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Pemberdayaan Peran Serta Profesi Arsitek Lanskap
dalam Mengatasi Masalah Kerusakan Lingkungan dan
Bencana Alam Melalui Pendekatan Konservasi dan
Penataan Ruang

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SAMBUTAN KETUA UMUM PN IALI

SIMPOSIUM ILMIAH NASIONAL IKATAN ARSITEK LANSEKAP INDONESIA TAHUN 2010

Bismillahirrahmanirahim
Assalamu'alaikum warahmatullah wabarakatuh
Salam sejahtera untuk kita semua dan selamat pagi

Yang terhormat

Direktur DP2M, Direktorat Penelitian dan Pengabdian kepada Masyarakat, Direktorat Jenderal Pendidikan Tinggi - Kementerian Pendidikan Nasional RI

Rektor Institut Pertanian Bogor

Para Dekan dan perwakilan dari 23 Universitas di Indonesia, baik Negeri maupun Swasta yang mempunyai program Pendidikan Arsitektur Lanskap

Ketua Forum Pendidikan Arsitektur Lanskap Indonesia (FPALI)

Para pembicara, Prof Tong Mahn Ahn dari Seoul National University dan dari Kementerian Lingkungan Hidup RI

Para Undangan dan Peserta Simposium Nasional yang berbahagia

Pertama tama marilah kita bersama sama memanjatkan puji dan syukur kehadirat Allah SWT, Tuhan Yang Maha Esa, atas segala karunia yang dilimpahkan Nya kepada kita semua sehingga dapat hadir di tempat yang sejuk ini, di IPB International Convention Center dalam keadaan sehat walafiat.

Pada kesempatan yang terhormat ini perkenankanlah saya menyampaikan apresiasi yang tinggi serta ucapan terimakasih kepada Pemerintah Indonesia, dalam hal ini Direktorat Penelitian dan Pengabdian kepada Masyarakat, Kementerian Pendidikan Nasional RI, yang telah memberikan untuk pertamakalinya Bantuan Pengembangan Himpunan Profesi kepada Ikatan Arsitek Lansekap Indonesia (IALI)

Bantuan Pengembangan Himpunan Profesi ini kami peroleh dalam bentuk Hibah dengan mengajukan proposal untuk menyelenggarakan Simposium Ilmiah Nasional, Ikatan Arsitek Lansekap Indonesia (IALI) tahun 2010, dengan tema "**Pemberdayaan Peran Serta Profesi Arsitektur Lansekap dalam mengatasi Masalah Kerusakan Lingkungan dan Bencana Alam Melalui Pendekatan Konservasi dan Penataan Ruang**". Dituangkan dalam SURAT PERJANJIAN PENUGASAN, Dalam Rangka Program Hibah Bantuan Pengembangan Himpunan Profesi, nomor 018/SP.SIP/DP2M/VI/2010, pada tanggal 28 Juni 2010 dan berakhir pada tanggal 1 Desember 2010.

Simposium Ilmiah Nasional ini, dipandang penting untuk diselenggarakan guna menampung, menggalang Naskah Ilmiah, Konsep, Pemikiran-pemikiran dan Hasil Rekayasa serta Perencanaan dari para profesional dalam bidang Arsitektur Lanskap di seluruh Indonesia, yang bertujuan untuk meningkatkan kepedulian dan peran serta para peneliti, akademisi dan para profesional di bidang Arsitektur Lanskap dalam upaya mengatasi permasalahan kerusakan lingkungan dan bencana alam melalui pendekatan konservasi dan penataan ruang.

Dalam Penyelenggaraan Simposium Ilmiah Nasional Ikatan Arsitek Lanskap Indonesia tahun 2010 ini, kami bermitra dengan Departemen Arsitektur Lanskap dan Lingkungan Fakultas Pertanian, Institut Pertanian Bogor. Untuk itu kami Pengurus Nasional Ikatan Arsitek Lanskap Indonesia, sangat menghargai dan menyampaikan penghargaan yang tinggi atas kerjasama yang baik ini.

