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คณะนิติศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย อนุมัติให้เอกัตศึกษาฉบับนี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต สาขาวิชากฎหมายเศรษฐกิจ

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หัวข้อเอกัตศึกษา	มาตรการทางภาษีเพื่อบรรลุเป้าหมายการพัฒนาที่ยั่งยืน: ศึกษากรณีการส่งเสริมการพัฒนาอาคารเขียวในประเทศไทย
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ปัญหาการเปลี่ยนแปลงสภาพภูมิอากาศเป็นปัญหาเร่งด่วนที่สุดปัญหาหนึ่งที่มีความจำเป็นต้องได้รับการแก้ไข ทั้งนี้เป้าหมายการพัฒนาที่ยั่งยืน (SDGs) เป็นทางออกที่ดีที่สุดในการแก้ไขปัญหานี้ เนื่องจากเป็นความตกลงร่วมกันของทั้ง 193 ประเทศทั่วโลก โดยตกลงที่จะปฏิบัติตามเป้าหมายดังกล่าว เพื่อหยุดการเปลี่ยนแปลงสภาพภูมิอากาศและสร้างโลกที่ดีขึ้น และเนื่องจากประเทศไทยเป็นหนึ่งใน 193 ประเทศทั่วโลก จึงจำเป็นต้องมีมาตรการสนับสนุนให้แก่ทุกภาคส่วนประกอบด้วยภาคธุรกิจ ภาครัฐ และภาคประชาสังคม เพื่อให้ร่วมมือกันบรรลุเป้าหมาย 17 ประการของการพัฒนาที่ยั่งยืน ยิ่งไปกว่านั้น ยังมีรายงานจากสหประชาชาติที่ได้อ้างว่าอาคารเขียวจะช่วยให้บรรลุเป้าหมายที่ 7 และ 11 ซึ่งจะช่วยให้แต่ละประเทศเข้าใกล้การบรรลุเป้าหมายการพัฒนาที่ยั่งยืนได้มากยิ่งขึ้น นอกจากนี้ ในทฤษฎีภาษีอากร มีหลักการที่ว่ามาตรการภาษีสามารถที่จะช่วยส่งเสริมการพัฒนาอาคารเขียวได้ด้วยการเปลี่ยนแปลงพฤติกรรม ดังนั้น หากนำมาตรการทางภาษีเพื่อส่งเสริมการพัฒนาอาคารเขียวมาใช้จะช่วยให้บรรลุเป้าหมายการพัฒนาที่ยั่งยืนได้

แต่อย่างไรก็ตาม มาตรการภาษีของไทยในการส่งเสริมการพัฒนาอาคารเขียวจำเป็นต้องได้รับการปรับปรุง เนื่องจากมีประสิทธิภาพต่ำ ดังนั้น งานวิจัยนี้จึงมีวัตถุประสงค์เพื่อวิเคราะห์ปัญหาของมาตรการภาษีส่งเสริมการพัฒนาอาคารเขียวในประเทศไทย เพื่อสร้างแนวทางในการปรับปรุงมาตรการภาษีเพื่อส่งเสริมการพัฒนาอาคารเขียว นอกจากนี้ รายงานวิจัยฉบับนี้ยังได้วิเคราะห์ปัญหาของมาตรการทางกฎหมายและมาตรการทางการเงินในการส่งเสริมการพัฒนาอาคารเขียวในประเทศไทยด้วย เพื่อช่วยให้ประเทศไทยบรรลุเป้าหมายการพัฒนาที่ยั่งยืนได้สำเร็จ

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Tax measures to achieve the sustainable development goals: a case study of promoting green building development in the Kingdom of Thailand

Wuttipong Limwarapus

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ABSTRACT

Title of Individual Study	Tax measures to achieve the sustainable development goals: a case study of promoting green building development in the Kingdom of Thailand
Author	Mr. Wuttipong Limwarapus
Field of Study	Economic Law
Advisor	Assistant Professor Suphasit Taweejamsup, Ph.D.

Climate change is one of the most urgent problems that needs to be fixed. The Sustainable Development Goals (SDGs) are the best solution that 193 countries in the world agree to follow the goals to halt the climate change and to make the better world. As Thailand is one of the 193 countries in the world, it is necessary to have some measures for encouraging all sectors, including business sector, public sector, and government sector to achieve the 17 goals of sustainable development. Moreover, the United Nations claimed that green buildings would help to achieve the goals with the SDG 7 and 11. Also, in a theory of taxation, tax measures can encourage the development of green buildings by changing behaviors.

However, Thai tax measures on green building promotion need to be improved due to their low efficiency. Therefore, this research paper aims to analyze the problems of tax measures on promoting green building development in Thailand in order to get a guideline for improving tax measures on promoting green building development. Nevertheless, this research paper also analyzes the problems of legal measures and financial measures on promoting green building development in Thailand to help Thailand to achieve the sustainable development goals.

..... Advisor's signature
(Assistant Professor Suphasit Taweejamsup, Ph.D.)

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(Mr. Wuttipong Limwarapus)

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AB	Access to Basic Services and Resources
ACMV	Air Conditioning and Mechanical Ventilation
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BCA	Building and Construction Authority
BOD	Biochemical Oxygen Demand
BOI	Board of Investment
BREEAM	Building Research Establishment Environmental Assessment Method
CASBEE	Comprehensive Assessment System for Building Environmental Efficiency
CBD	Central Business District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIT	Corporate Income Tax
CO	Carbon monoxide
COD	Chemical oxygen
CPA	Carbon Pricing Act
dB	Decibel
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen
EE	Efficient and Sustainable Energy
EEWH	Ecology, Energy saving, Waste Reduction and Health
EIA	Environmental Impact Assessments
EPA	Environmental Protection Agency
EPT	Environmental Protection Tax
EQ	Environmental Quality
ESCO	Energy Service Company
FAR	Floor Area Ratio
FIT	Feed-in tariffs

FYP	Five-Year Plan
GBL	Green Building Label
GDP	Gross Domestic Product
GFA	Gross Floor Area
GHG	Greenhouse Gas
GGGI	Global Green Growth Institute
GLS	Government Land Sales
HKBEAM	Hong Kong Building Environmental Assessment Methods
HQE	Haute Qualité Environnementale
IAP	Indoor Air Pollutants
IBFD	International Bureau of Fiscal Documentation
LEED	Leadership in Energy and Environment Design
LPT	Local Property Tax
MDGs	Millennium Development Goals
NC	National Council
NDRC	National Development and Reform Commission
NO_X	Nitrogen oxide
OECD	Organization for Economic Co-operation and Development
PIT	Personal Income Tax
PPP	Polluter Pays Principle
RMB	Ren Min Bi (Chinese Yuan)
ROI	Return on investment
SBS	Sick Building Syndrome
SDGs	Sustainable Development Goals
SE	Social Equity
SGD	Singapore Dollar
SO_2	Sulfur dioxide
SP	Social Protection
TGBI	Thai Green Building Institute
THB	Thai Baht
TREES	Thai's Rating of Energy and Environmental Sustainability
UD	Universal Design

UN	United Nations
USD	United States Dollar
USGBC	U.S. Green Building Council
VAT	Value-Added Tax
VOC	Volatile Organic Compounds
WGBC	World Green Building Council

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CHAPTER 1

INTRODUCTION

1.1 Statement of the Problems

The problems of climate change, global warming, sea level rise, acid rain, ozone depletion, forest disappearing, and energy crisis have been shown repeatedly on the news. Environmental problems become an inevitable issue to humanity regardless of region, gender, and age because people breathe the same air and live in the same globe. Therefore, people in every place in the world must strengthen our environmental efforts and international cooperation to achieve the better world.

Sustainable Development Goals (SDGs) are the United Nations development goals that are developed from the Millennium Development Goals (MDGs). SDGs were presented at the UN General Assembly in 2015. At that time, 193 member states signed the 2030 Agenda for Development and jointly pledged to achieve the Sustainable Development Goals by 2030[1]. As Thailand is one of the 193 countries that have also adopted the 2030 Agenda for Development, it is necessary to have some measures for encouraging all sectors, including business operators, the public and the government to achieve the 17 goals of sustainable development.

In addition, Goal 11: making cities and human settlements inclusive, safe, resilient, and sustainable is a goal that foreign countries out of Thailand attach great importance to, especially in the matter of Green Building. This is a form of building where building owners focus on increasing the efficiency of the building in the use of resources such as hydropower, electric power, wind power, as well as building materials to maximize the benefits and minimize the impacts on the environment.

The green building organizations of each country have collaborated to establish the World Green Building Council (WGBC) to enhance the effectiveness of green building promotion in the world. However, each country still has their own green

[1] United Nations Department of Economic and Social Affairs. (n.d.). *The 17 Goals*. Retrieved August 17, 2021, from United Nation: https://sdgs.un.org/goals

building assessment systems due to the problem of differences in geography, climate, and local cultures in each country. Nowadays, there are about 100 countries in the world and 18 countries in Asia Pacific in participating with WGBC. At present, the building that registered in WGBC are over ten thousand buildings or a billion square meters[2].

The members of WGBC prescribe their own green building rating systems, therefore, there are various names and rating systems in the world. Currently, there are 29 worldwide green building assessment systems (see Fig. 1.1).

