The Future Challenge"

5

Green Cities, Eco-Architecture  
(Diane Wildsmith, MSc.Arch (Visiting Assistant Professor Dept Architecture, University of Indonesia - Commissioner PT IDC)

7

Green Networking As An Appropriate Urban Greening Method To The Green City  
Prof. Dr. Yoritaka Tashiro (Chiba University - Japan)

19

From Green City to Urban Jungle  
Prof. Dr. Joerg Rekittke (Director of MLA Program, National University of Singapore)

20

Green Cities Policy in Indonesia  
Dr. Denny Ruchyat, M.Eng (Directorate General of Spatial Planning, Ministry of Public Works)

28

## PLENARY SESSION : "Experience Learning"

29

The Largest Street Garden  
Andrian Budi Utama (Director of PT Sentul City, Tbk)

31

Community Based Participation Towards Green City: Practice Learning from "Kotaku Hijau" (Green City) Competition  
Prof. Dr. Hadi Susilo Arifin (Head of Department of Landscape Architecture)

33



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## PARALLEL SESSIONS: Green city, Eco-city and Sustainable City

	41
Eco-city Development, A Challenge for Tomorrow ( <i>Ning Purnomo Hadi</i> )	43
The Role of System Dynamic in Future City Landscape Development Planning ( <i>Aris Munandar, AC Achsan, Setia Hadi, Alinda F. M. Zain</i> ) ✓	57
Historical Public Open Space Analysis in The Old City Revitalization ( <i>Euis Puspita Dewi, Nurhayati H.S. Arifin, Aris Munandar</i> )	65
Urban Greenways Assesment: Providing Suitable Space for Wildlife (Lesson from City of Onkaparinga, South australia) ( <i>Cynthia Wuisang</i> )	76
Towards Green City Through Green Architecture Movement ( <i>Budi Faisal, Putrikinasih, Ria Asyurani</i> )	91
Eco City and Urban Sustainability ( <i>Quintarina Uniaty</i> )	119
Eco-Architectural and Eco-Landscape Management Concepts for Repararian landscape in Lebak Kantin, Sempur-Bogor ( <i>Ni Wayan Febriana, Setia Hadi</i> )	132
Environmental Strategy as an action plan toward sustainable city (or ecocity) ( <i>Nana Fitriana Firman</i> )	137
Internalizing Water Literacy Among Students in Semarang Through Participatory Film-making A Lay Person Approach ( <i>Dwi Prabowo, Rahmad Djati Winarno, Tjahjono Rahardjo</i> )	142
Internalizing Water Literacy Among Students in Semarang Through Participatory Film-making Water Sustainability Aspects ( <i>Vina Oktiviani, Wiyanto Hadipuro, Budi Widianarko</i> )	147
Internalizing Water Literacy Among Students in Semarang Through Participatory Film-making Water Access Aspects ( <i>Juwanto, Tjahjono Rahardjo, Budi Widianarko</i> )	152
<b>PARALLEL SESSION: Green Infrastructure and Green Architecture</b>	157
The Changing Roles of Public Spaces in Malaysia ( <i>Nor Zalina Harun, Ismail Said, Hamidah Ahmad</i> )	159
Green Architecture in Indonesia: Challenging for Practitioners, Regulations and Local Governments ( <i>M. Syarif Hidayat</i> )	170
The Trees Diversity of Roadside Greenbelt in Jakarta ( <i>Nizar Nasrullah, Chatarine Suryowati</i> )	174
Study of Development Model for Settlement Improvement and Urban Infrastructure at Kali Banger Project in Semarang City ( <i>Budi Susetyo</i> )	186
Ornamental Shrubs Palettes on Streetscape Greening and Their Potency As Bioindicator of Surabaya City Air Quality ( <i>Pangesti Nugrahani</i> )	193
Modelling of temperature, pressure, air flow distribution on Eco-house's inner room using Computational Fluid Dynamic (CFD, Flovent V7.2.) ( <i>Sri Mudiastuti, A. Indra S., Kudang B.S., H. Armansyah T., Suryono S.</i> )	199
Trees Reserve Estimation of City Greenery Open Spaces (GOS) in East	209

