

# Factor Affecting the Willingness of Community in Application of Green Infrastructure Component

Sri Maryati\*, An Nisaa' Siti Humaira and Muhfidlatul Qira'ati

Research Cluster for Regional and City Infrastructure System of School of Architecture, Planning, and Policy Development, Institute of Technology Bandung, Jalan Ganeca 10, Bandung 40132, Indonesia

\*Corresponding Author: smaryati@pl.itb.ac.id

## Abstract

Green infrastructure (GI) has several benefits compared to gray infrastructure in terms of environmental services and sustainability, such as reducing energy consumption, improving water quality, providing carbon sequestration, and increasing property values. Nevertheless in practice, the implementation of the concept in Indonesia is still limited. This paper aims to explore the perception and willingness of the community to apply the concept of GI and the factors influencing the willingness. The case study is in Cikahuripan Village, Lembang District. The methods used are descriptive statistics and cross-tabulation. The result of analysis shows that after an education the willingness of community to apply the GI component is high (40 of 51 respondents), but most of them cannot finance the application of the concept. Occupation is factor influencing the willingness of respondents to implement GI Component.

Keywords: Community, factors affecting willingness, green infrastructure.

## Introduction

Green infrastructure (GI) is defined as an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife (Benedict and McMahon, 2006). Green infrastructure is an alternative to provide infrastructure, especially storm water infrastructure in combining with green open space infrastructure. Because of its characteristics, GI is stated as multifunction infrastructure. The benefits of GI among others are reducing cost of infrastructure provision, reducing energy consumption, improving water and air quality, providing carbon sequestration, and increasing property values. There are various forms or components of GI, such as rain garden, bioswales, permeable pavement, infiltration basin, dry pond, green roof, downspout disconnection, and rainwater harvesting.

Although GI has multiple benefits, the implementation of the concept in Indonesia is still limited. In order to implement GI component, the willingness of the community to implement the component is very crucial. GI can be defined only if the people involved in the implementation of the concept (Nauman, et al., 2011). This paper aims to explore the perception and willingness of the community to apply the concept of GI and the factors influencing the willingness. Callahan (2007) stated that information from community is very important for the implementation of GI. Barau (2015) stated that household perception of urban greenery is a vehicle for understanding socio-ecological dimensions of grassroots urban sustainability. It also helps in advancing public participation in urban green infrastructure initiatives. In the case of infrastructure provision, there are several factors that usually considered as factors influencing people participation, such as demographic factors, economic, and individual preferences and awareness (Dwivedya and Mittal, 2013).

This research used Cikahuripan Village as a case study. Cikahuripan village is located in the northern part of Lembang District, West Bandung Regency. In the context of Bandung Metropolitan Area, Lembang district is classified into periurban area that plays a role in accommodating developments in the core/urban areas. The total area of Lembang District is 9,826.54 ha that consists of 16 villages. It is geographically located at an altitude between 1,250 meters to 1,750 meters above sea level. Lembang district consists of the hills and mountains with slopes ranging from 0% to over 45%. Level slope in Lembang district is dominated by steep slope.

Cikahuripan village is situated on the slopes, with a gradient ranging from 15–25 degrees. The total population in the Cikahuripan Village based on *Potensi Desa* (2011) was 10,527 inhabitants and it consists of 3,082 families which 1,674 of them are farmer family. The main source of livelihood of the villagers is agriculture. The main agricultural commodities are fruits, vegetables, ornamental plants, and medicines. Land

use in the Cikahuripan Village is still dominated by farm land. There are also a little settlement and forest in fairly large amount compared to other villages in the Lembang District. Cikahuripan Village is a catchment area, especially in the southern part of the Village.

Natural disaster that has occurred in the Cikahuripan Village based on Potensi Desa (2011) was landslide. This relates to topography and rainfall in the village. Rainfall in the Cikahuripan Village ranges between 2,000–2,500 mm/year therefore is included into high rainfall intensity category. Almost all the land in the Cikahuripan Village is andosol type. Andosol is quite sensitive to soil erosion. High rainfall and its soil type cause this area prone to erosion. That indicates that the Cikahuripan Village has risk of ground movement natural disaster. Besides the land movement, this village is also in the high risk of earthquake (Kurniawan, 2014).

