

POTENTIAL RESOURCES IN CONSERVATION UNIVERSITY FOR GREEN INFRASTRUCTURE DEVELOPMENT

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Abstract : Semarang State University (UNNES) as part of a larger community has initiated the positive development for the surrounding environment by establishing itself as a conservation university. The university has many potentials resources that can be developed into initial model of Green Infrastructure in university scale. This paper aims to present the supports, burdens and limitations of GI implementation in the university's area through identifying resources that university have. Supports of the university include natural resources, man-made resources, institution and programs. Burdens and limitations explain the challenge for the university to implement and securing GI as an ongoing commitment and goal. Methodology used is primary observation and documents analysis. The analysis shows that the application of GI in the university is very possible regarding its natural and man-made resource supports as well as institutional and the university programs. Natural Resources supports are through the existence of birds and butterflies in the area of UNNES and some of them are classified as endangered species. The university is located among two kinds of important natural landscapes; there is valley with dense vegetation and river banks with steep cliffs. Those landscapes are potential for GI in UNNES. Man Made resources include water conservation zone, biodiversity conservation facilities and green spaces inside the campus. Supports from institution and programs are abundant because the vision of UNNES as a conservation university. GI in UNNES should include natural landscapes outside the area of campus to make a possible connection to create network required for GI system.

Keywords: Green Infrastructure, Conservation University, Supports, Limitations

INTRODUCTION

Green infrastructure (GI) is not a new concept in the development area especially in natural conservation. GI has reached a prominence in discussion and research since late 1900's around America, UK and Europe. In Asia, the issue of GI is developing more than concern to be a strategy of national development since ADB (Asian Development Bank) pushing GI for Asian mega cities in 2012. And in Indonesia, the knowledge of GI is still limited for experts, researchers and has not been implemented as a national strategy. Indonesia should prepare for GI as a need for sustainable development and Semarang Municipality in Central Java Province is one of megacity that at risk of climate disaster (Joga, 2010).

The vision of Conservation University is one of the education institution concern and commitment regarding this threat of climate disaster. Conservation University is the vision of Semarang State University (Unnes). It is the first university that declared itself as the Conservation University in Indonesia. This conservation university was declared by Rector of Unnes in a glorious declaration attended by the Minister of National Education of Indonesia on March 12th, 2010. The idea of conservation has become its vision to be an international conservation university which is healthy, outstanding and prosperous. Regarding the vision, Unnes determine to consistently uphold the idea of protection, preservation, utilization and sustainable development of natural and cultural resources of Indonesia. The vision leads

to the responsibility to make Unnes as a pioneer of sustainable development within the university itself and to the larger area outside the campus.

In 2012, the university is developing rapidly since the bigger demand of buildings for education and office. In the other hand, reviewing from the geographical side, Unnes is located in mountainous areas with diverse topography. Administratively, Unnes is located in Gunungpati districts of Semarang Municipality. This region is an area that serves as a water catchment area which maintains the hydrological cycle and provides water for the life of the lowland of Semarang. The campus is also surrounded by some types of habitat include: forests, fields, farms, mixed farms and settlements. The potential level of biodiversity of flora and fauna are relatively high. This hilly region is also very likely be exploited and utilized to develop renewable energy sources such as water, wind and sunlight.

Facing the rapid development, the progress of science and technology, and global warming, the existence of conservation areas in the district of Gunungpati should also take into account. The recent development in the campus should be the alarm of bigger concern to secure the ecological resources and conservation vision. These conservation areas are vital to maintain the balance of the ecosystem. The GI as a system of ecology can be developed on a smaller scale inside the campus.

This paper aims to present the supports, burdens and limitations of GI implementation in the university's area through identifying resources that university have. Supports of the university include natural resources, man-made resources, institution and programs. Burdens

and limitations explain the challenge for the university to implement and securing GI as an ongoing commitment and goal.

Green Infrastructure Concept

The concept of GI is developing depends on the context which it is used. This paper approaches GI from the definition and concept of Benedict and McMahon (2006). Green Infrastructure is 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, 2006:1).

Our best concern now is related to grey infrastructure. Unlike our roads, storm water system, schools and other types of public infrastructure, green infrastructure – natural lands and processes-is perceived as an amenity, not as a necessity – a 'nice to have' rather than a 'must have' (Benedict and McMahon, 2006).