Bapak, Ibu dan peserta Simposium Nasional yang saya hormati,

Tema dari Simposium Ilmiah Nasional ini sangat tepat, yaitu penekanannya kepada pemberdayaan peran serta dari profesi Arsitektur Lanskap, maka kami sebagai insan Arsitek Lanskap Indonesia, sebagai profesi yang turut bertanggung jawab terhadap pengelolaan sistem ruang luar, merasa perlu untuk memberikan kontribusi pemikiran yang sampai saat ini belum sepenuhnya diikuti sertakan dalam tahap kebijakan-kebijakan dan selama ini pula lebih banyak mempunyai kesempatan pada tahap pelaksanaannya saja.

Keberadaan Arsitek Lanskap masih dianggap sebagai pelengkap, hanya menjadi kebutuhan yang bersifat tersier dengan paradigma beautyfikasi sebagai konsep pengembangan bentang alamnya.

Untuk itu melalui berbagai seminar, workshop dan simposium, kami berusaha merebut posisi profesi ini guna lebih dapat memberikan sumbangan pemikiran secara universal, makna dari pentingnya keberadaan suatu lanskap di Indonesia, pentingnya penataan ruang luar yang mewujudkan ruang-ruang di nusantara yang nyaman, produktif dan berkelanjutan sesuai yang diamanatkan oleh International Federation of Landscape Architecture (IFLA) dalam World Congress di Suzhou - China pada bulan Juli 2010, dimana intinya adalah Arsitek Lanskap didorong untuk terlibat langsung dalam upaya pengurangan pemanasan global.

Melalui delegasi IALI, serta beberapa anggota IALI yang turut serta dalam kongres dunia ini, juga telah menyampaikan isu-isu strategis termasuk menyangkut keberadaan profesi lanskap di Indonesia.

Bapak Ibu dan peserta Simposium Nasional yang saya hormati,

Didalam penyelenggaraan Simposium Nasional ini, kami membentuk gugus tugas termasuk didalamnya membentuk tim reviewer dan editor serta mengundang pembicara dari dalam dan luar negeri. Makalah yang telah diterima adalah merupakan pemikiran alternatif untuk penyelesaian masalah kerusakan lingkungan dan budaya. Para kontributor makalah terdiri dari para profesional dan akademisi, termasuk juga yang sedang menyelesaikan program magister dan program doktor, yang berasal dari komunitas dalam organisasi institusi pendidikan tinggi bidang Arsitektur Lanskap yang tergabung dalam Forum Pendidikan Arsitektur Lanskap Indonesia (FPALI), maka pada kesempatan ini kami sangat menghargai upaya dan karya dari seluruh kontributor yang telah menyampaikan makalahnya. Atas kerjasama yang baik ini dan sesuai dengan waktu yang telah ditentukan, maka tim Simposium Nasional ini telah berhasil menjangkau serta selanjutnya dapat menyeleksi 58 Naskah Ilmiah yang layak diterbitkan pada berkala ilmiah pada tingkat nasional, internasional, atau beraspirasi internasional..

Dengan adanya kerjasama berupa Penugasan dari DP2M Direktorat Pendidikan Tinggi Kementerian Pendidikan Nasional RI kepada Ikatan Arsitek Lanskap Indonesia, maka kami dari Asosiasi Profesi menyatakan bahwa ini adalah momentum awal dari kiprah profesi Arsitek Lanskap untuk lebih memberikan kontribusi kepada bangsa dan negara guna menjaga alam Nusantara "agar tidak salah urus" yang dapat mengakibatkan kerusakan alam yang akhirnya menjadi masalah bersama yang sulit dikendalikan, karena evaluasi lanskap harus dimulai dari aspek manusianya, sehingga definisi apapun tentang lanskap harus sudah mencakup dimensi sosial didalamnya.

Kenyamanan suatu lingkungan selain dapat terjadi karena karakteristik ruang yang sudah ada "given", tetapi juga harus tetap mengutamakan azas manfaat seperti berguna, ekonomis, sehat, aman, serta bersinergi dengan aspek produktif dan pembangunan berkelanjutan.

Bapak Ibu dan peserta Simposium yang saya hormati,

Demikianlah sambutan Simposium Ilmiah Nasional Ikatan Arsitek Lanskap Indonesia tahun 2010. Semoga Simposium ini menjadi pemacu semangat bagi IALI -organisasi profesi kita- untuk dapat menyelenggarakan secara rutin kegiatan semacam ini pada tahun-tahun mendatang.