Figure 1.1 World Green Building Assessment Systems[3]

Although Thailand is not a member of WGBC, it still concerns about sustainable building development by establishing its own green building assessment system named TREES (Thai's Rating of Energy and Environmental Sustainability) by Thai Green

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[2] World Green Building Council. (2021). *Every building on the planet must be 'net zero carbon' by 2050 to keep global warming below 2°C - New report*. Retrieved August 17, 2021, from World Green Building Council: https://www.worldgbc.org/news-media/every-building-planet-must-be-%E2%80%98net-zero-carbon%E2%80%99-2050-keep-global-warming-below-2%C2%B0c-new

[3] National Taiwan University of Science and Technology. (2018). 2018 Conference on Innovative Low-Carbon and Green Buildings in Subtropical Areas. *2018 Conference on Innovative Low-Carbon and Green Buildings in Subtropical Areas.* Taipei, Taiwan. Retrieved November 2, 2021, from https://site.cibworld.nl/dl/publications/2018_ILCGBS_Taipei_Taiwan-Book_Of_Papers.pdf

Building Institute (TGBI), where was founded in mid of the year 2008 by the formation of voluntary groups, including Association of Siamese Architects and Engineering Institute of Thailand under the Royal Patronage of His Majesty the King. The main objective of TGBI foundation is to promote research and development in architectural and engineering professional standards for the design, construction and building management of green building. Even though TREES does not focus on green buildings outside of Thailand, it would help the Kingdom of Thailand achieve the sustainable development goals by guiding Thai construction industry to designing and constructing architecture becomes environmental friendly. Ultimately, the green buildings accredited by TREES in Thailand will generate the well-being to the environment and make impacts to other countries in Southeast Asia. Then, every country in the world will be aware of the importance of green building.

However, there are 10 famous global rating systems that focus on international assessment of green building, as follows:

1. **BREEAM** (Building Research Establishment Environmental Assessment Method) by UK Green Building Council, the United Kingdom of Great Britain and Northern Ireland

2. **HKBEAM** (Hong Kong Building Environmental Assessment Methods, now replaced by BEAM Plus) by Hong Kong Beam Society, the Hong Kong Special Administrative Region of the People's Republic of China

3. **HQE** (Haute Qualité Environnementale) by France Green Building Council, the French Republic

4. **LEED** (Leadership in Energy and Environment Design) by U.S. Green Building Council, The United States of America

5. **EEWH** (Ecology, Energy saving, Waste Reduction and Health) by Taiwan, Republic of China

6. **CASBEE** (Comprehensive Assessment System for Building Environmental Efficiency) by Japan Sustainable Building Consortium, Japan

7. **Green Star** by Green Building Council of Australia, the Commonwealth of Australia

8. **DGNB** (Deutsche Gesellschaft für Nachhaltiges Bauen) by German Sustainable Building Council, the Federal Republic of Germany

9. **Green Mark** by Singapore Green Building Council, the Republic of Singapore

10. **GBL** (Green Building Label) by China Three-Star rating system, the People's Republic of China

Table 1.1 Green Building Certification in Various Countries by Launched Year[4]

Launched	Country	Certification	Logo
1990		BREEAM	
1996		HKBEAM	
1996		HQE	
1998		LEED	
1999		EEWH	
2001		CASBEE	
2003		Green Star	
2005		Green Mark	
2007		GBL	

Economic growth does not always translate into better well-being for everyone. In addition, the economies progress seems to be a rising tide. It may have lifted too few boats. The Government, therefore, has an important role to play in ensuring that the

[4] Zhonghua Gou, e. a. (2013). MARKET READINESS AND POLICY IMPLICATIONS FOR GREEN BUILDINGS: CASE STUDY FROM HONG KONG. *Journal of Green Bilding, 8*(2), 162-173. Retrieved from https://meridian.allenpress.com/jgb/article/8/2/162/116390/MARKET-READINESS-AND-POLICY-IMPLICATIONS-FOR-GREEN

fruits of economic progress reach all citizens in society and that social harmony is strengthened. Fiscal policy is the use of government spending and taxation to influence the economy. Simultaneously, governments normally use fiscal policy to promote strong and sustainable growth. The role and objectives of fiscal policy gained prominence during the recent global economic crisis and including to environmental crisis, when governments stepped in to support financial systems and launch measures suited to the context of each country[5].

It would be a great idea if governments in each country could balance between the economic growth and the good environment properly. If the governments pay attention to the importance of green building by using fiscal policies to promote green buildings and treat them likewise driven policies to achieve SDGs, all people in the world will be benefit off from these fiscal tools.

Unfortunately, Thailand does not use the fiscal policy to promote green buildings. However, the Energy Conservation Promotion Act establishes obligations and responsibilities (e.g., construction or retrofit criteria) for certain types of buildings with a total floor area of 2000 m^2 or more, such as hospitals, schools, offices, convention centers, theaters, hotels, entertainment venues and department stores. Moreover, the certain types of buildings have additional obligations, where non-compliance may result in special electricity charges and criminal fines[6]. In addition, Thailand would loss the opportunity to achieving the SDGs faster. Nevertheless, it would never achieve the goals because it does not have proficiency public policies.

Accordingly, it is critical that Thai government should review the fiscal policies in reaching the goals becomes success. In order to bridge the gap on fiscal policies, tax measures should be used as tools to incentive green building development or penalize environmental offence. However, the Thai government or the policymaker has to aware

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[5] Mark Horton, A. E.-G. (2020). *Fiscal Policy: Taking and Giving Away*. Retrieved August 17, 2021, from International Monetary Fund: https://www.imf.org/external/pubs/ft/fandd/basics/fiscpol.htm

[6] Carmen Díaz-López, e. a. (2021, July). Identifying Public Policies to Promote Sustainable Building: A Proposal for Governmental Drivers Based on Stakeholder Perceptions. *Sustainability*, 1-21. Retrieved August 17, 2021, from https://mail.google.com/mail/u/0/#inbox/FMfcgzGkZssfwngLTsRlxPGshqpxZptB?projector=1&messagePartId=0.1

of fiscal status of Thailand as well since Gross Domestic Product (GDP) per capita of Thailand is only $7,189 USD in 2020 which is lower than 9, 8, 1.5 times to the United States, the Republic of Singapore, and the People's Republic of China[7].

Recognising the problems on lacking good fiscal policies on green building in Thailand as well as acknowledging information from conducting the literature review, the research on "Tax measures to achieve the sustainable development goals: a case study of promoting green building development in the Kingdom of Thailand" is established with an aim to analyze tax, incentive, and penalty contexts as fiscal tools to know the strengths, weaknesses, opportunities and obstacles of foreign country measures on tackling the environmental issues. Also, it is to evaluate tax measures on promoting green building development in the Kingdom of Thailand through conducting documentary research from reliable sources such as: journals on Scorpus, Master's degree thesis, Doctoral degree dissertations, textbooks from online university libraries, Google Scholar, and so on.

Ultimately, the obvious consequence is getting tax measures that promote green building development in Thailand and further lead to achieve the sustainable development goals.

1.2 Research Objectives

1) To study the economics tools on promoting green building development to achieve the sustainable development goals.

2) To study the balance between fiscal disciplines and tax incentives on promoting green building development to achieve the sustainable development goals.

3) To study tax measures and other legal measures on promoting green building development in foreign counties.

4) To analyze the problems of tax measures and other legal measures on promoting green building development in Thailand.

5) To create a guideline for improving tax measures on promoting green building development to achieve the sustainable development goals in Thailand.

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[7] World Bank. (2021). *GDP per capita*. Retrieved November 2, 2021, from The World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

1.3 Research Outcomes

1) To understand the economics tools on green building promotion to achieve the sustainable development goals.

2) To understand the balance between fiscal disciplines and tax incentives on promoting green building development to achieve the sustainable development goals.

3) To understand tax measures and other legal measures on promoting green building development in foreign counties.

4) To understand the problems of tax measures and other legal measures on promoting green building development in Thailand.

5) To get a guideline for improving tax measures on promoting green building development to achieve the sustainable development goals in Thailand.

1.4 Research Hypothesis

Thai tax measures on green building promotion need to be improved due to their low efficiency.

CHAPTER 2

THE BALANCE BETWEEN FISCAL DISCIPLINES AND TAX INCENTIVES IN PUBLIC POLICIES FOR SUPPORTING THE ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT GOALS: PROMOTING GREEN BUILDING DEVELOPMENT

Fiscal discipline needs governments to maintain fiscal positions that are consistent with economic stability and sustained economic growth. However, public policies sometimes can have a tension with the fiscal discipline because tax incentives to promote sustainable development in public policies usually lower the fiscal positions. Therefore, balancing between fiscal discipline and tax incentives is kind of a good compromise resolution to achieve the sustainable development goals.

2.1 Definition and Necessity of Sustainable Development

The definitions of sustainable development are various. They depend on the perspective of each person. However, all people agree that sustainable development is important since it can make the world to be a better place.

2.1.1 Definition of Sustainable Development

Sustainable development has become the buzzword in development discourse. It also has been associated with different definitions, meanings, and interpretations. Literally, sustainability means a capacity to maintain some entity, outcome, or process over time[8]. However, in development literature, most academics, researchers, and practitioners apply the concept of sustainable development to imply improving and sustaining a healthy economic, ecological, and social system for human development. Also, sustainable development can be defined as the efficient and equitable distribution of resources intra-generationally and inter-generationally with the operation of socio-economic activities within the limited ecosystem[9].

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[8] Basiago, A. D. (1996, June). The search for the sustainable city in 20th century urban planning. *Environmentalist, 16*, 135-155. Available online at https://doi.org/10.1007/BF01325104

[9] H. Stoddart, a. e. (2011). A pocket guide to sustainable development governance. *Stakeholder Forum*.