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Jakarta Municipality Using Landsat Imagery (*Bambang Sulistyantara, Nizar Nasrullah, Isdiyantor*)

Landscape Structure Analysis to Develop Green Infrastructure Network in Depok City (*F.X. Herwirawan, Alinda F.M. Zain, Dwi Putro Tejo Baskoro*) 216

**PARALLEL SESSION: Urban-Rural linkages (Ecological Network) 217**

Adoption Patterns of Communal Waste Water Treatment Facilities in Kricak Kidul and Sukunan Neighborhoods, Jogjakarta (*Juliana Luminto, Tjahjono Rahardjo, Budi Widianarko*) 219

Industrial Areas Management Strategy Towards Eco-Industrial Park (Study Case : Industrial Areas in Cilegon, Banten Province (*Fatah Sulaiman, Asep Saefuddin, Rizal Syarif, Alinda FM Zain*) 220

The Typology of Real Estat Physical Boundary at Jakarta Periphery (*Tin Budi Utami*) 228

Urban Ecotourism Development Planning Area at Ciliwung Corridor (*Dini Rosmalia, Siti Nurisjah*) 238

Environmental Management System (EMS) in An Eco-living Community (Case Study: Jambangan Kampong, City of Surabaya) (*Mayrianti Annisa Anwar, Aris Munandar, Asep Saefuddin*) 247

Ecological Legal Aspects for Sustainable Riparian Landscape Management in Sempur Area, Bogor City, Indonesia (*Yuni Prihayati, Hadi Susilo Arifin*) 254

Landscape Planning Base on Bioregion Approach (Case Study: Ciliwung Settlement Corridor) (*Arin Ningsih Setiawan, Qodarian Pramukanto*) 259

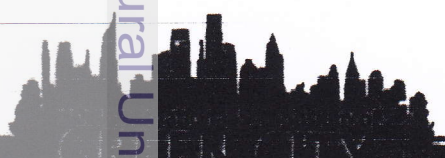
Payment for Environmental Services (PES) Scheme Implementation in Upstream and Downstream Areas as an Alternative for Sustainable Ecological Network (*Christine Wulandari, Hadi Susilo Arifin, Qodarian Pramukanto, Kaswanto, Hermayani Putra*) 272

Dynamic Model for Settlement Area Managementin The Upper Stream of Ciliwung Watershed, Bogor District, Indonesia (*Indarti Komala Dewi, Surjono Hadi Sutjahjo, Kholil, Hadi Susilo Arifin*) 281

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
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24  
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84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100

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## POSTER PRESENTATION

	289
Dealing With Climate Change Disaster With Green and Low-Cost Innovations (Ariya Aruninta)	291
Evaluation of Healthy and Environmentally Sound Housing in The Upper Stream of Ciliwung Watershed, West Java (Dwi ariyanti, Hadi Susilo Arifin, Nurhayati.HS.Arifin, Aris Munandar)	306
The Study of The Comfortness Aspect at Pedestrian Space in Order to Increase The Use Effectiveness on M.H. Thamrin-Jend. Sudirman Street Jakarta (Mimi Rahmiati)	314
Greenery Open Space as Ecological Features of The City (Imawan Wahyu Hidayat)	322
Influence of Surface Material and Trees Density on Thermal Environment and Comfort for Pedestrian in Tropical and Humid Climate (Sangkertadi, Cynthia V Wuisang, Reny Syafriny)	327
Building the Tree Inventory Application for the city of East Jakarta (Bambang Sulistyantara, Imawan, Nasirudin, Hendrawan)	342

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# Developing Rural Settlements in Upper Stream of Ciliwung Watershed to Support the Environment Sustainability in Down Stream of Jakarta City

Dwi Aryanti<sup>1</sup>, Hadi Susilo Arifin<sup>2</sup>, Nurhayati.HS.Arifin<sup>2</sup>, Aris Munandar<sup>2</sup>