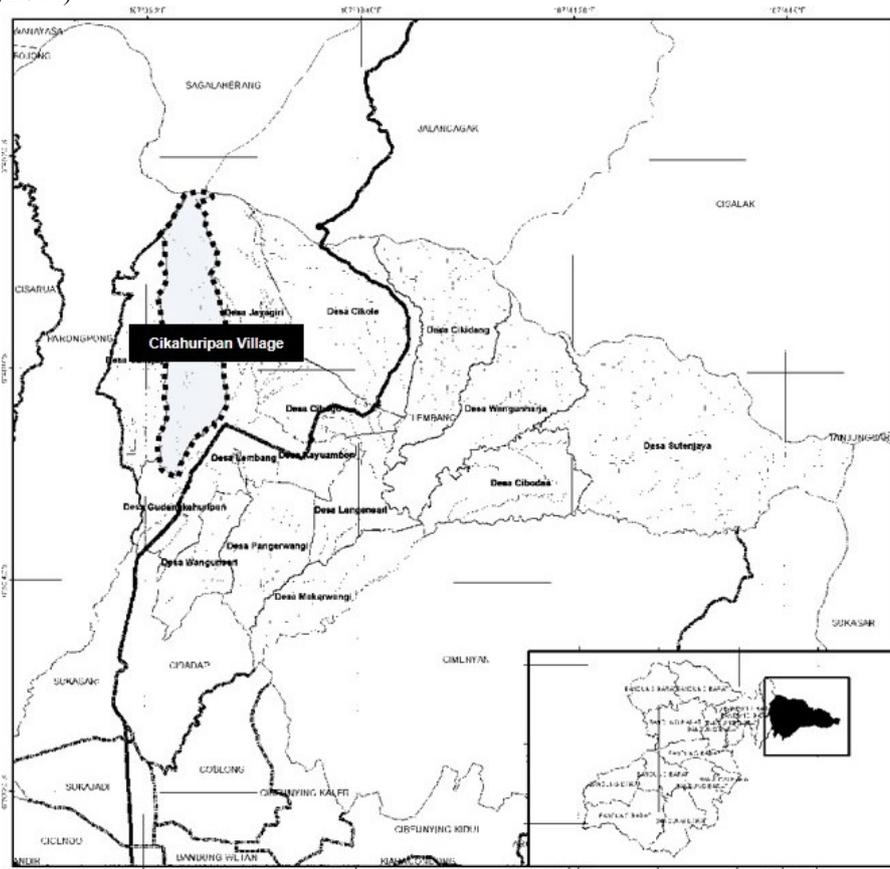


Figure 1. Cikahuripan Village in Lembang District (Kurniawan, 2014)

## Material and Methods

Primary data is collected in two stages. The first stage, called pre-questionnaire or education step, is a step where researchers introduce the concept of GI to the community. In this step, the community was educated through video playback in Sundanese language. Through the video, GI concept, benefits, elements, and precedents were introduced. Since the concept is relatively new, the objective of this step is to assist respondents in completing questionnaires. The second stage was questionnaire distribution to determine public perception of the GI, its benefits for the community, as well as potential and constraints in applying the concept. Questionnaire was written in Sundanese; traditional language in that area. Questionnaires were distributed by using non-probability sampling technique with quota sampling. The type of sampling technique was selected based on the objective of the research; to know the perception of community towards relatively new concept. Quota sampling is a technique to select sample from population who has certain characteristics in specified number. The criteria used to select respondents are women with diverse occupation, education, income, and age.

For correlation research, minimum sample required to obtain the good result is 30. In this study, the number of samples was 51 samples. The samples have diverse characteristics in terms of level of education, occupation, and income. Cikahuripan Village consists of 10 RW(s); neighborhood unit, and those 51

questionnaires were distributed proportionally in all RW(s), except RW 9. The process of survey was done by utilizing regular religious gathering held every Friday and regular events of women gathering in the village hall.

The analytical methods used for each objective are listed as follows:

1. Identification of Public Perception regarding GI  
Quantitative approach by using descriptive statistical techniques is used to gain the information concerning public perception regarding GI seen from the experience of implementing GI.
2. Community Willingness in Implementing GI Component  
This objective is analyzed using descriptive statistical techniques. Some tasks done are reviewing some plans and community ability in implementing GI.
3. Factors that Affect People's Willingness in Implementing GI Component  
Identifying correlation between factors that affect people's willingness in implementing GI with the willingness in implementing GI Component is conducted using descriptive statistical techniques and cross tabulation analysis technique (crosstabs). Factors used in this study is education, income, occupation, access to new information, and information related GI.

## Results and Discussion

### *Perception of Respondents towards Green Infrastructure*

Current conditions indicate that there are respondents who already use their yard for gardening. Types of crops grown are food crops, ornamental plants, and medicinal plants. Gardening cannot be classified as implementation of GI since it does not involve the concept of water management. Although this gardening activity cannot be categorized as an activity in the implementation of GI, this condition indicates that there is desire to utilize their existing open space. From 51 respondents, 21 of them already carry out this gardening activity.