Sedikit catatan dari profesi:

Para arsitek lanskap hendaknya dapat menjadi pionir dalam upaya konservasi, preservasi dan perencanaan sistematis dari pemanfaatan sumber daya alam, sehingga manusia dan karyanya dapat dibawa pada keharmonisan dengan sistem alami. Rasa bahagia akan timbul dari kesederhanaan, ambil secukupnya dari alam, maka kita akan hidup damai, nyaman dan ceria.

Semoga Allah SWT, Tuhan Yang Maha Esa senantiasa memberikan bimbingan dan karunia kepada kita semua.

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Hengki Triyogo Heksanto

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RESIDENTIAL LANDSCAPE ANALYSIS BASED ON ENERGY CONSERVATION

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ABSTRACT

The development of residential for public requires a wide landscape change resulting in microclimate change. The presence of residential has an impact on the increase in electricity need to provide comfort for dwellers, through the use of electric appliances such as Air Conditioner (AC). Efforts to cope with the increase of the need on electricity are done through two ways, i.e. by increasing electricity production or by reducing electricity consumption. The presence of vegetation can control microclimate by absorbing heat of sunrays and reflecting it, so that the temperature will be reduced (Carpenter et al 1975). In addition, the presence of trees as landscape elements affects the reduction of CO₂ in the atmosphere. The process is done through photosynthesis and the deposition of CO₂ in its biomass. The correct placement of trees can reduce the consumption of energy, which indirectly reduces CO₂ emission from fossil-fueled power plant (Nowak 1994; McPherson 1998).

This research tries to examine the relationship between the presences of trees in the use of electric energy for air conditioner in residential area, and to calculate the economic value. The research is conducted on Villa Duta and Yasmin residential. The analysis is done by using ArcView and CITYgreen extension. The result shows that the presence of trees at Villa Duta is able to cut electric energy as much as Rp 47,852,500 per year or equal to 97,387,56 kWh, and is able to avoid carbon from power plant as much as 1,681,765.71 kg. The presence of trees at Yasmin is able to cut electric energy as much as Rp 89,276,175.28 per year or 551,817.56 kWh, with ability to avoid carbon from power plant as much as 9,519,451.04 kg per year. With annual expense for air-conditioning as much as Rp 3,350,000 per year the savings at Villa Duta and Taman Yasmin are, respectively, 2.52% and 0,88%.

INTRODUCTION

The campaign on environmentally friendly development has been agreed upon by many countries in the world including Indonesia. Climate change is a global phenomenon triggered by human activities especially those related to the use of fossil fuel and land use conversion activities. These activities rise the spread of various gases such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) in the air, which create destruction on the environment.

The 80s and 90s are historical decades when the phenomenon of continuous destruction of planet earth and the atmosphere were revealed scientifically. In the 1980s a fact was found that there was a big hole on the ozone layer in the atmosphere above Antarctic which henceforth known as ozone depletion phenomenon. Other fact shows that there was a continuous rise of earth temperature, which created the raise of global temperature and affected climate pattern. The phenomenon, known as global warming or greenhouse effect, is an effect of the increase of air pollution that comes from various large-scale

energy consumption of all sectors to support modern human society.

The development of public residential demands the use of wide landscape and the use of large amount of energy in each process of its development. Seo and Hwang (2001) wrote that residential development in general is seen from four processes where each process contributes to the spread of CO₂ emission in air. Those are production process (material manufacturing), construction process, utilization process (dwelling phase) and demolition process. The biggest use of energy on residential happens during the dwelling process.

The establishment of residential basically aims at providing comfort for residents. The creation of this condition in modern residential demands more energy than what is needed in other phases. The condition of site reflects the comfort felt by residents, which later defines the form of interaction between the dweller and the area. Trees as element of the landscape create significant effect on atmospheric CO₂ reduction and on efficiency of energy utilization. The process happens through photosynthesis and the deposition of CO₂ in its biomass. Secondly, the correct placement of

trees can indirectly reduce residential energy consumption, which results in less CO₂ emission from fossil-fueled power plant (Nowak 1994; McPherson 1998).

The ideal condition of a site is a form of comfort felt by users. The comfort of climate elements is the integration of temperature, humidity, solar radiation, and wind. Vegetation can serve as a microclimate control by absorbing heat from solar radiation and reflecting it so the temperature become cooler (Carpenter et al 1975). The reduction of temperature means reduction of energy consumption especially from the use of room air conditioner.