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## ABSTRACT

This research was held in the upper-stream of Ciliwung Watershed on March- September 2007. The research site was divided into 3 zones, i.e. the upper-part, the middle-part and the lower-part with village sample in Tugu Utara, Cilember, and Katulampa, respectively. The objectives of research were (1) to evaluate land suitability for housing, (2) to analyze housing condition, (3) to analyze community behavior in environmental management, and (4) to draft recommendation for the development of environmental friendly housing. Land evaluation for housing was performed using the spatial analysis method by GIS. Some land characteristics of slope steepness, erosion hazard and existing land utilization were used as evaluation attributes. It's indicated very suitable class (S-1) 51 ha (3.8% the upper-part), 28 ha (9.4% the middle-part), and 183.3 ha (61.2% the lower-part). Those S-1 areas are lower than the existing housing area (2003), except in the lower-part. Housing characteristic in the upper-part and the middle-part are almost similar, i.e. informal, small to medium size, dense, and linear. In the lower-part was indicated there are two types (formal and informal), large size, dense, and linear. Community waste management behavior in the upper-part and the middle-part are similar. They used public toilet without septic tank; domestic garbage was through out into river directly; drinking water source from spring. Most the lower-part community used private toilet; garbage is managed by public work agency; and water source from PDAM.

**Keywords:** building density, housing size, housing type, community behavior, watershed

## 1. INTRODUCTION

The upper-stream of Ciliwung Watershed is a conservation area and protected Forrest that needs to keep its conservation in biophysics and ecology (Direktorat Penataan Ruang Wilayah Tengah, 2003; Syartinilia, 2004). This area has been changing of land use, from protected forrest and farm land to be a housing land. According UU PP No.4/1992 housing is a part of live environment outside protection area, even as city area or village that has function as living place or settlement environment and priliving activities. Housing is a house group that has a function as a resident completed with facilities and infrastructures.

Changing of land use occurred as population growth in Bogor during 1980-2003 achieving 2.04%/year and request more land for housing. Housing width on upper course of Ciliwung DAS in 1981 is 255,25 ha (Irianto, 2000) increasing to be 1,336 ha in 2002 (Maryanto dan Ubaidah, 2004). The increasing of total population together with housing land increasing in reality give impact to the decreasing quality of environment. To solve the problem needs exact management to create harmony of nature and artificial element. The purpose of this research is 1) Compatible land housing evaluation, 2) Housing conditional analysis, 3) Community behaviour analysis in managing the environment, and 4) Healthy housing development recommendation composition with environmentally sound. This result can be an input for house developer and community in planning to develop housing land,

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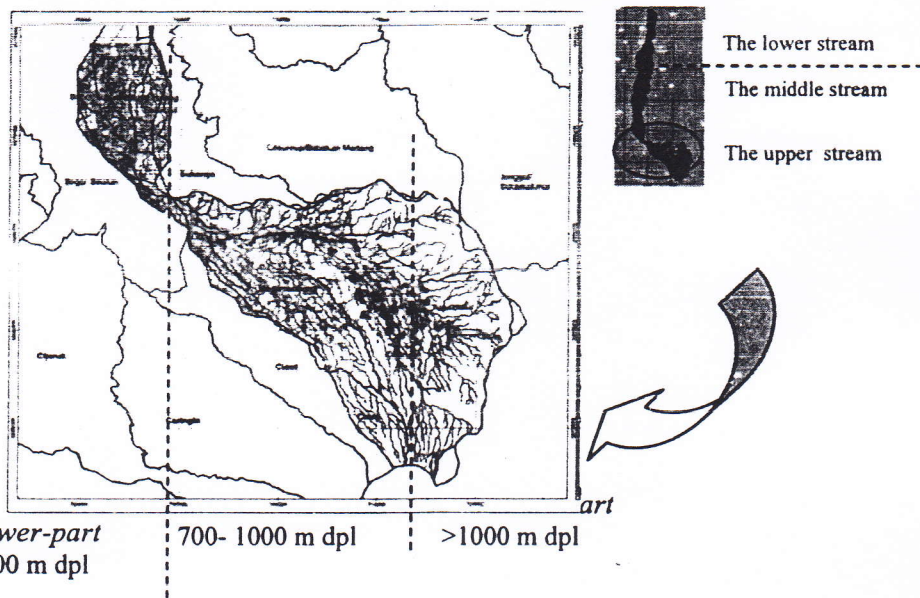
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also input for local government of Kabupaten Bogor and Kota Bogor, also input for community in managing environment in upper course Ciliwung DAS area.