2.1.1.1 Economic Maximization: The Meaning of Sustainable Development in Classical Economics Theory Aspect

When discussing various activities involved in the meaning of sustainable development, there are some economic theoreticians mentioned the root of development concepts. In the 18th century, Adam Smith pointed out that the activities were needed to ensure full social and environmental exclusion and economic maximization. Basically, the meaning of sustainable development in the classical economics theory aspect is only sustainable in economic development regardless to social and environmental development[10].

2.1.1.2 Sustaining of Economic, Social, and Environment: The Meaning of Sustainable Development in Neoclassical Economics Theory Aspect

However, Karl Marx and Ricardo argued about the certain elements of sustainable development. The neoclassical economics theory emphasized the importance of pure air and water and renewable resources as well as the need for government intervention in public property to protect environment[11]. In addition, the late 20th century, scholars affirmed that there need not be a trade-off between environmental sustainability and economic development[12]. Nowadays, the most common definition of the sustainable development originally emerged from Brundtland Report, published in 1987 by the United Nations World Commission on Environment and Development[13]. The commission wrote "Sustainable development is development

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[10] Klarin, T. (2018). The Concept of Sustainable Development: From its Beginning to the Contemporary Issues. *Zagreb International Review of Economics & Business, 21*(1), 67-94. Retrieved August 22, 2021, from https://www.researchgate.net/publication/326164068_The_Concept_of_Sustainable_Development_From_its_Beginning_to_the_Contemporary_Issues

[11] Ibid.

[12] Emas, R. (2015). The Concept of Sustainable Development: Definition and Defining. Retrieved August 22, 2021, from https://sustainabledevelopment.un.org/content/documents/5839GSDR%202015_SD_concept_definiton_rev.pdf

[13] *Brundtland Report*. (2018, July 3). Retrieved August 22, 2021, from Sustainable Environment: https://www.sustainable-environment.org.uk/Action/Brundtland_Report.php

that meets the needs of the present without compromising the ability of future generations to meet their own needs"[14].

2.1.2 Necessity and Essence of Sustainable Development

Sustainable development is fast becoming fashionable in strategic management. Some scholars restrict sustainable development to environmental issues, and others use it synonymously with corporate social responsibility. However, the aspects of sustainable development include economy, environment, and society. Hence, companies and all organizations should not focus on the economic side only, but they must have an eye on environmental and social sides as well to achieve the true sustainability.

2.1.2.1 Living in the Better World: The Necessity of Sustainable Development

Nowadays, people in the globe are searching for sustainable development because the simple realization that people have been living unsustainably. In the field of sustainable development, there are many major challenges to be addressed. They require people to aware of the limitation of resources. Some of these challenges can have defined them into three aspects, as follows:

1) Sustainable Development in Economic Context

Economic sustainability is a system of production that satisfies present consumption levels without compromising future needs. Economic growth plays a key role in income and employment distribution to society. Therefore, every country in the world concerns on their growths. However, economic growth must trade off the natural resources. In the past, economists believed that economic growth would be accompanied by the technological advancement to replenish natural resources destroyed in the production process[15]. However, it has been realized that the natural resources are not infinite; besides not all of them are renewable. The growing scale of the economic system has overstretched the natural resource base. This issue has prompted many academicians to question the feasibility of uncontrolled growth and

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[14] (2020, July 15). Retrieved August 22, 2021, from International Institute for Sustainable Development. Available online at https://www.iisd.org/about-iisd/sustainable-development

[15] Cooper, P. J., & Vargas, C. M. (2004). *Implementing Sustainable Development: From Global Policy to Local Action.* Lanham, MD: Rowman and Littlefield Publishers, Inc.

consumption. Sustainable development, therefore, can be sustained in terms of economic by balancing between natural resources and industrial production to keep generating income and employment distribution.

2) Sustainable Development in Social Context

Social sustainability includes the ideas of equity, participation, accessibility, cultural identity, empowerment, and institutional stability. In addition, social sustainability is a system of social organization that mitigates poverty. Even though social sustainability is not about ensuring that everyone's needs are met, its aims are providing enable conditions for everyone to have the capacity to realize their needs. Social sustainability also encompasses many issues such as human rights, gender equity and equality, public participation, and rule of law all of which promote peace and social stability for sustainable development[16]. Hence, it is hard to deny that how important sustainable development is to solve the social issues.

3) Sustainable Development in Environment Context

Climate change has already shown signs of affecting biodiversity. Also, climate change affects nearly every aspect of our lives, from our food sources to our transport infrastructure, from what clothes we wear, to where we go on holiday. It has a huge effect on our livelihoods, our health, and our future. Moreover, higher temperature or global warming tends to affect the timing of reproduction in animal and plant species, migration patterns of animals and species distributions and population sizes[17]. Thus, the sustainable development in environment context is very important to avoid global warming because environmental sustainability relates to ecosystem integrity and carrying capacity of natural environment which the earth has limitedly.

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[16] Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. *Cogent Social Sciences*, 1-22. Available online at https://doi.org/10.1080/23311886.2019.1653531

[17] Kumar, S. (2014). Prioritising development planning in the Indian semi-arid Deccan using sustainable livelihood security index approach. *International Journal of Sustainable Development & World Ecology*, 332-345. Available online at https://doi.org/10.1080/13504509.2014.886309

In addition, the United Nations affirmed that sustainable development principles are to provide the better life of creature including assurance of clean water and clean energy; development of infrastructure, industry, and innovation to enable employment; assurance of economic development and inequalities between countries, sustainable cities, and communities; responsible production and consumption; preservation of the ecosystem on the ground and in the waters; assurance of the world peace, and so on. In other words, human live together in the better world is the necessity of sustainable development[18].

2.1.2.2 Achieving the 17 Goals: The Essence of Sustainable Development by The United Nations

In order to succeed in sustainable development, there are 17 goals of the essence of sustainable development which are guided by the United Nations. The 17 Sustainable Development Goals (SDGs) are an urgent call for action by all developed and developing countries in the world. These countries recognize that they have to cooperate to drive the strategies to achieve the goals including ending poverty, improving health and education, reducing inequality, spurring economic growth, and tackling climate change become true. The 17 goals of SDG are as follows[19]:

1) No poverty: ending poverty in all its forms everywhere.

2) Zero hunger: ending hunger, achieve food security and improved nutrition and promote sustainable agriculture.

3) Good health and wellbeing: ensuring healthy lives and promote well-being for all at all ages.

4) Quality education: ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all.

5) Gender Equality: achieving gender equality and empower all women and girls.

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[18] United Nations. (2021). *Global indicator framework for the Sustainable Development Goals.* Available online at https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202021%20refinement_Eng.pdf

[19] United Nations. (2019, August). *Sustainable Development Goals*. Retrieved from United Nations. Available online at https://www.un.org/sustainabledevelopment/news/communications-material/

6) Clean water and sanitation: ensuring availability and sustainable management of water and sanitation for all.

7) Affordable and clean energy: ensuring access to affordable, reliable, sustainable, and modern energy for all.

8) Decent work and economic growth: promoting sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.

9) Industry, innovation, and infrastructure: building resilient, promoting inclusive and sustainable industrialization and fostering innovation.

10) Reduced inequalities: reducing inequality within and among countries.

11) Sustainable cities and communities: making cities and human settlements inclusive, safe, resilient, and sustainable.

12) Responsible consumption and production: ensuring sustainable consumption and production patterns.

13) Climate action: taking urgent action to combat climate change and its impacts.

14) Life below water: using the oceans, seas, and marine resources for sustainable development.

15) Life on land: to protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

16) Peace, justice, and strong institutions: promoting peaceful and inclusive societies for sustainable development, providing access to justice for all and building effective, accountable, and inclusive institutions at all levels.

17) Strengthen the means of implementation and revitalize the global partnership for sustainable development.

In order to make the SDGs easy to remember, it can be grouped into 5 Ps or categories: People, Prosperity, Peace, Partnership, and Planet[20]. First, People

[20] Department of Economic Affairs, C. a. (2021). *Sustainable Development Planning*. Retrieved September 1, 2021. Available online at https://www.deaci.aw/sustainable-development/expert-working-groups/

means reflecting the determination to end poverty and hunger, in all forms and dimensions, and ensuring that all human beings can fulfill their potential in dignity and equality and in a healthy environment.

Second, Prosperity means ensuring that all human beings can enjoy prosperous and fulfilling lives and that economic, social, and technological progress occurs in harmony with nature. Third, Planet means strengthening the conviction that the planet needs to be protected from degradation, including through sustainable consumption and production, sustainably managing its natural resources, and taking urgent action on climate change, so that it can support the needs of the present and future generations.

Next, Peace means emphasizing the determination to foster peaceful, and inclusive societies which are free from fear and violence, while recalling that there can be no sustainable development without peace and no peace without sustainable development. Then, Partnership means mobilizing the means required to implement the 2030 Agenda through a revitalized Global Partnership for sustainable development, based on a spirit of strengthened global solidarity, focused in particular on the needs of the poorest and most vulnerable and with the participation of all countries, all stakeholders and all people, leaving no one behind (see Fig. 2.1).

Figure 2.1 5Ps Model of Sustainable Development[21]

[21] Ibid.

Figure 2.1 shows the sustainable development goals can be grouped into 5 categories which are People, Prosperity, Peace, Partnership, and Planet. Also, it can be called 5Ps model.