Vegetation absorbs solar radiation in transpiration and photosynthesis processes. Radiation that reaches ground surface will be used for evaporation. Vegetated land has a more stable temperature (low variation during night and day) compared to those with scarce or no vegetation. The presence of trees also increases relative humidity of shaded areas and is needed to provide shades, which can reduce environmental temperature (Laurie 1990).

This study tries to examine the benefit of trees at Taman Yasmin and Villa Duta residential.

METHODOLOGY

Location and Time

The research was conducted at two residential in Bogor City, i.e. Villa Duta Residential (Figure 1) and Taman Yasmin Residential (Figure 2). Observations and data collection was implemented in five months, from April to August 2010.

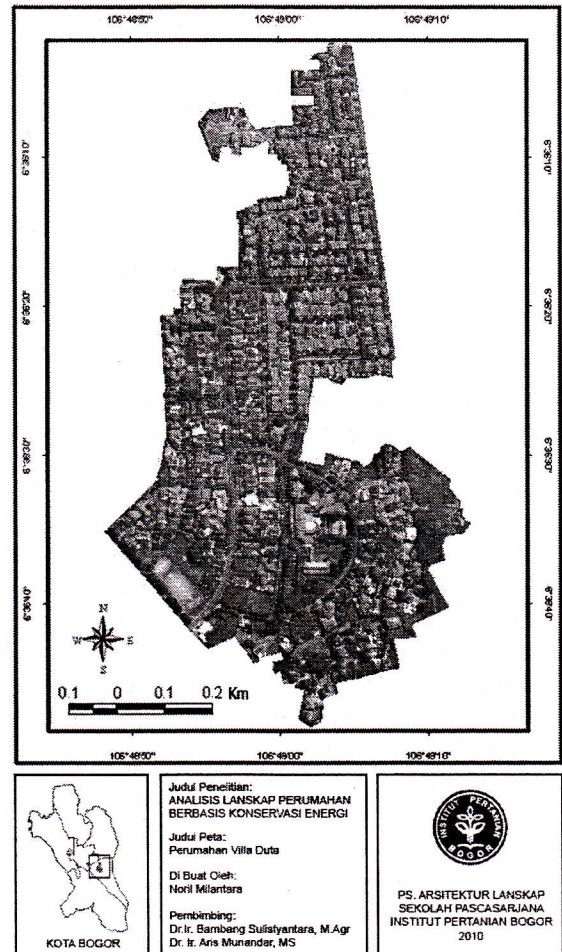
Materials and Tools

Material used in this study was Quickbird Satellite Image. Tools used in this study were a set of computer, ArcView 3.2 software, and extension CITYgreen.

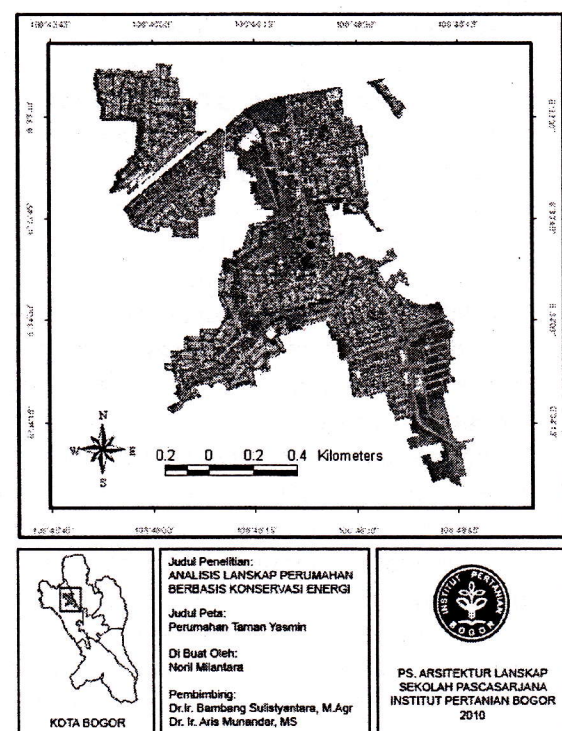
Data Collection and Analysis

CITYgreen is a software of American Forest that can calculate benefit of value of natural system. Generally, the data collection and analysis were done in three phases. Phase one is analysis of satellite images of each residential. In this phase, three themes were created. They were: Canopy Theme, containing spatial information of trees in study area; Non-canopy Theme, containing blocks of