## 2. METHOD OF RESEARCH

### a. Time and Place

The study area was located in the upper-stream of Ciliwung Watershed. The study had been conducted from March 2007 to September 2007, in housing area of upper stream of Ciliwung Watershed with 300 mdpl - >1000 mdpl height (Picture 1). The evaluation of housing condition was held in 3 zones, i.e. the upper-part is on  $\pm > 1000$  m dpl height, the middle-part and the lower-part with village sample in Tugu Utara, Cilember is on  $\pm 700$  m dpl height, and Katulampa is on  $\pm 300$  mdpl height



Picture 1. Research location on The upper-stream of Ciliwung Watershed

This research area is connected with umbrella research about landscape Watershed in skema Hibah Penelitian Tim Pasca Sarjana periode 2006-2008 with title Harmonisasi Pembangunan Pertanian Berbasis DAS Pada Lanskap Desa-Kota Kawasan Bogor-Puncak-Cianjur (Bopunjur).

### b. Material and tools

Material that been used is consists of Indonesian map from BAKOSUTRANAL lembar Cisarua, Ciawi and scale 1:25.000, slide map of Kabupaten Bogor BP.DAS year 2006, rainfall map year 2004, slope map PPLH IPB 2004, and citra landsat year 2004 PPLH IPB. Tools such as Scanner, Acr View versi 3.3, GPS, Digital camera, roll meter, qestioner dan pencil.

### c. Method

This research was done in three phases, they are pre survey, data/survey collecting and processing.

**Pre Survey.** Focused on book research, map delineation and determine sample location by considering typical topography and different social economy condition, sample amount in each location is 30 houses with total 90 houses and family members.

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**Data collecting** Spatial data collecting is taken from BAKOSURTANAL, BAPPEDA, PPLH IPB, BP DAS, Dinas Cipta Karya, Kantor Pemda tingkat Kecamatan dan Desa, Biro Pusat Statistik and direct survey. Field observation such as data : house size, building density and house type. The data is received through field survey and interviews. Population data, village monographic and Bogor district and city are taken from related source.

**Data processing.**

**House land compatible evaluation** viewed from biophysics aspects which are declivity, slide danger and land use (Table 1). This evaluation is for the best land use for housing land. In determining the compatible land by spatial analysis geographic information system (SIG) with overlay tehnic to each layer for every compatible land. Compatible land classification was done in one step quality, based on suitable land for house land use, by comparing each map quality with applied conditional land use. Evaluation of compatible land phase consist of 1) determine condition (parameter and criteria), 2) Devide land class and its value, which is Very Suitable (S1), Suitable Enough (S2), Marginal Suitable (S3) and Not Suitable (tidak sesuai), 3) comparing land value with each class land value, and 4) compatible class land mapping (Hardjowigeno 2007).

**Housing condition analysis** consists of population data (total population and total paterfamilias), housing construction (type of construction, room elements, width and material), house size measured based on total houses and/or total population, the density is based on total of houses width by the track width and the type is based on structural building composition. (Zee, 1986).

Table 1. **House land compatible classification**

Land charatheristic	Land quality for land compatible class			
	S1	S2	S3	N
Slope	<10%	10-15%	15-20%	>20%
Slide	Normal	Potential	Danger	Very danger
Land use	Houses	shrub, grass	Field, farm, plantation	Water source, forest

Source: Zee (1990); Hardjowigeno (2001);Kelarestaghi (2003); Sani (2006).

**Community behaviour analysing** is considered on how they manage the environment such as liquid and solid waste, garbage and water resources, then will be compared with Kepmenkes No.829/Menkes SK/VII/1999 standard and Permenkes 907 year 2002, Dept.PU for house quality standard and healthy housing.

**Recommendation**, based on evaluation land compatible result, house condition and community behaviour in managing the environment, arranged in criteria and common recommendation in developing housing on upper course of Ciliwung DAS.