Moreover, the first category, People includes SDG 1, 2, 3, 4, 5. The second category, Prosperity includes SDG 7, 8, 9, 10, 11. Next, the Planet category includes SDG 6, 12, 13, 14, 15. The Peace category is SDG 16. Then, Partnership is SDG 17[22].

In addition, these 17 Sustainable Development Goals also have the indicators which are developed by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) and agrees upon at the 48th session of the United Nations Statistical Commission held in March 2017. Sustainable Development Goal indicators should be disaggregated, where relevant, by income, sex, age, race, ethnicity, migratory status, disability and geographic location, or other characteristics, in accordance with the fundamental principles of official statistics. Also, the 17 Sustainable Development Goals are defined in a list of 169 SDG targets. Progress towards these targets is agreed to be tracked by 232 unique indicators[23].

In short, the essence of sustainable development by the United Nations concern on People, Prosperity, Peace, Partnership, and Planet with 17 sustainable development goals and 232 indicators. However, only SDG 7 and 11 are the most related issues to promote green building development.

2.1.2.3 Following the Sufficiency Economy Philosophy: The Essence of Sustainable Development by His Majesty King Bhumibol Adulyadej

Sufficiency Economy Philosophy (SEP) was introduced in 1974 by His Majesty the late King Bhumibol Adulyadej. The SEP model consists of

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[22] The Association of Flemish Cities and Municipalities. (2020). *INSPIRATION GUIDE: INTEGRATING THE SDGS INTO YOUR MULTI-ANNUAL POLICY PLAN.* Singapore. Available online at https://www.local2030.org/library/707/SDGs-in-policy-plan.pdf

[23] United Nations. (2021). *Global indicator framework for the Sustainable Development Goals.* Available online at https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202021%20refinement_Eng.pdf

moderation, reasonableness, and self-immunity with the 2 conditions of knowledge, and integrity[24] (See Fig. 2.2).

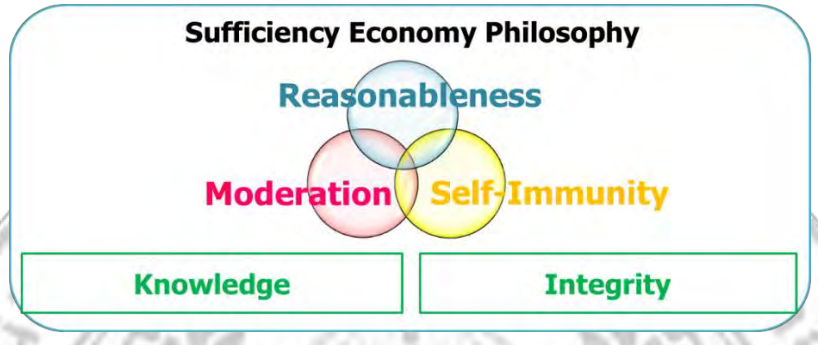

Figure 2.2 SEP Model of Sustainable Development[25]

Figure 2.2 shows the SEP model of sustainable development that consists of three components: reasonableness, moderation, self-immunity, under two conditions: knowledge, and integrity. Firstly, reasonableness means making a decision by using academic approaches, legal principles, moral values, and social norms. Next, moderation means in the sense of not too much and not too little. Then, self-immunity means the preparation for the internal and external changes through having a good risk management.

In addition, the Sufficiency Economy philosophy is able to be applied to all levels, branches, and sectors of the economy. It is not necessarily limited to the agricultural or rural sectors. This philosophy can be extended to the financial, the real estate, and the international sectors by following the ideas of Sufficiency Economy Philosophy.

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[24] *Sufficiency Economy Philosophy*. (2020, August 29). Retrieved November 3, 2021, from Thailand International Cooperation Agency (TICA): https://tica-thaigov.mfa.go.th/en/content/tipp-theme-sufficiency-economy-philosophy?page=5f4e1d96fdf0d627941cb8c2&menu=605b13b274ddd251292abaf2

[25] *The SEP for SDGs Partnership in Action*. (2021, June 22). Retrieved November 3, 2021, from Royal Thai Consulate-General, Fukuoka: https://fukuoka.thaiembassy.org/en/content/it0621?cate=60c70ad723fad859d3034032

2.2 Moving Public Policies to Meet the Sustainable Development Goals (SDGs) through the Promoting Green Building Development Approach

The main idea of generating a policy that meets SDGs is to improve life for all members of the public under three dimensions of SDGs. Green building development is a good approach to make the public policies that can achieve SDGs becomes true because the concept of green building development is 100% related to the SDGs; especially SDG 7: ensuring access to affordable, reliable, sustainable, and modern energy for all and SDG 11: making cities and human settlements inclusive, safe, resilient, and sustainable.

2.2.1 Concept and Rating System of a Green Building

Normally, there are many concepts of a green building. However, the basic concept of a green building is about ecological architecture. This concept leads to support the sustainable development goals; especially in the dimension of society, and environment. In order to clarify that which one is a green building, there is a rating system for the buildings.

2.2.1.1 Preserving Natural Resources and Improving Quality of Life: The Concept of a Green Building

Green building is a holistic concept that starts with the understanding that the built environment can have profound effects, both positive and negative, on the natural environment, as well as the people who inhabit buildings every day. However, the idea of green building can mitigate the negative effects throughout the entire life cycle of a building from construction to razing the buildings[26]. Also, a green building also focuses on increasing the efficiency of resource use such as energy, water and materials while reducing building impact on human health and the environment during the building lifecycle, through the better design, siting, construction, operation, maintenance, and removal[27].

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[26] U.S. Green Building Council. (2021). *What is green building?* Retrieved September 6, 2021. Available online at https://www.usgbc.org/articles/what-green-building

[27] Green Building Index. (2020). *What and why green buildings?* Retrieved September 6, 2021. Available online at https://www.greenbuildingindex.org/what-and-why-green-buildings/

Therefore, there are many different terms to describe the concepts of green building. However, a comprehensive definition of green building can be given as "a green building is a building that, in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment"[28]. From this definition, the main concept of green building can be briefed as green building overall process starting from the planning, design, construction, operation, and maintenance needs to reduce the overall negative impacts on its surrounding. In other words, green buildings preserve precious natural resources and improve our quality of life.

2.2.1.2 The Intersection Criteria of Green Building Standard Rating Systems

There is a tool for green building qualification called green building rating system. This system is used to examine the performance or expected performance of a building and translate that examination into an overall assessment that allows for comparison against other buildings. There are various green building systems in the world, but all the green building rating systems provide guidelines on how to make a building green and certifications aimed at mitigating the impact of buildings on the natural environment through sustainable design. The push toward sustainable design increased in 1990 with the creation of Building Research Establishment Environmental Assessment Method (BREEAM), the first green building rating system in the U.K. Then, BREEAM was followed by HKBEAM, HQE, LEED, EEWH, CASBEE, Green Star, Green Mark, and GBL respectively.

The assessment criteria of rating systems are different due to specific climate and cultural context of each country in the world. Therefore, each country has to develop green building rating systems for their own systems. However, LEED was studied the most among all green building ratings followed by BREEAM, CASBEE,

[28] World Green Building Council. (2021). *About Green Building*. Retrieved September 6, 2021. Available online at https://www.worldgbc.org/what-green-building

Green Mark, BEAM, and Green Star. CASBEE and Green Mark were the most studied rating systems from Asia[29].

However, all the green building rating systems have some intersection criteria as follows: energy efficiency, water efficiency, materials, locations and linkages, waste, local environment, and indoor environment[30]. Hence, all governments in the world should attend to these criteria to put them to their public policies to promote green building in their countries.

2.2.2 Measuring a Country's Performance in Achieving SDGs

Performance measurement is the process of collecting, analyzing, and reporting information regarding the performance of each country in pushing their public policies to succeed the Sustainable Development Goals.

2.2.2.1 Goal 7 and 11: A Measurement of the Achievement of Sustainable Development Related to Green Building Development by the United Nations

SDG 7 and 11 are the goals related to green building development. Therefore, this paper focuses on the Goal 7 and 11. The indicators to measure the achievement of these two goals from a country's performance can be seen from the global indicator framework issued by the United Nations (see Table 2.1).