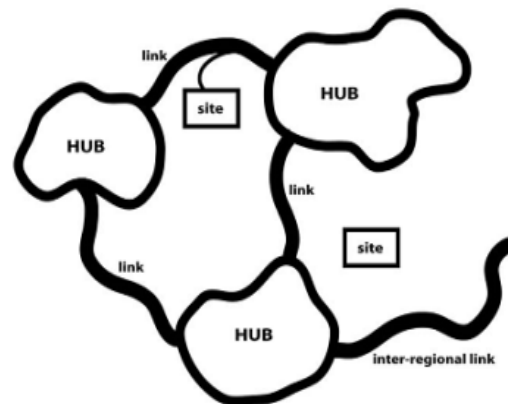


Figure 1. A Green Infrastructure Network connects ecosystems and landscapes in a system of hubs, links, and sites. Source: Benedict and McMahon, 2006

Although green infrastructure initiatives often begin from greenways efforts, there are some important differences. Green infrastructure differs from greenways in three major ways (Benedict and McMahon, 2006):

- Green infrastructure emphasizes ecology, not recreation
- Green infrastructure includes ecologically important hubs, as well as key landscape linkages
- Green infrastructure can be designed to shape urban form and provide a framework for growth—a framework that pre-identifies ecologically significant lands and suitable development areas.

Conservationists and planners alike recognized that preserving isolated natural areas is not enough—that natural areas need to be connected at the regional and landscape scales to protect biodiversity and ecosystem processes.

Table 1. Differences of Traditional Development and GI Based-Development. Source : Green Infrastructure Center, 2009

Traditional Development	Green Infrastructure Based- Development
Plan for grey infrastructure first (roads, stormwater pipes)	First, assess natural features and functions and protect them.
Green spaces in leftover lands (e.g. steep slopes and floodplains)	Plan for parks, trails, habitat connections before siting buildings.
Work within confines of parcel – pocket parks, inner trails, gated systems	Connect land and water habitats to region and across ownerships

The following criteria should be considered when determining conservation values (Rattclife, 1977; Kendle and Forbes, 1997) :

1. Size: Importance to nature conservation increases with size; bigger is better.

2. Diversity: Variety (e.g., range of species and habitats) is better.
3. Naturalness: Less modification is better.
4. Representation: Natural communities that are not well represented in existing protected areas should be priorities.
5. Rarity: Sites that contain rare elements are better.
6. Fragility: Fragile communities are more valuable and deserving of protection.
7. Typicalness: Maintaining good examples of common species is important.
8. Recorded history: Selecting well-researched and documented sites with known presence of species and habitats is better than suppositions.
9. Landscape position: Particularly important in green infrastructure, the contiguity a site maintains with surrounding landscape elements is an important consideration (connectivity of habitat).
10. Potential value: Sites with diminished value but with restoration or enhancement potential are important.
11. Intrinsic appeal: The protection of certain conspicuous species may be appealing to society and may result in a greater overall appreciation for nature conservation.

ANALYSIS : GI SUPPORT IN THE UNIVERSITY

Unnes campus is located in the area of 1.245.483 m² which lies around the housing and green spaces in Sekaran Sub District, Gunungpati District (Fig.2). Since Gunungpati serves as water catchment area for Semarang

Municipality, the development is restricted by the local government due to this role. This regulation is beneficial for Unnes if GI is implemented in the campus at small scale. Green Infrastructure approach will help the Unnes development plan to secure natural landscapes and creating man-made landscapes which support the whole system of ecology inside and outside the campus.

supports are natural resources, man-made resource, institution and programs.

Natural Resource

The campus area doesn't have a natural ecological landscape which stated in the local government regulation as protected. Natural resources in the area of study are classified through the potential existence of fauna. Geographically, Unnes is located at mountainous areas with diverse topography and high levels of biological diversity (biodiversity) of flora and fauna.

Initial inventory of fauna specially birds and butterflies in the campus in 2005, 2008, and early 2009 have identified as many as 58 species of birds. Of these, 14 of them are protected by Indonesian laws and regulations; 2 species included in the CITES protected species category (Conservation on International Trade in Endangered Species of Wild Fauna and Flora) Appendix II, I and a group of protected species including the IUCN (International Union for Conservation of Nature) with the category Endangered Species: EN, and five species including endemic species category of Java. Also found as many as 33 species of butterflies and one of them is a protected species under Indonesian law system (Division of Biodiversity UNNES, 2010).