**3. RESULT AND DISCUSSION (House Land Compatible Evaluation)**

The evaluated area of the upper-stream of Ciliwung Watershed course covers three areas, they are the upper-part (Desa Tugu Utara) with 1339,4 ha width, middle-part (Desa Cilember) with 296,7 ha width and lower-part s (Kelurahan Katulampa) with 299,7 ha width. Based on overlay result, house land use, compatible land evaluation of declivity, slide danger and land use, in table 2 shown that compatible land for housing on upper-part is dominated by not suitable compatible land class (N) with 548,5 ha width (41%). Middle-part is dominated by suitable marginal compatible land (S3) with 216,8 ha width (73,1%), then lower-part is dominated by very suitable compatible land (S1) with 183,3 ha width (61,2%), see Picture 1.



Table 2. Width and percentage of compatible housing land at research location

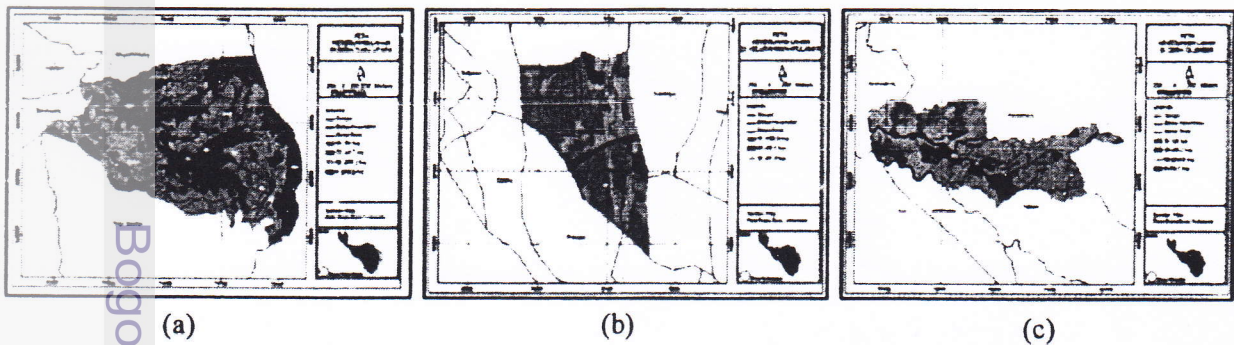
The upper-stream of Ciliwung Watershed	Compatible Land							
	Very suitable		Suitable enough		Suitable Marginal		Not Suitable	
	Width (ha)	%	Width (ha)	%	Width (ha)	%	Width (ha)	%
Upper-part	51,0	3,8	44,7	3,3	695,2	51,9	548,5	41,0
Middle-part	28,0	9,4	35,2	11,9	216,8	73,1	16,7	5,6
Lower-part	183,3	61,2	25,1	8,4	91,3	30,5	0,0	0,0

Total population will increase land use for housing and will give land conversion keep occurs. Based on Dirjen Penataan Ruang (2003) review, we know that house land on sample location until year 2012 on upper- part will be 88,4 ha width (6,6%), middle- part will be 106,2 ha width (35,8%), and lower- part will be 216,3 ha width (72,2%). House development distribution on sample location can be seen on Table 3.

Table 3. Land Compatible result for House Development Distribution

The upper-stream of Ciliwung Watershed	Actual House Land width		House Land development Estimate until Year 2012*			Land development on compatible class		
	Width (ha)	%	Width (ha)	%	Need (ha)	Compatible Class		Border Factor
						Class	Width (ha)	
Upper-part	61,2	4,6	88,4	6,6	27,2	S1	51,0	None
						S2	37,4	Declivity and slide
Middle-part	32,2	10,9	106,2	35,8	74,0	S1	28,0	None
						S2	35,2	Slide potential
						S3	43,0	Farm Land Use
Lower-part	172,2	57,5	216,3	72,2	44,1	S1	183,3	None
						S2	25,1	Shrub Land Use
						S3	7,9	Farm Land Use

\* Source: Dirjen Penataan Ruang (2003)



Picture 2.  
 (a) House land compatible Map at the upper-part (Tugu Utara village)  
 (b) House land compatible Map at the middle-part (Cilember village)  
 (c) House land compatible Map at the lower-part (Katulampa)

House development on in the upper-stream of Ciliwung Watershed better need to focus on land quality. It becomes a border factor to develop various housing area. On the upper part the border factor at S2 land is devlicity and slide potential, on S3 is land use for agriculture and plantation, on middle-part the border factor at S2 is slide danger,

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S3 is land use; field, farm and tea plantation. Lower-part is land use which is shrub and grass.