[29] Luangcharoenrat, C., & Intrachooto, S. (2019). Comparative Analysis of Green Building Rating Standards for Improvement Opportunities. *Periodica Polytechnica Architecture, 50*(1), 41–49. Available online at https://doi.org/10.3311/PPar.12656

[30] Vierra, S. (2019, May 8). *Green Building Standards And Certification Systems*. Retrieved September 12, 2021, from Whole Building Design Guide. Available online at https://www.wbdg.org/resources/green-building-standards-and-certification-systems

Table 2.1 Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development[31]

Goals and targets (from the 2030 Agenda for Sustainable Development)	**Indicators**
Goal 7. Ensure access to affordable, reliable, sustainable, and modern energy for all	
7.1 By 2030, ensure universal access to affordable, reliable, and modern energy services	7.1.1 Proportion of population with access to electricity
	7.1.2 Proportion of population with primary reliance on clean fuels and technology
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption
7.3 By 2030, double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP
7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	7.a.1 International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems

[31] United Nations. (2021). *Global indicator framework for the Sustainable Development Goals.* Available online at https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202021%20refinement_Eng.pdf

Goals and targets (from the 2030 Agenda for Sustainable Development)	Indicators
7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programs of support	7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)
Goal 11. Make cities and human settlements inclusive, safe, resilient, and sustainable	
11.1 By 2030, ensure access for all to adequate, safe, and affordable housing and basic services and upgrade slums	11.1.1 Proportion of urban population living in slums, informal settlements, or inadequate housing
11.2 By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	11.2.1 Proportion of population that has convenient access to public transport, by sex, age, and persons with disabilities
11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlement planning and management in all countries	11.3.1 Ratio of land consumption rate to population growth rate
	11.3.2 Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically

Goals and targets (from the 2030 Agenda for Sustainable Development)	Indicators
11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	11.4.1 Total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal)
11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
	11.5.2 Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities
	11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women	11.7.1 Average share of the built-up area of cities that is open space for public use for all, by sex, age, and persons with disabilities

Goals and targets (from the 2030 Agenda for Sustainable Development)	Indicators
and children, older persons and persons with disabilities	11.7.2 Proportion of persons victim of physical or sexual harassment, by sex, age, disability status and place of occurrence, in the previous 12 months
11.a Support positive economic, social, and environmental links between urban, peri-urban, and rural areas by strengthening national and regional development planning	11.a.1 Number of countries that have national urban policies or regional development plans that (a) respond to population dynamics; (b) ensure balanced territorial development; and (c) increase local fiscal space
11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels	11.b.1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030
	11.b.2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

This table shows SDG 7, 11, and their indicators to achieve the goals. Basically, SDG 7 has 5 targets and 6 indicators. SDG 11 has 9 targets and 14 indicators. Therefore, the factors that affect the achievement of sustainable development goals can be various. They depend on each goal and each target. However, the factors that affect the achievement of sustainable development goals which relate to green building development are as follows: proportion of population with access to electricity and

clean fuels, renewable energy share, primary energy, GDP, international financial flows, proportion of urban population living in slums, access to public transport, ratio of land consumption rate to population growth rate, total per capita expenditure on the conservation of all cultural and natural heritage, number of affected persons attributed to disasters per 100,000 population, economic loss in relation to global GDP attributed to disasters, proportion of municipal solid waste, PM2.5 and PM10, open space for public use for all, sexual harassment, urban policies, national disaster risk reduction strategies, and local disaster risk reduction strategies.

2.2.2.2 Green Growth Index: A Measurement of SDGs Achievement of Sustainable Green Building Development by Global Green Growth Institute

Green Growth Index is a composite index measuring a country's performance in achieving SDGs. The index is the first metric for green growth that explicitly links to sustainable development. In order to make the index relevant at the national and international level, it has been imperative for Global Green Growth Institute (GGGI) to align the index with global sustainability goals and targets. This complementary set of internationally accepted targets and related indicators serves as a reliable reference for the green growth index and allows governments to align their pathway to green growth with achieving the SDGs and national climate and biodiversity goals. The main point of the index is a measuring each country's performance in achieving SDGs. In addition, there are four dimensions in green growth index: Efficient and sustainable resource use, Green economic opportunities, Natural capital protection, and Social inclusion[32].

In terms of Efficient and sustainable resource use, it means government policies must include efficiency and sustainability both in energy and water use. Also, they must include sustainable land use, and material use efficiency to their policies. In the part of Green economic opportunities, government policies must pay attention in all green areas: investment, trade, employment, and innovation.

[32] Global Green Growth Institute. (2020). *Green Growth Index.* Available online at https://greengrowthindex.gggi.org/wp-content/uploads/2021/01/2020-Green-Growth-Index.pdf

Next, Natural capital protection, the policies must include cultural and social value, greenhouse gas emission reductions, biodiversity and ecosystem protection, and environmental quality. Then, in the part of Social inclusion, the policies must concern to social equity and protection, gender balance, and access to basic services and resources (see Fig. 2.3).

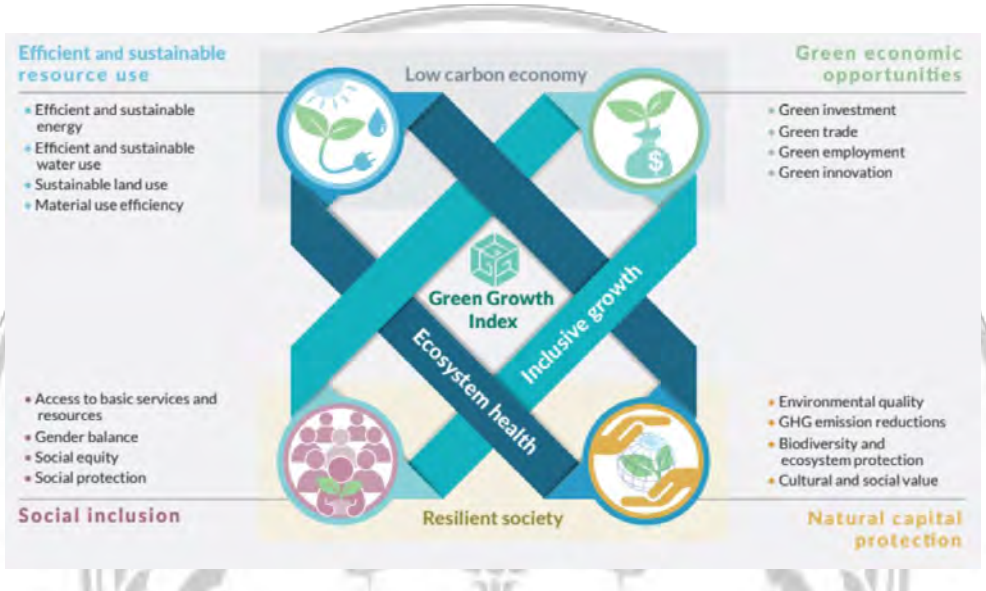


Figure 2.3 Conceptual Framework for the Green Growth Index[33]

Figure 2.3 shows the four dimensions of Green Growth Index. Also, it shows the details of the green growth category in each dimension. In short, the Green Growth Index is divided into four categories or dimensions: Efficient and sustainable resource use, Green economic opportunities, Natural capital protection, and Social inclusion. Theses dimensions aim to measure the achievement of Sustainable Development Goals. Therefore, the policymakers for promoting the green building development can follow Green Growth Index in issuing the better policies.

2.2.2.3 The Comparing between SDGs and Green Growth Index Indicators on Green Building Development Basis

The Green Growth Index covers 27 SDG targets. The index also

[33] Ibid.

covers SDG 1 to SDG 17. Since this paper focus on green building development, green growth indicators linked to SDG target include Efficient and sustainable energy (EE1, 2), Environmental quality (EQ1, 3), Access to basic services and resources (AB2), Social equity (SE2), and Social protection (SP3) (see Table 2.2).

Table 2.2 Green growth indicators linked to SDGs[34]

Green Growth Index		**SDGs**	
Dimension	**Indicator**	**Goal**	**Indicator**
Efficient and sustainable energy	EE1: Ratio of total primary energy supply to GDP		7.3.1 Energy intensity measured in terms of primary energy and GDP
	EE2: Share of renewable to total final energy		7.2.1 Renewable energy share in the total final energy consumption
Natural capital protection	EQ1: PM2.5 air pollution, mean annual population-weighted exposure		11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
	EQ3: Municipal solid waste generation per capita		11.6.1 Proportion of municipal solid waste collected and managed in controlled

[34] Ibid.

Green Growth Index		SDGs	
Dimension	**Indicator**	**Goal**	**Indicator**
			facilities out of total municipal waste generated, by cities
Social inclusion	AB2: Access to electricity and clean fuels/technology		7.1.1 Proportion of population with access to electricity
			7.1.2 Proportion of population with primary reliance on clean fuels and technology
	SE2: Ratio of urban-rural access to basic services, i.e. electricity		7.1.1 Proportion of population with access to electricity
	SP3: Proportion of urban population living in slums		11.1.1 Proportion of urban population living in slums, informal settlements, or inadequate housing

In brief, this table shows that there are three dimensions of green growth index link to SDG 7 and 11. The dimensions are Efficient and sustainable energy, Natural capital protection, and Social inclusion. Therefore, if any countries want to

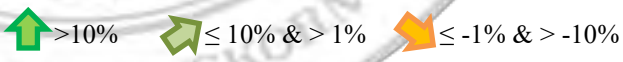
achieve the SDGs focusing on green building development, they must pay attention to those green growth dimensions.

2.2.2.4 Countries' Performances in Achieving SDGs

The most countries in Asia perform very well on green growth index such as Japan, China, and Philippines. These countries are the top four on the list. In terms of Thailand, it has recorded a slightly increasing trend across the dimensions of efficient and sustainable resource use, green economic opportunities, and social inclusion, which is a positive sign for green growth transition. However, this trend increases quite slowly compared to other countries in Asia such as China, Philippines, Myanmar, Nepal, Bangladesh, Laos, Cambodia, and so on. These countries have above 10% increasing performance in green growth scores from year 2005 and 2019.

On one hand, Thailand ranks better than before. It ranked the 12th in Asia in 2005, but it ranked the 9th in Asia in 2019. On the other hand, Thailand will lose its position to the upcoming countries that have made great efforts to green growth policies soon in the future. The country that made the biggest leap in green growth index in Asia is Myanmar. It ranked the 26th in Asia in 2005, but it ranked the 8th in Asia in 2019. Even though Thailand ranked better than Myanmar in the past, Thai public policies are not effective enough to drive Thailand to achieve the green growth goals.