The existence of these fauna cannot be separated from Mount Ungaran. Unnes is just 10 km from Mount Ungaran and this condition affects the biodiversity in Gunungpati especially in Unnes. The large area of green spaces and lots of trees attract birds, butterflies, and other fauna that makes the campus as potential habitat for certain animal regeneration especially birds.

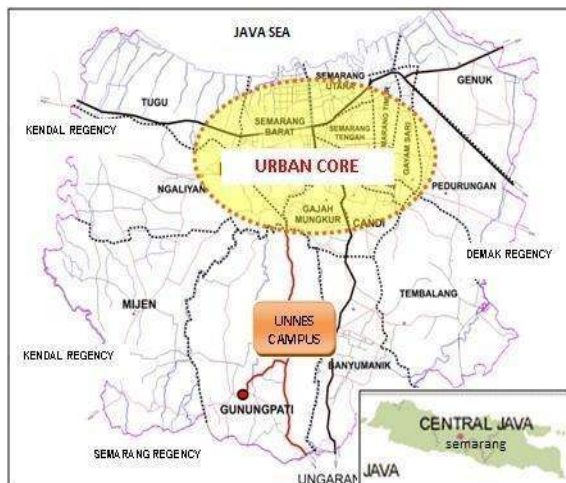


Figure 2. Area of Study Source : Local Government Semarang Municipality, 2012



Figure 3. UNNES Campus in Sekaran Source : UNNES Conservation Agency, 2012

The following describes the existing supports so that GI can be applied in UNNES campus by exploiting existing resources. Such

Man-Made Resource

Man-made resources are identified through Unnes facilities which have environment conservation value. The Unnes Conservation Development Agency classified this resource into three categories, water conservation area, biodiversity conservation facilities and green spaces.

a. Water conservation area

The area has primary function as a reservoir of rainwater that flows over the ground. The reservoir water can then be used for various purposes. The area (Fig. 4) includes West Reservoir (Area A), Middle Reservoir (Area B) and East land basin (Area C).

b. Biodiversity conservation facilities

The facilities are Mahogany Plantation (Area A, D), Campus Mini Forest (Area B, F, G, E), and Educational Garden and Butterfly Sanctuary (Area C).

c. Green and Open Spaces

Green spaces in the area of study are identified through university parks and parking areas (Fig. 6). There are 13 points of green spaces with 10 classified as Green spaces (Area A, D, E, F, G, I, L, K, J, C) and 3 classified as open spaces/ parking areas (Area B, H, M,)



