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Internal and External Cost of Spanish Mosses as Green Roof with Zero Maintenance in Hot and Humid Climate

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ABSTRACT

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Keywords: Spanish Mosses; Green Roof; Zero Maintenance; Sustainable Buildings

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INTERNAL AND EXTERNAL COST OF SPANISH MOSSES AS GREEN ROOF WITH ZERO MAINTENANCE IN HOT AND HUMID CLIMATE

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Abstract

Green roofs have been proposed for sustainable buildings. Internal and external cost ensures the economic feasibility by reviewing the efficiency related to energy consumption, mitigation of urban heat island, improvement of air pollution, water management, sound insulation, and ecological preservation. This paper used Spanish moss for green roof in hot and humid climate. It is an angiosperm belonging to the family Bromeliaceae Tillandsia type. It is known colloquially as “air plant” that grows upon tree branches, in sunshiny or partial. Spanish moss is a passive natural “air plant” with rootless and soilless. It is epiphyte (no need soil like orchid). It is also xerophyte (drought tolerant). It absorbs carbon dioxide during the night time (Crassulacian Acid Metabolism Plant) and closes the stomata during daytime to avoid water releasing. It is the growth retardant plant which is good for building envelope)green facade or green roof(because of the low maintenance requirement.

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1. Introduction

Green roofs have been increased in many countries because the benefits of green roofs have been accepted for sustainable buildings. The decreases of buildings energy demand for cooling can be happened by using green roofs resulting in heat reduction in the building and the save energy meaning the reduction of GHG emission for mitigation of climate change. However, high economic barriers of green roofs are the initial construction cost, irrigation system, and supporting structure. This study aims to describe the cost and benefits of Spanish moss for green roofs to support the decision making of buildings both private and public sectors. The highlighting of internal cost and external cost of Spanish moss would be helpful as well.

2. Literature Review

Basically green roofs are also known as environmental friendly product in different name e.g. living roofs, eco-roofs, roof wig. It has normally the built vegetation

covering on final layers [1]. The major classifications of green roofs are intensive and extensive green roofs. Extensive green roof has been explained as unexpected loads. The investigating of effective benefits of green roofs is the energy balance of the building [2]. The energy consumption decreases as the increasing of the thermal insulation capacity into roof. Other benefits are low maintenance cost, extended lifetimes of roofs, reduced capabilities of water runoffs, improved market price of building, increased solar radiation, provided natural shadow to against the solar radiation, decreased urban heat island effects, reduced quantity of dust particles in the air, and protected noise pollution, and provided diversity of habitat.

3. Research Methods

The decision making in choosing green roofs for building is based on several factors to be reviewed in this paper. Internal costs are also named private costs which determined and managed just by

private organization such as: the owner, architect, engineer and developer. Consequently, the external costs are also named social costs because these are extremely related to the resultant on economic, environment or social system. This paper targets to analyze the internal and external costs of Spanish mosses roofs.

4. Result and Discussion

Internal costs consist of initial construction, repair and maintenance and disposal or recycling costs. Initial construction costs are extremely important for instance covering structure, hanging structure and labor. The covering structure of Spanish mosses consists of lightweight steels such as steel box, slotted angle steel and welded wire mesh. In addition, the total of initial Spanish mosses roofs was estimated at \$ 76.67/m². Furthermore, operation and maintenance costs in this study were inspected the watering, weeding and cutting of lifespan operation. The characteristic of Spanish mosses had low operation and zero maintenance because CAM plants do not require watering, weeding and trimming. The analysis of operation and maintenance costs of air plant green roofs were estimated at \$3.58/m² twice per year. Regarding the demolition and recycling cost of green roofs are included disposal growing mediums, transportation materials, plant demolition and recycling. The characteristic of lightweight and not require the soil or substrate as a result to very low disposal. The disposal and recycling costs of air plant green roof was evaluated at \$5.37/m². The external costs of green roofs had been demonstrated green roofs as a mean of pollution abatement which improved urban air quality, human health and human wellbeing. Similarly, Spanish mosses roof

are made of the sustainable materials resulting in social benefits and less pollution. The internal benefits of green roofs are distinctly the value-added of energy consumption reduction, increasing of surface function, recreational space and aesthetically of the building, property value and opportunities in market, roof longevity, avoided storm water in drainage system, plant in the market. Obviously, the installations of green roofs are the pollution mitigation and benefits to communities. External benefit approaches in green roof have significant public benefits to provide with regard to environment, economic and social. Therefore external benefits was considered from the emission in the production process, air quality improvements, carbon reduction, habitat creation, mitigation of urban heat island effect, reduction of infrastructure costs, reduction of flood risk, provision as of recreational space, increasing surface function, and aesthetic of green roof.

5. References

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