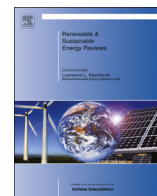




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Property tax assessment incentives for green building: A review



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ABSTRACT

The development of green building has received the attention of various levels of government around the globe, including from local authorities. There are two main categories of incentives provided by local authorities as a means of encouraging the development of green building, which include financial and structural incentives. It has been found that financial incentives, in particular property tax assessment incentives, have been widely adopted by several Commonwealth countries around the globe including Spain, Romania, Italy, Bulgaria, the United States, Canada, Malaysia and India. The practice of providing property tax assessment incentives within the green building field has been empirically documented by several researchers, in order to encourage the growth of numbers of green building instances at a local level. However, no comprehensive academic study has been conducted to review the effect of this incentive on the development of green building. Therefore the purpose of this study has been to review and discuss the available models and bases adopted, in order to develop this incentive. There are three types of property tax assessment incentive models that have been identified as available for encouraging the development of green building, which include reductions, exemptions and rebates. These incentives were developed based on four identified bases, which specifically include the increased amounts of property tax assessments of completed green buildings, the costs of green components, the rate imposed on property tax assessments, and the level of green certification. The findings identified that most property tax assessment incentive models regarding green buildings were developed on the basis of the value of green components, specifically the increased amount of property tax assessments of green buildings, and the costs of green components.

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Contents

1. Introduction	536
1.1. The relationship between property tax assessment incentives and green building development	537
1.2. Review of property tax assessment incentive models for green building by countries and states	537
1.2.1. Spain	538
1.2.2. Romania	539
1.2.3. Bulgaria	539
1.2.4. Italy	539
1.2.5. Canada	539
1.2.6. The United States	539
1.2.7. Malaysia	544
1.2.8. India	544
1.3. The bases of property tax assessment incentive models for green building	544
2. Discussions	546
3. Conclusion	547
Acknowledgments	547
References	547

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1. Introduction

The involvement of governments has been regarded as an undeniably effective way of promoting the development of green building [1–5]. Local authorities, as operating under local government, act as not-for-profit organizations whose function is to provide services to society, to control and regulate town planning, to approve applications for planning permission, and to develop and renovate premises. The development of green building can result in various potential benefits to local authorities, including boosting their positive images, increasing property tax revenue, decreasing worker absenteeism, reducing pollution and natural disasters, making savings on management, maintenance, operational, utility and infrastructure costs, and creating job opportunities [6–10].

Two categories of incentives have been provided by local authorities as initiatives to encourage the development of green building development, including financial and structural incentives [11,12]. Financial incentives relate to monetary support, including property tax assessments, grants and development fees. Meanwhile, structural incentives provide technical support, such as marketing, technical assistance, expedited permit processing and density bonuses. Financial incentives, specifically property tax assessment incentives on green buildings, have been widely adopted by several Commonwealth countries around the globe including Spain, Romania, Italy, Bulgaria, the United States, Canada, Malaysia and India. Additionally, the practice of providing property tax assessment incentives for green buildings has been proven to encourage the growth of green building practices at a local level [5,13–15].

However there has been a lack of academic publications comprehensively reviewing the practice of providing property tax assessments as an incentive for green building within these countries. Such a comprehensive review would play a critical role in discovering the grounded basis of each incentive adopted by various countries and states around the globe. This research aims to comprehensively review available property tax assessment incentive models regarding green building, as adopted by various countries and states around the globe. This paper therefore reviews the relationship between the application of property tax assessment incentives and the development of green building, reviews the established and adopted bases used to develop incentive models, and evaluates the bases of the property tax assessment incentives based on their existing application by countries or their individual states.

1.1. The relationship between property tax assessment incentives and green building development

The building sector has been responsible for high levels of energy consumption, greenhouse gas emissions, solid waste generation, resource depletion and environmental damage [16]. The increased concerns regarding alarming trends in energy demand, the depletion of scarce earth resources, and significant damages to environment as a result of building construction activities, have all triggered green building movements around the world [17,18]. The Urban Land Institute [19] defines green building as the practice of increasing the efficiency with which buildings use resources, while at the same time reducing their impact on human health and the environment, throughout the building's lifecycle. This can be achieved at the siting, design, construction, operation, maintenance and removal stages.

The United States has had the greatest experience in the development of green building. Property tax assessment incentives have been widely provided in the United States since 2009, as a means of encouraging the development of green building [20].

Clement et al. [21] conducted research in the United States, and found that in terms of financial incentives for green building provided at a local level, property tax assessment is the most offered incentive within the energy efficiency sector. The practise of providing property tax assessment incentives for green building has had a positive impact on the development of green building. Several studies have been carried out regarding this incentive's effectiveness, in regards to the growth of green building.

According to an empirical study conducted in Spain by Sanchez and Pablo [19], the adoption of property tax assessment incentives for green building has been proven to encourage the growth of solar thermal energy use in buildings. The study came to the conclusion that the provided incentive has had a positive effect on the growth of green building, having encouraged the installation of solar thermal energy in buildings ranging from 102.245 to 122.389 m², and more. The result have indicated that the percentage of installed solar thermal energy in squares meters within municipalities that have adopted the property tax incentive has increased from 70.7 to 98.4%.

Additionally, Shrimali and Jenner [22] have conducted a study investigating the impact of state government policies on the deployment and cost of solar photovoltaic systems in the United States. The findings have proven that property tax assessment incentives and cash incentives have appeared to increase the number of installed photovoltaic systems in residential properties in the United States. In addition, Pablo et al. [18] arrived at the positive conclusion that providing property tax assessment incentives can be considered an adequate approach, one that is highly visible, and one that involves a significant cost reduction when promoting the development of green building. This study has empirically established that these factors have influenced the decision of Spain's local municipals to adopt property tax incentives on the development of green building.

Furthermore, an empirical study conducted by Li and Yi [13] has indicated that local authorities have played a significant role in the development of solar photovoltaic systems. The study has evaluated the effectiveness of the work of state and local level governments in promoting solar photovoltaic development. A regression analysis was carried out on 186 cities in United States. Its findings indicated that local financial incentives, including property tax assessment incentives, have empirically stimulated the deployment of solar photovoltaic systems in buildings. Likewise, Cansino et al. [23] stated in his study that the use of tax deductions, such as property tax assessment reductions, has had the advantage of being an ex-post incentive enabling investors to receive financial compensation after they carried out the installation of green equipment in buildings. Also, Sawin [24] has stated that this type of tax incentive is appropriate, especially in cases where the investment costs are relatively high. These studies have therefore shown that providing property tax assessment incentives for green building can stimulate and encourage growth in the field.

1.2. Review of property tax assessment incentive models for green building by countries and states

There are several Commonwealth countries around the globe that have adopted a property tax assessment incentive for green building. It was found that these countries have adopted annual values and improved values within their property tax assessment systems [25,26]. Fig. 1 below presents several countries that have adopted property tax assessment incentives for the development of green building.

In Europe there are only four countries, all members of the European Union (EU), who have been identified as having adopted several types of property tax incentives for green building. These

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