### a. House Condition Analyze

The average width of house land on the upper-part is smaller than on the middle and lower-part. This is caused by topography condition with various slopes that the housing is not possible to grow in groups. In this condition, more expensive construction cost, also slide danger, especially not balance with strong construction. See the house condition on the upper-stream of Ciliwung Watershed. Shown in table 4.

Table 4. House Condition in research area

House Condition	Upper-part	Middle-part	Lower-part
House Characteristic	Informal	Informal	Informal formal
<b>House size</b>			
- Large > 2000-5000 pax	--	--	Average 3000 pax
- Medium 500-2000 pax	Average 601 pax	Average 750 pax	--
- Small-Medium 100-500 pax			
<b>House Shape</b>			
- Linear	linear	linear	linear
- streetplan	--	--	streetplan
<b>Building Density</b>			
- Rare	50%	--	50%
- Dense	50%	100%	50%
<b>Construction Type</b>			
- Permanent	83,5%	90%	93,3%
- Semi permanent	10%	6,7%	0,7%
- Stage	6,5%	0,3%	--
<b>Movement Space</b>			
- <9 m <sup>2</sup> /pax	100%	100%	50%
- >9 m <sup>2</sup> /pax	--	--	50%
<b>Yard Ownership</b>	52%	20%	66,6%
<b>Light hole width</b>			
- < 10% of room width	33,3%	46,6%	50%
- ≥10% of room width	56,7%	53,4%	50%
<b>Room Completeness</b>			
Very complete	30%	16,7%	60%
Complete	46,7%	36,7%	46,7%
Not complete	23,3%	46,6%	3,3%
<b>Material Use</b>			
- Modern	96,7%	96,7%	--
- Traditional	3,3%	3,3%	--

Source: Survey 2006-2007

Housing condition on the upper-part has a informal characteristic, with small-middle house size, rare and dense population with linear type, on middle-part, it has informal characteristic with small-middle house size, dense population and linear type. On lower-part, there are two characteristics, formal and informal, dense polation and linear type and street plan. Respondence construction house composition type on the upper-part and middle-part consist of permanent, semi-permanent and stage, on lower-part consists of permanent and semi-permanent. If we look the minimum room needs by Menteri Kimpraswil in 2002 is 9 m<sup>2</sup> / pax, then the minimum size per pax on the upper side and middle-part is ideal with the standard. On the lower-part is only 7,8 m<sup>2</sup>/pax, can be categorized as not ideal to minimum standard. This condition will affect the comfortable level and scope of movement from the

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dweller as mentioned by Sarwono (1992) that the existing free room will affect the dweller behaviour.

Formal housing that been used in this research is in the middle of construction named Mutiara Bogor Raya housing located at Katulampa, this housing is built on dry land (cassava plantation), and a new construction that built by developer in KPR, total population is 82% from outside Kelurahan Katulampa, they chose this housing based on fresh air, quiet and near to the city center. The existing of this housing is really interesting, besides close to the city center, also the house price is not too expensive. But the developer did not construct in good standard to fulfill consumer's needs. With 800 houses if we assumed with 5 people in one house the the total population is 4000, then according to housing construction rules, some facilities need to be filled are Education facility i.e. Elementary School (SD), Supermarket or small stores, Meeting Hall, Parking lot, Sanitary and Security office, one musholla, an open yard i.e garden for sport, house type is in a row with maximum 30 m or 6 units. This thing will consider the structure stability. That's why, the government need to give more attention related to house construction permit so the consumers get a proper residence.

### b. Community Behaviour Analysing in Environment Management

Various kinds of community behaviour not only show their ability to use existing resources and daily needs but also their wisdom in managing the environment. Their behaviour in creating healthy and environmentally sound can be reflected from their daily activity. The mentioned environment management is a waste that covers liquid and solid waste and garbage. In table 5 can be seen how community behaviour in managing the environment to be a healthy environment.