Table 2.3 Green Growth Index Performance of Asian Countries[35]



Country	Rank in 2005	Rank in 2019	Changing in index scores
Japan	1st	1st	
China	2nd	2nd	
Philippines	8th	4th	
Myanmar	26th	8th	
Thailand	12th	9th	
Nepal	21st	11th	

[35] Ibid.

Table 2.3 shows the changing of index score ranking between the year of 2005 and 2019 in six countries: Japan, China, Philippines, Myanmar, Thailand, and Nepal. Even though Japan dropped the scores slightly, it still ranked the best country in Asia where had the highest score on Green Growth Index in both the year of 2005 and 2019. The table also shows that Philippines, Myanmar, Thailand, and Nepal had the better scores than year 2005. However, the raised score of Thailand is quite low compared to Myanmar and Nepal. Therefore, the Thai government should pay more attention on green public policies to help succeed in the Sustainable Development Goals faster.

2.3 Economics Tools in the Public Policies on Balancing between Fiscal Disciplines and Tax Incentives to Tackle Environmental Issues

When it comes to the idea of using tax incentives to tackle the environmental issues, some countries care about it while other countries do not. The main reason that countries ignore on promoting environmental conservation by using tax incentives is the limitation of budget. Therefore, tax incentives and fiscal disciplines are quite the controversial equipment in public policies.

2.3.1 The Opposite of Objectives between Fiscal Disciplines and Tax Incentives

After governments of many OECD countries have started on expansionary fiscal policies in 1990s. In 2000, the US government deficit reached 33 percent of GDP, compared with 99 percent in 2016, and is projected to increase further in the future. Over the same period, Singapore's deficit rose to 109 percent of GDP from 84 percent[36]. As a result, the fiscal stability has come under strain, possibly weakening the resistance to larger deficits in OECD countries in the future.

One of the main concerns raised by governments' increased fiscal laxity is its effect on long-term interest rates. In other words, budget deficits push interest rates up, leading to decreased investment and growth in the long run. However, many economists

[36] World Bank. (2021). *Central government debt, total (% of GDP) - United States, Singapore*. Retrieved November 6, 2021, from The World Bank: https://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS?end=2018&locations=US-SG&start=2000&view=chart&year=2007

and policymakers argued that the decreased investments can be resolved by tax incentives that are able to attract investments, but the incentives may increase the deficits as well [37]. Therefore, the policymakers have to balance between fiscal disciplines and tax incentives properly to get the best public policy and make the sustainable development in the end.

2.3.1.1 Maintaining Fiscal Positions: The Objective of Fiscal Disciplines

Fiscal discipline needs governments maintain fiscal positions to make their economic stabilities. Also, the way that fiscal discipline normally goes to make the fiscal stability is avoiding excessive borrowing or debt accumulation[38].

2.3.1.2 Reducing in Taxes: The Objective of Tax Incentives

Normally, the purpose of tax incentives is to reduce taxation to make investment attraction in the end. In addition, types of tax incentives are various such as exemption from property taxes, corporate income taxes, personal income taxes, VAT exemption for goods and services directly related to the investment, and exemption from transfer taxes for real estate purchases directly related to the investment. However, reducing in taxes mean reducing in the government revenue as well[39]. In terms of the environment, tax incentives are designed for polluters who engage in investment or business related to reducing pollution emissions and saving energy. They can be divided into three types of incentives as follows:

(1) Tax deduction

A tax deduction for corporate tax purposes is available for

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[37] Parys, S. V. (2012, March). The effectiveness of tax incentives in attracting investment: evidence from developing countries. *Reflets et perspectives de la vie économique*, 129. doi: https://doi.org/10.3917/rpve.513.0129

[38] Ter-Minassian, T., & Kumar, M. S. (2021). *Fiscal Discipline: Key Issues and Overview*. Retrieved November 6, 2021, from IMF eLibrary: https://www.elibrary.imf.org/view/books/071/05461-9781589066090-en/ch01.xml#:~:text=Fiscal%20discipline%20requires%20that%20governments,excessive%20borrowing%20and%20debt%20accumulation.

[39] Clark, S., Cebreiro, A., & Böhmer, A. (2017, June). *Tax Incentives for Investment – A Global Perspective.* Retrieved November 7, 2021, from OECD: https://www.oecd.org/mena/competitiveness/38758855.pdf

expenditures on certain environmental protection activities. Specific tax deductions are also available expenditures incurred in establishing trees in a carbon sink forest, creating renewable energy, and using eco-friendly products[40].

(2) Tax credit

A tax credit is an amount of money that taxpayers can subtract directly from taxes owed to their government. Unlike deductions, which reduce the amount of taxable income, tax credits reduce the actual amount of tax owed. In terms of environmental promotion, the tax credit can be applied to acquisitions of recycled materials to be used in production processes, to research and development expenditures, and so on.

(3) Tax exemption

Tax exemption is the reduction or removal of a liability to make a compulsory payment that would otherwise be imposed by a ruling power upon persons, property, income, or transactions. Tax-exempt status may provide complete relief from taxes, reduced rates, or tax on only a portion of items. For example, Germany provides a value-added-tax (VAT) refund for the purchase of renewable energy equipment, as well as an energy tax exemption to produce electricity from renewable sources[41].

2.3.2 Finding the Sweet Spot

In order to reach all conditions between fiscal disciplines and tax incentives, the policymakers have to find the sweet spot to achieve the most desirable or effective outcome to benefit for all people.

2.3.2.1 Adjusting Tax Measure through Principles of Good Taxation

The principles of good taxation include equity, economic efficiency,

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[40] KPMG. (2017, July). The KPMG Green Tax Index. United States of America. Retrieved September 19, 2021. Available online at https://assets.kpmg/content/dam/kpmg/tw/pdf/2017/09/655445_NSS_2017Green_TaxIndex_v18web.pdf

[41] Ibid.

administrability, and coherence[42].

(1) Equity

The benefit principle proposes that all persons pay tax in accordance with the benefits that they receive from government goods and services. The difficulty in this regard is the measurement of the benefits received. Numerous functions provided by a state serve all people, but regardless of whether they contribute or not. Therefore, the principle is interpreted on the basis that persons contribute from their ability to pay in order that all may receive access to the collective benefits offered by the state.

(2) Economic efficiency

Basically, an economic efficiency refers to the cost to society that taxation brings through its impact on and twisting out of the shape of economic behaviors and the attempt to minimize these impacts and distortions while achieving the societal goals of the state. In addition, to make this approach successful, the tax system should have stability, simplicity, sufficiency, and productivity[43].

In terms of productivity, taxes create real costs, known as "Deadweight losses". The deadweight loss is a loss of economic welfare. It also consists of buyers who will no longer buy the product because the price is higher than their willingness-to-pay price, so they decide to do without. Likewise, some sellers will not produce a product because they are not receiving a high enough price to cover their economic costs. The benefit that these buyers and sellers would have added to the economy but for the tax is a deadweight loss of taxation. The buyers pay part of the tax, in an economic sense, as a reduction in their consumer surplus, which is the difference

[42] International Bureau of Fiscal Documentation (IBFD). (2019, May). Fundamentals of Taxation: An Introduction to Tax Policy, Tax Law and Tax Administration. Amsterdam, The Netherlands: IBFD. Retrieved September 17, 2021. Available online at https://ocw.ui.ac.id/pluginfile.php/2371/mod_resource/content/1/1_2019_Fundamentals%20of%20Taxation%20An%20Introduction%20to%20Tax%20Policy%20Tax%20Law%20and%20Tax%20Administration.pdf

[43] Ibid.

between their willingness-to-pay price and the product price. Likewise, sellers pay part of the tax as a reduction in their producer surplus.

However, this loss goes to the government in the form of its tax, which makes sense, since only the buyers that continue to buy the product and the sellers who continue to sell the product contribute to the tax. Thus, in terms of total surplus (= consumer surplus + producer surplus), the deadweight loss equals the reduction in total surplus minus the tax revenue collected by the government (see Fig. 2.4).

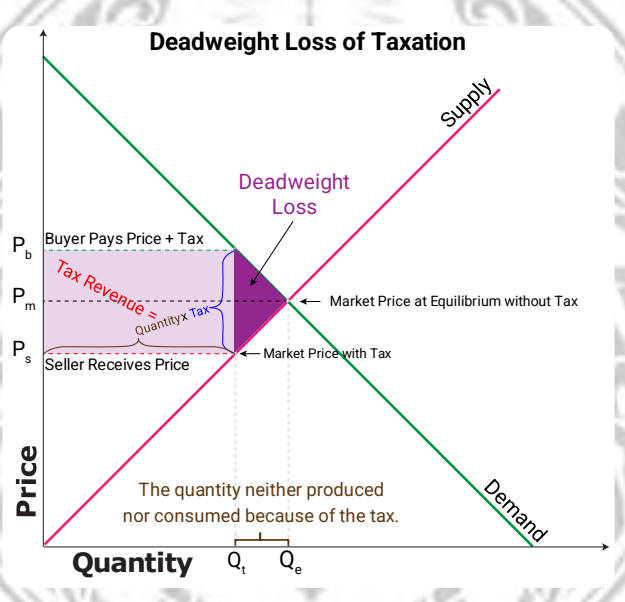

Figure 2.4 Deadweight Loss of Taxation[44]

Figure 2.4 shows a key consideration of efficiency, namely government intervention to adjust market reaction. Although, taxes are often used to change people behavior either by encouraging certain activities such as investment through the use of incentive measures or discouraging others such as the consumption of tobacco and alcohol, and carbon emission through the use of high excise duties, they have deadweight losses to impact on the economy as well. Therefore, the government has to impose taxes carefully.