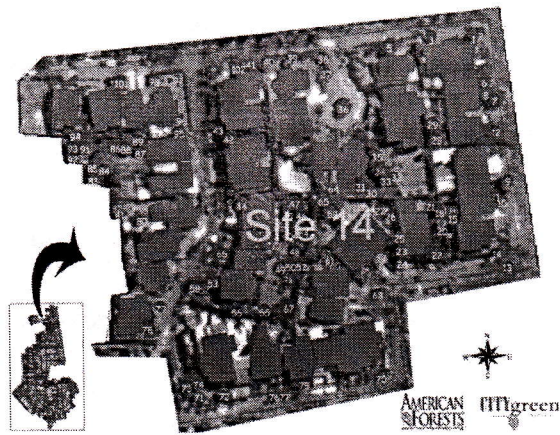
houses; and the third Theme, containing limits of observation area.



[Figure 1] Location of Villa Duta Residential



[Figure 2] Location of Taman Yasmin Residential



[Figure 3] Example of Data Collection on Site 14 at Villa Duta Residential (red=houses, green=tree canopy)

The second phase was field survey for collecting attribute data for Canopy Theme and Non-canopy Theme. Data collection was done by using tally sheet or with support of ArcPad software. The collected data is presented in Table 1.

The last phase was inputting data of field survey and conducting analysis of tree benefit for energy saving. Data from field survey was adjusted to the attributes of Canopy Theme and Non-canopy Theme. For kind of trees, data input were: name of species, canopy shape, growth of diameter and height, maximum height, leaf density.

Table 1. List of Field Data Inventory

| Collected Data | Class | Criteria |
|---------------------------|-------|---------------------|
| Building Inventory | | |
| Building Identity | - | - |
| Roof Albedo | - | - |
| Roof Color | 0.05 | Black |
| | 0.08 | Dark gray |
| | 0.18 | Light gray |
| | 0.21 | White |
| Number of Stories | - | - |
| Tree Inventory | | |
| Location | - | - |
| Species | - | - |
| Diameter | - | - |
| Height | 1 | < 6 m |
| | 2 | 6 – 13.7 m |
| | 3 | >13.7 m |
| Health condition | 5 | Good |
| | 4 | Fair |
| | 3 | Poor |
| | 2 | Very Poor |
| | 1 | Removal Recommended |
| Growth condition | 3 | Good |
| | 2 | Fair |
| | 1 | Poor |

Research Limitations:

- Measurement was conducted on several groups of houses with consideration on percentage of tree cover and same type of house (house roof).
- The presence of trees can only affect energy saving of houses with one to three floors.
- Trees with distance of more than 10 meters from building and/or with height of less than 6 meters were assumed to be not affect the energy saving in buildings (McPherson and Simpson 1999).

RESULTS AND DISCUSSION

Villa Duta Residential

Villa Duta Residential had an average of percentage of land cover by canopies as much as 8.39%. With an average of 2 units/house of air conditioner and average of use of 12 hours/day, the presence of trees in Villa Duta saved energy as much as Rp 47,852,500/year or 97,387.56 kWh. Average of saving was Rp 84,395.94/year or 171.76 kWh. Number of observed houses was 567 houses with 3 trees/ house, and average of saving was Rp 27,756.67/tree or 56.49 kWh/ tree. The presence of these trees had avoided the creation of carbon from fossil-fueled power plant as much as Rp 1,681,765.71 kg. The following Table 2 contains energy statistics of Villa Duta Residential. Table 3 presents an example of result of calculations on Site 10 of Villa Duta Residential by using CITYgreen.

Table 2. Energy Statistic on Villa Duta Residential

| Energy Statistics | Annual Rp. Saved | Annual kWh Saved | Annual Avoided Carbon (Kg) |
|-----------------------|-------------------|------------------|----------------------------|
| Per tree avg. | 27.757 | 57 | 976 |
| Per home avg. | 84.396 | 172 | 2.966 |
| Per ha avg. | 1.181.252 | 2.404 | 41.515 |
| All Villa Duta | 47.852.500 | 97.388 | 1.681.766 |