Figure 4. Water Conservation Area

Source: Unnes Conservation Development Agency, 2012

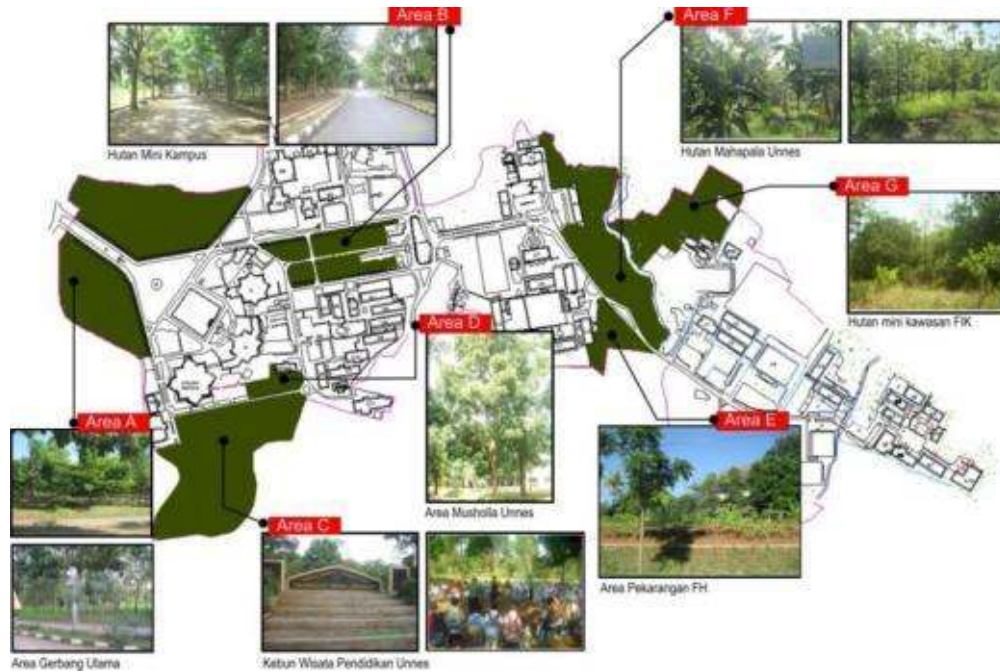


Figure 5. Biodiversity Conservation Facilities
 Source: Unnes Conservation Development Agency, 2012



Figure 6. Biodiversity Conservation Facilities
 Source: Unnes Conservation Development Agency, 2012

Institution

Unnes has committed to develop conservation value through university's vision documented in Unnes Strategic Planning 2010-2025. Moreover, the university has established Unnes Conservation Agency since 2011 which is responsible for planning and managing conservation programs. According to these facts, it is clear that the institution supports are abundant. GI is part of conservation value which combines biodiversity conservation and green architecture planning. Green Infrastructure can be implemented in the university with collaborating the experts and resources.

Program

As the support of institution emerged, the planning and programs follow. Programs that support the implementation of GI in the university are as followed:

1. Students Tree Plantation
"One Man Five Trees" is a program required for every new student of Unnes. One student is required to plant and responsible for the growth of five trees which planted in the campus area. The student must monitor the growth of the plants and input the growth data online start from they enter the university up to their graduation day. The existence of the trees and growth data are two of the graduation requirements.
2. Green Unit Award
The program provides award to the units of Unnes that have a clean and beautiful environment. This will make every member of the university trying to maintain the clean and shady

environment.

3. Internal Transportation System
Since January 2013, The University has restricted the use of vehicles inside the campus. Parking areas are centered at some parking points, and the people must walk, bicycling, or use the campus bus.
4. Green Architecture Master plan
Based on the university master plan, Unnes is gradually designing and organizing a better and humane environment. The programs stages from arranging green corridors, designing street furniture, land use identification as a basic for next development, etc.

Those programs have direct correlation to the implementation of GI besides other Unnes programs related to conservation. One of the principles of GI is long term commitment through ongoing programs that will maintain GI in the right track. Unnes has all of the commitment evidence which support GI. There should be some specific programs directly related to plan GI in the university.

Limitation of GI In University

The term of GI is relatively new in Indonesia. People still confuse between GI, land conservation, green space, etc. People's perspectives are varied and these make GI so challenging. Ten principles of GI mentions that GI should respect the needs of landowners and other stakeholders as well as connect the activities within and beyond communities (Benedict and McMahon, 2006). In UNNES, knowledge about GI has not been spread evenly among experts involved in the university's

conservation program. GI application requires an understanding process to stakeholders that the GI is as important as gray infrastructure.

GI should be funded like other critical public investments. The infrastructure funding in UNNES is still based on grey infrastructure. Greenways is still planned separately, they have not been connected as a part of ecological system and still perceived as amenity not necessity. The campus building developments are still leading the priority. There seems to be no action of securing potential landscape to make the greenway system work.

Those weaknesses are not going to make the application of GI becomes impossible. Once the conservation team and program are realizing the importance of GI, the policy to develop GI in the campus will emerge.

CONCLUSION

- a) The application of GI in the university is very possible regarding its natural and man-made resource supports as well as institutional and the university programs.
- b) Natural Resources supports are through the existence of birds and butterflies in the area of UNNES and some of them are classified as endangered species. The university is located among two kinds of important natural landscapes; there is valley with dense vegetation and river banks with steep cliffs. Those landscapes are potential for GI in UNNES.
- c) Man Made resources include water conservation zone, biodiversity conservation facilities and green spaces inside the campus.
- d) Supports from institution and programs

are abundant because the vision of UNNES as a conservation university.

- e) GI in UNNES should include natural landscapes outside the area of campus to make a possible connection to create network required for GI system.

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