[44] Spaulding, W. (2021). *Deadweight Loss of Taxation*. Retrieved September 18, 2021. Available online at https://thismatter.com/economics/deadweight-loss-of-taxation.htm

(3) Administrability

In simple terms, the cost of collection of a tax should not be excessive. States are responsible to use the resources efficiently, including in the collection of taxes. There are several elements that are grouped in administrability as follows: enforceability, certainty, transparency, accountability, and legality. These elements will serve to significantly reduce the tax gap between the tax that should be collected and the tax actually collected.

(4) Coherence

Normally, any tax systems will have to take account of the specific realities and activities within the economy. The tax systems should aim to avoid instances of economic double taxation. In addition, adjusting a tax system must consider all elements of the tax system. For example, a certain exemption from income taxation may be justified by the consumption tax as well. Simply abolishing the exemption without considering the consumption tax may lead to twisting out of shape the tax system as a whole. This is an often-overlooked aspect of tax reform. Also, coherence of the tax system is needed to ensure that tax revenue relating to state borrowings is sufficient to cover both current operational and capital expenditure by the state because this places an ever-increasing burden on future taxpayers[45].

2.3.2.2 Using Other Tools instead of Tax Incentives

Besides tax incentives, tax penalties and non-tax measures can be used to preserve the environment. Taxation is a subset of fiscal policy that is looking through the revenue side of fiscal policy such as the collection of revenue by a state. Tax measures touch on several disciplines, including, but not limited to, economics, behavioral science, political science, accounting, finance, and law. Usually, these disciplines may intervene in tax measures. In terms of the economics perspective, taxation relates to both macro and microeconomic aspects. The macroeconomic aspects

[45] International Bureau of Fiscal Documentation (IBFD). (2019, May). Fundamentals of Taxation: An Introduction to Tax Policy, Tax Law and Tax Administration. Amsterdam, The Netherlands: IBFD. Retrieved September 17, 2021. Available online at https://ocw.ui.ac.id/pluginfile.php/2371/mod_resource/content/1/1_2019_Fundamentals%20of%20Taxation%20An%20Introduction%20to%20Tax%20Policy%20Tax%20Law%20and%20Tax%20Administration.pdf

consider the influence of tax policy on the economy as a whole such as unemployment rates, economic growth, consumption levels, and so on. The microeconomic aspects include the impact of tax on individuals, firms, and the market.

In addition, the purposes of collecting taxes are as follows: to raise revenue, to reprice goods and services considered to be incorrectly priced by the market such as tobacco, alcohol, carbon emissions; to control people behaviors, to redistribute income and wealth, and to reorganize the economy through fiscal policy[46]. Therefore, tax penalties can help to change or control people behaviors as well. Nevertheless, non-tax measures such as financial tools, other fiscal tools, and legal requirements can also be an alternative way to find the sweet spot to issue the great public policies in promoting green building development.

(1) Tax Penalties

Economics addresses the problem of scarcity. Incorporating environmental concerns into economics involves sustainability into scarcity. It trades with the issue of how to meet people's current needs in a way which is both equitable and efficient and does not diminish the supply or quality of environmental goods and services available for future generations. Therefore, economics is study of how people make choices under conditions of scarcity, and of the results of those choices for society. One principle that becomes popular to tackle environmental problem is Polluter Pays Principle (PPP). It is a measure to motivate people to change their behavior and conduct implementing activities to reduce pollution affecting on land, water, and air such as using cleaner technology, reducing energy consumption. and choosing eco-friendly products[47].

Nowadays, many countries have been bringing the PPP

[46] Kabinga, M. (2016, March 14). Principles of Taxation. Retrieved September 17, 2021. Available online at https://www.taxjustice-and-poverty.org/fileadmin/Dateien/Taxjustice_and_Poverty/Introduction/05_Principles.pdf

[47] The London School of Economics and Political Science. (2018, May 11). *What is the polluter pays principle?* Retrieved September 12, 2021. Available online at https://www.lse.ac.uk/granthaminstitute/explainers/what-is-the-polluter-pays-principle/

principle to their public policies as economics tools to enhance legal measures more regulation and control in the management of environmental problems[48].

A tax penalty applies when producers, customers, or taxpayers fail to meet a required obligation under the law. In terms of environmental taxes, the environmental taxes are designed to tax behavior that is harmful to the planet's health. They are based on a simple principle, those who pollute, pay, and essential to halting climate change. The purpose of environmental taxes is to oblige polluters to pay a tax in order to safeguard the environment. Examples include Pigouvian tax, indirect environmental tax, excise tax, and earmarked tax.

(1.1) Pigouvian tax

A Pigouvian tax is a tax levied on a market activity that generates negative externalities. The environmental economic theory describes the concept of externality as a social cost. The social benefits correspond to a positive externality, but the social costs correspond to a negative externality. Negative externalities or social costs are related to the environmental consequences of production and consumption.

In addition, the Pigouvian tax is a tax levied on the negative externality at a tax rate that is equal to the marginal damage costs and considered to correct the market outcome back to efficiency. However, the best tax rate is not a zero level of pollution externality, but an optimal level where the marginal benefit from the reduction of pollution equals its marginal cost or alternatively the marginal damage (social cost) equals the marginal benefit from the production of the good[49] (see Fig. 2.5).

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[48] Teeranuwat, N. (2011). Tax Incentives and Privileges for Green Business: The Case Study of Swine Production . *Law Thesis*. Bangkok, Thailand: Chulalongkorn University. Retrieved September 12, 2021. Available online at https://cuir.car.chula.ac.th/bitstream/123456789/27461/1/nattaya_te.pdf

[49] Panayotou, T. (1994, December). ECONOMIC INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT. International Environment Program Harvard Institute for International Development Harvard University. Retrieved September 12, 2021. Available online at https://core.ac.uk/download/pdf/48031478.pdf

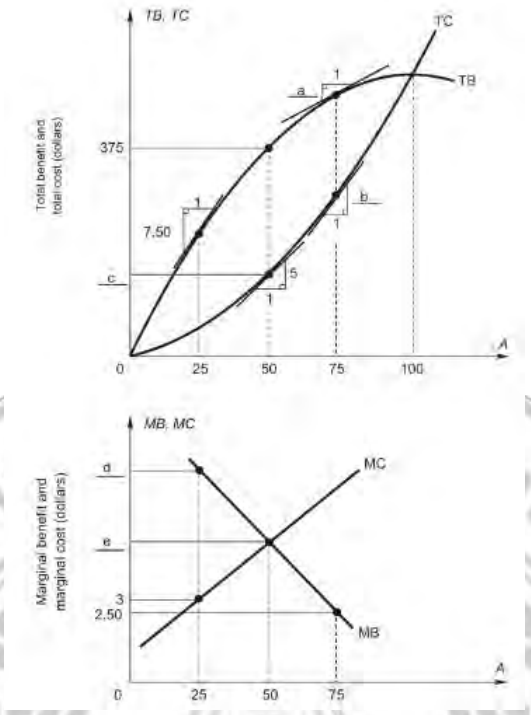

Figure 2.5 Graphs of an Optimal Level (MB = MC)

Figure 2.5 shows the optimal level between the marginal benefit and marginal cost. At the optimal level, it means the most efficient outcome from tax measures. In other words, social costs and social benefits are equal. Normally, the diminishing marginal benefit will occur when total benefit goes over the optimum point. Therefore, states should concern to the optimal level of pollution reduction when issuing a tax measure to change polluter behavior. Nevertheless, Pigouvian tax is still considered as the most effective environmental tax to solve environmental problems because this tax will directly affect the cost of emissions or waste.

(1.2) Indirect environmental tax

Indirect environmental tax will be collected from the use of production factors or the amount of consumption of goods under conditions of production or consumption that affect to the environment. This tax does not concern on the amount of waste discharge and the amount of damage to the environment, but it concerns on the amount of consumption of goods. Therefore, this tax will affect only the price. Hence, the price of pollution products will be higher than the price of eco-friendly products due to the indirect environmental tax. For example, Carbon tax, used

to reduce global warming, is taxed from the amount of fossil fuel consumption within a constant proportion to the amount of environmental damage. However, Petroleum tax, used to reduce air pollution is not as effective as the Pigouvian tax because it has no relation to the proportion of petroleum use and environmental damage[50].

(1.3) Excise tax

Excise tax is not very effective to protect natural resources because this tax on oil products is not affect the amount of environmental damage reduction.

(1.4) Earmarked tax

Earmarking dedicates tax to a specific purpose. This can be dedicated the revenues to natural resources, clean water, and cultural heritage. On one hand, in terms of advantages, supporters of programs advance earmarking to guarantee a steady and reliable funding source for the favored programs. On the other hand, critics contend that earmarks reduce the legislature's budgetary flexibility. Earmarks may block its ability to construct an overall budget based on its funding priorities, including assessment of changes in circumstances that have occurred since the earmark was adopted. Also, earmarks may have indirect effects on tax and revenue policy and can increase administrative and compliance costs. However, there is a general consensus that the earmark tax is an appropriate budgeting practice, such as earmarking a special tax on highway fuels for construction and maintenance of highways[51].

(2) Non-Tax Measures

Besides both tax incentive and tax penalty, there are other economics tools to tackle the environmental issues, include charges, fees, financial tools, marketable tools, legal requirements, and other privileges.