Table 3. Example of result of calculations of CITYgreen on Site 10 of Villa Duta Residential

| Site Statistics | |
|--|-----------|
| Area (ha) | 2.24 |
| Number of Trees | 155 |
| Tree Canopy (%) | 14 |
| Residential Cooling Effects Villa Duta | |
| Averg Annual Cooling Cost per Home (Rp.) | 3.350.000 |
| Number of Homes | 33 |
| Savings from Trees (Rp.) | 4.937.900 |
| Savings from Roof (Rp.) | 1.576.900 |
| Total Savings (Rp.) | 6.514.800 |
| Savings per Home (Rp.) | 197.400 |
| Killowatt-hours Saved | 8.043 |
| KWHs Saved per Home | 244 |
| Carbon Generation Avoided (kg) | 138.750 |
| Carbon Generation Avoided per Home (kg) | 4.205 |

Taman Yasmin Residential

Since this residential has a wide area data collection has been done on several groups of houses. This division of groups of houses was done by combining percentage of area of land cover by canopy and dominant roof color in the group. Table 4 shows division of groups at Taman Yasmin Residential.

Table 4. The division of groups of Areas for Sampling

| Group | Total Site | Sample Site |
|--------------|------------|-------------|
| C05RB_SX_XX | 1 | 1 |
| C05RDG_SX_XX | 14 | 7 |
| C05RLG_SX_XX | 19 | 7 |
| C10RDG_SX_XX | 7 | 4 |
| C10RLG_SX_XX | 18 | 8 |
| C15RB_SX_XX | 1 | 1 |
| C15RDG_SX_XX | 5 | 2 |
| C15RLG_SX_XX | 9 | 4 |

Remarks:

- The first three digits indicate the percentage of canopy (C05= canopy 0-5; C10=canopy 5-10; C15=canopy 10-15)
- The 4th-6th digits indicate the roof color (RB=Roof Black; RDG= Roof Dark Grey; RLG= Roof Light Grey)
- The letter S indicate the Xth sector
- The last two digits indicate site number

The results of CITYgreen calculation in Taman Yasmin residential are presented as energy statistics in Table 5.

Table 5. Energy Statistics in Taman Yasmin Residential

| Energy Statistics | Annual Rp. Saved | Annual kWh Saved | Annual Avoided Carbon (Kg) |
|-------------------|-------------------|------------------|----------------------------|
| Per tree avg. | 21.428 | 132 | 2.285 |
| Per home avg. | 29.571 | 183 | 3.153 |
| Per ha avg. | 1.251.506 | 7.736 | 133.447 |
| All Yasmin | 89.276.175 | 551.818 | 9.519.451 |

Taman Yasmin Residential showed an average percentage of canopy land cover of 6%, that gives an energy saving of Rp 89,276,175.28/year or equal to 551,817.56 kWh. Average saving per house was Rp 29,570.91 or 171.76 kWh. Taman Yasmin Residential has also been able to avoid the creation of carbon from the activity of fossil-fuel power plant up to 9,519.04 kg.

Discussion

CITYgreen analysis showed that the average energy saving per house in Villa Duta Residential was Rp 84,395.94, while in Taman Yasmin Residential it was Rp 29,570.00. The average annual cost for cooling in each residential was Rp 3,350,000.00. Therefore, there was 2.52% of decrease in electricity consumption in Villa Duta Residential, and 0.88% of decrease in electricity consumption in Taman Yasmin Residential.

Villa Duta Residential was developed in 1980s. This residential can be considered as an established one, because there is no further development activities. On the other hand, Taman Yasmin Residential was started to be developed in the 1990s and currently development activities are still going on in sector 7. The newly developed residential (Taman Yasmin) tends to have less mature trees that can give effective shades to houses. The results showed that the percentage of land cover by canopy in Villa Duta Residential reached 8.39% or the average number of trees per house is three trees, while in Taman Yasmin Residential it reached 6% with an average of one tree per house. The difference in land cover by canopy affects the electricity consumption for AC. However, the biggest energy saving was found in Taman Yasmin Residential that has twice bigger land area than Villa Duta Residential.

Carbon avoided is the capability of trees in the residential areas to prevent the

carbon creation in the atmosphere. A decrease in electricity consumption in residential areas means a decrease in the supply of electricity, which means preventing the high emission of carbon from fossil-fuel power plant. The indirect benefit of trees is influenced by the type of fuel used in the city (McPherson and Simpson 1999).

CONCLUSION

The need of electricity can be fulfilled by two ways: increase production or decrease consumption. The existence of trees in residential areas can decrease electricity consumption, especially those used for AC. Mature trees can provide effective shades.

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