Tabel 5. Community behaviour in managing environment at research location

Environment Management	Upper-part	Middle-part	Lower-part
<b>Waste management</b>			
• Public sanitary			
- River	50%	95%	10%
- Septic tank	50%	5%	90%
• Private sanitary			
- River	45%	95%	--
- Septik tank	55%	--	100%
- Pond	--	5%	--
• Kitchen			
- River	80%	90%	40%
- Open pipe	20	10%	60%
<b>Garbage processing</b>			
- River	33,3%	66,7%	--
- Burn	33,3%	23,3%	10%
- Midden	6,6%	10%	--
- Processed	26,8%	--	--
- Final site	--	--	90%
<b>Water Resources</b>			
- Water source	100%	100%	--
- Water Company	--	--	53%
- Well	--	--	46,7%

Source: Survey Result 2006-2007

Community behaviour in managing housing environment in upper-part and middle-part area based on the consideration in dealing the liquid and solid waste, garbage processing,



even getting clean water, then in lower-part, environment management is better based on the facilities and the availability of facilities from local government. This is appropriate with WHO concept about environment health (2001) that some factors can increase house member health standardization. It involves sociology and management technical, risk and oriented to location, building, qualification, adopt, magement, house and environment maintenance and sewerage.

### c. Healthy Housing Development Recommendation

The recommendation to healthy housing and environmentally sound is built based on three analysis, compatible land, housing condition and community behaviour in managing settlement environment. This is developed by considering the comfortable aspect, security and harmony between houses and main function of the upper-stream of Ciliwung Watershed as water and soil conservation area, in appropriate with Perpres No.58 in 2008 about Jabodetabek area structuring to give back the function of in the upper-stream of Ciliwung Watershed as water absorption and soil conservation area and based on PP No.26/2008 about RTI-RWN categorized as specified area that need special action and in Keputusan Menteri Kesehatan No.829/Menkes/SK/VII/1999 that one of the conditions to build a housing and environment healthy is the location should not in a natural disaster area such as river banks, volcanic mudflow, slide land and earthquake. The recommendation is divided into two, they are healthy housing criteria with environmentally sound and common recommendation in developing housing with environmentally sound based on compatible land.

#### House Criteria at the upper-stream of Ciliwung Watershed

The criteria that suitable to be applied is middle - big size, rare building density, linear type and street plan, with permanent construction and stage, and permanent hole width 10% of floor width, max KDB 40%, clean water available in the housing area, also has garbage/trash processing and liquid/solid wate and closed drainage pipe.

#### Common Recommendation

Housing development on S1 land (very suitable), is at existing land housing and declivity < 10%. Recommended house model is stage house, sengkedan house and split level house (following contour line). On compatible land on S2, can be developed to be housing on grass and shrub land use; declivity 10-15%, but has slide potential so need to be solved with land resistant construction such as making guludan terrace, with resistant wall. The development on S3 (marginal suitable) with with declivity 15-20%, border factor of field, farm and tea plantation and is not allowed to be developed as housing land and there is an alert of slide danger. N (not suitable) is not allowed at all for land housing, with declivity > 20%, the land is not stable and slide so it is not safe to build houses.

## 4. CONCLUSION AND SUGGESTION

### a. Conclusion

1. The upper-stream of Ciliwung Watershed has a potency to develop house land by considering compatible land class.
2. Generally settlement condition on upper and middle side has informal settlement character with linear type of rare and building density, lower side has formal and informal housing with dense, linear and street plan.  
Community behaviour in managing environment on *the upper-stream of Ciliwung Watershed* is based on considering the availability of facilities in managing liquid and solid waste, garbage and clean water.
3. Common recommendation regarding criteria in planning housing on the upper-stream of Ciliwung Watershed and special recommendation which is idea to take care the danger on that area.

## b. Suggestion

Based on the upper-stream of Ciliwung Watershed function as a water and soil conservation, in developing house, better to consider compatible land class, by considering slope border factor, slide danger and land use with stage shape using modern or local materials, need to give intensive counseling for community to manage the environment and also need cooperation between local government, private and community to create healthy house and good environment.

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