In general, respondents need to implement the GI Component. From 51 respondents, 50 of them stated that they needed to implement GI component. The needs are based on a number of benefits that will be accepted by respondents by implementing GI, such as health, greening and water absorption, air coolness, environmental, and aesthetics benefits. The respondents who stated that they needed to implement the GI component, in general, experience environmental problems, such as lack of clean water in term of quantity and quality, flooding, air and water pollution. They realize that the problems could be minimized by implementing GI component.

### *Willingness of the Community in Implementing the GI and Factor Influencing the Willingness*

Based on the survey result, it is known that most respondents are willing to implement GI component, but they are not able to finance the implementation of the GI component yet. There is only a small proportion of respondents said that they could apply the funding for the implementation of GI component. From 51 respondents, 8 of them are willing and able to finance the implementation of GI, 32 of them willing to implement but still cannot finance the implementation, and 11 of them are not willing and cannot finance the implementation of GI.

Table1. Categories of factors influencing the willingness of community in implementing GI component

Factors	Categories	Factors	Categories
Education	No Education	Occupation	No Occupation
	Elementary School		Farmer
	Junior High School		Labor/Employee
	Senior High School		Breeder
	Higher Education		Trader
Income (IDR)	0–500,000		Civil Servant
	500,001–1,000,000		
	1,000,001–1,500,000		
	1,500,001–2,000,000		
	2,000,001–2,500,000		
	2,500,001–3,000,000		
	3,000,001–3,500,000		
	3,500,001–4,000,000		
	4,000,001–4,500,000		

In order to know the factors influencing the willingness of the community in applying the GI component, cross tabulation analysis is conducted. The factors which are considered as factors influencing the willingness in this study are education, income, and occupation. The willingness consists of three categories: (1) willing and able to finance the implementation of GI; (2) willing to implement but cannot finance the implementation; (3) not willing and cannot finance the implementation. The categories for education, income, occupation are shown in Table 1.

From the five factors mentioned above, only Occupation have significant value (below 0.05) (see Table 2). It can be concluded that occupation influence the willingness to implement GI component. Respondents with all types of occupation tend to implement GI but cannot finance the implementation, except farmers. Almost all of respondents with farmer occupation are not willing to implement GI component. It is because they feel that they have worked with plant and the most important thing that they do not have time to apply the concept.

Table 2. Result of cross tabulation analysis

Factors	Phi Value	Significant Test (Sig)
Education	0.501	0.118
Income	0.508	0.514
Occupation	0.685	0.021

## Conclusions

It can be concluded that most of respondents will to apply the GI component after education. Occupation is factor influencing the willingness of respondents to implement GI Component. It is recommended that government conducts socialization regarding GI to community. Besides, subsidy from government to implement the concept is also important. Based on the result, most farmers are not willing to implement GI due to the fact that farmers perceive that they already implement this concept in their daily life and they do not have enough time to implement the concept. In this case, the role of government to educate people is very important since farmer's activity is quite different from activity in implementing GI.

## Acknowledgements

The research, on which this article is based, is funded by Institute of Technology Bandung under the scheme of Riset Inovasi Kelompok Keahlian 2016. The title of the research is 'Model Konseptual Penyediaan Infrastruktur berdasarkan Persepsi dan Preferensi Stakeholder'. The authors would like to thank all the stakeholders involved in this program. However, the authors alone are responsible for any mistakes and shortcomings.

## References

- Barau, A. S. (2015). Perception and Contributions of Households Towards Sustainable Urban Green Infrastructure in Malaysia. *Habitat International*, 47: 285–297.
- Benedict, M. A. and McMahon, E. T. (2006). *Green Infrastructure: Linking Landscapes and Communities*, Island Press.
- Callahan, K. (2007). Citizen Participation: Models and Methods. *International Journal of Public Administration*, 30 (11): 1179–1196.
- Dwivedya, M and Mittal, R. K. (2013). Willingness of Residents to Participate in E–Waste Recycling in India. *Environmental Development*, 6: 48–68.
- Government of West Java Province. (2011). Potensi Desa.
- Kurniawan, Y. (2014). Kesiapan Kecamatan Lembang sebagai Pusat Kegiatan Lokal Ditinjau dari Aspek Resiko Bencana Gerakan Tanah. *Undergraduate Thesis*, Dept. Of Regional and City Planning, Institute of Technology Bandung.
- S. Nauman, M. Davis, T. Kaphengst, M. Pieterse, and M. Rayment. (2011). Design, Implementation and Cost Elements of Green Infrastructure Projects, *Final Report Contract no.070307/2010/577182/ETU/F.1*, DG Environment, Ecologic Institute and GHK Consulting.