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[50] Piluek, S. (2013). Energy and Environment Conservative Building (Green Building) Tax Measure of Thailand. *Thesis*. Bangkok, Thailand: Thammasart University.

[51] Michael, J. (2015, August). Earmarking State Tax Revenues. St. Paul, Minnesota, United States of America: Research Department Minnesota House of Representatives. Retrieved September 19, 2021. Available online at https://www.house.leg.state.mn.us/hrd/pubs/earmarking.pdf

(2.1) Other Economics Fiscal Tools Besides Taxation

This group of tools charge fees from gaining benefits from resources and collect the fees from the activities that harm the environment by setting a market price for the impact on resources. In other words, these tools can be defined as a tax system to reflect the real value of resources, but collecting fees will have more explicit results than the taxation because the resource users will suffer immediately after using the charges. This consequence of charge fee system will change the behaviour of people to the right direction[52]. However, countries are usually reluctant to set taxes and charges high enough to act as economic incentives because of political reasons, resistance by industry or concerns about competitiveness. Among developed countries, only the Netherlands has come close to charging the marginal damage cost of pollution. France is on the other side: charges have been set at less than a quarter of the level necessary to induce a significant change in behavior, and 90% of the charge revenue is returned to the industry as subsidies for investment in pollution reduction technology[53]. The other fiscal tools include: (a) charge systems, (b) effluent charges, (c) product charges, and (d) administrative fee.

(a) Charge systems

Charges are defined as payments for use of resources, infrastructure, and services. Also, they are connected to market prices for private goods. In other words, charges are prices for public goods or publicly provided private goods. They differ from market prices for private goods because they are not market determined but are administratively set by a government agency. This contrasts them with taxes which are not payments for services but a means for raising fiscal revenue. In addition, charge systems may be divided into three groups[54].

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[52] Nanthakwang, W. (2011). Concepts and Principles on Environmental Tax Law. *Law Thesis*. Bangkok, Thailand: Chulalongkorn University. Retrieved September 12, 2021. Available online at https://cuir.car.chula.ac.th/bitstream/123456789/52025/1/wasinee_na.pdf

[53] Panayotou, T. (1994, December). ECONOMIC INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT. International Environment Program Harvard Institute for International Development Harvard University. Retrieved September 12, 2021. Available online at https://core.ac.uk/download/pdf/48031478.pdf

[54] Ibid.

The first group of charges is pollution charges, this includes emission charges, effluent charges, solid waste charges, noise pollution charges, and product charges. When set at optimal levels (equal to the marginal cost), pollution charges are like Pigouvian taxes.

The second group of charges is direct or active user charges which include utility charges (e.g. for water, electricity, etc.), road tolls, and access fees to parks, beaches, etc. These charges are analogous but not similar to prices for private goods. Road tolls, for example, may be thought of as congestion prices not as prices for gaining access to roads. If there is no congestion, restricting access to roads through road pricing reduces social welfare because there is an unused opportunity to make someone better off without making anyone worse off known as Pareto improvement.

The final group of charges is indirect or passive user charges which include betterment charges and impact fees. Betterment charges are usually imposed on private property which benefits from public investments. For instance, private property values may increase sharply because of new roads, parks, environmental clean ups, etc. This is an application of the beneficiary pays principle and could be a major source of financing, but its incentive effect is rather limited. The betterment charges, if sufficiently high, may reduce the incentive for private landowners to lobby government officials to influence the location, type, and level of public infrastructure and services to benefit their property. Impact fees are charges that aim to internalize the external cost of private investments (e.g., construction, tourism, or industrial development) on the landscape or the surrounded environment. For example, a charge may be imposed per cubic meter of built-up place.

(b) Effluent charges

Effluent charges have been applied in developed countries to air and water waste and to noise pollution. Several countries such as France, the Netherlands, and Germany have used effluent charges to control water pollution. The effluent charge is levied on all fresh and sea water polluters, both households and industries, and applies to several pollutants such as biochemical oxygen demand

(BOD), chemical oxygen (COD), soluble salts, ammonia, nitrogen, and phosphorus. Industries are charged on a flat rate set by actual measurement. However, the system was blamed designed to raise revenues rather than to act as an incentive for waste minimization, as the charge rate is set too low to induce a change in the production process in France.

(c) Product charges

They are fees imposed on products or raw materials that pollute pollution. This charge will increase the prices of products or raw materials by being charged a fee. Practically, the charge is not high because manufacturers can pass some or all the burden to consumers. This tool is suitable in cases where manufacturers or consumers want to reduce the use of polluting products such as chemicals, hazardous substances, chemical fertilizers, pesticides, etc. The product charges can be used to manage the end of the product or waste to be safe for the environment.

(d) Administrative fee

It is a fee that polluters pay for services to an environmental supervisory authority. For instance, the registration fee of specified chemicals is the administrative fee. In other words, administrative fee can be called as control and administration fee. This fee usually will charge to for-profit polluters. Also, the fee will be imposed immediately after applying for getting a permission[55].

(2.2) Economics Financial Tools

Financial incentives are the financial support provided by government or utility providers. The incentives offered in forms of subsidies, soft loans, and grants. Financial tools have many similarities with subsidy and tax incentive systems. The tools are distinguished from fiscal instruments because they are usually public resources that are not included in the annual budget, foreign aid, external borrowing, and so on. Since funds are interchangeable and loans must be repaid somehow, the implications of financial subsidies are not very different from those more

[55] Nanthakwang, W. (2011). Concepts and Principles on Environmental Tax Law. *Law Thesis*. Bangkok, Thailand: Chulalongkorn University. Retrieved September 12, 2021. Available online at https://cuir.car.chula.ac.th/bitstream/123456789/52025/1/wasinee_na.pdf

closely connected with the government budget. The Financial tools such as revolving funds, green funds, relocation incentives, subsidized interest, and soft loans may be justified as tools for mobilizing additional financial resources for conservation, environmental protection, and sustainable development. The types of financial tools that motivate polluters to change their behaviors to meet the standards are as follows[56]:

(a) Subsidies

Subsidies are financed from charges, revolving funds, and the general budget. The use of user charges that control pollution and treatment facilities is not considered a subsidy. The term subsidy refers to the financial assistance in the form of discount or monetary grants by the central government to public entities or private institutions. The objective is to make the products offered by these institutions affordable for public consumption or using as tools for environmental regulation. The transfer of money to the public or private institutions induces them to sell the products at lower prices. The subsidized products are necessary for the larger public good and are a means of supporting the community's welfare.

Subsidies are provided by both the central and the state governments and are a part of non-planned expenditure. People receive subsidies in the form of cheap food products, tax rebates, cash payment, and so on. In terms of incentives, subsidies are offered on energy upgrades or retrofits that enable investors to perform energy upgrades at a lower rate than market price. The subsidies can be in the form of grants, loans, and taxes[57].

(b) Grants

In terms of the environment, grants are often provided for non-revenue generating activities in recipient countries, such as knowledge management, and ongoing activities that do not generate financial return. In other words, grants are the monetary incentives that do not require to be paid back and

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[56] Ibid.

[57] Lendingkart. (2021, March 8). *What is Subsidy: Meaning, Types, Categories and Business Schemes*. Retrieved September 14, 2021, from Lendingkart. Available online at https://www.lendingkart.com/blog/what-is-subsidy/

are popular due to their simplicity. Grants account for a large sum of money and usually offered by the government at the federal level. In the medium and longer-term, grants can be used to help capitalize the financial mechanisms related to forestry and environmental preservation.

(c) Soft loans

International institutions have provided various kinds of financial tools for the environment in developing countries. Soft loan is one of these tools. It is defined as loan at conditions more favorable for the borrowers than loans at market conditions to change behavior to more concern about environment[58].

(d) Non-compliance fees

The various penalties have been designed to induce polluters to comply with environmental standards or regulations. Non-compliance charges or fines are the most commonly used enforcement incentive. Fines are relatively easy to impose and can often be assessed on the spot[59].

(2.3) Economics Marketable Tools

This approach treats the environment as a scarce. Since the environmental resources are free, the polluters pollute to the environment unlimited. A solution, thus, might be to create a market in which the right to use the environment is priced, and traded. The allocations of the right to use the environment would ensure a total aggregate use to the desired level of environmental quality. In terms of pricing, the issuance of environmental-use rights normally is fewer than the using demands. Therefore, it can be said that "the more it used the more it cost". Basically, the previous phrase means the prices of environmental-used rights will increase if there is more

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[58] Nanthakwang, W. (2011). Concepts and Principles on Environmental Tax Law. *Law Thesis*. Bangkok, Thailand: Chulalongkorn University. Retrieved September 12, 2021. Available online at https://cuir.car.chula.ac.th/bitstream/123456789/52025/1/wasinee_na.pdf

[59] Helmer, R., & Hespanhol, I. (1997). Water Pollution Control - A Guide to the Use of Water. Bury St Edmunds, Suffolk, Great Britain : St Edmundsbury Press. Retrieved September 14, 2021. Available online at https://apps.who.int/iris/bitstream/handle/10665/41967/0419229108_eng.pdf?sequence=1&isAllowed=y

demand to use. From this idea, the marketable tools can be developed to four environmental prevention tools as follows:

(a) Performance bond

A performance bond or surety bond is a unique guarantee that contractors will comply with federal regulations and environmental policies. It is designed to prevent environmental damage by covering construction projects and hazardous materials within the bond. Mitigating environmental risks for contractors can be tough because of the long-term liability, the collateral securities, and the length or period of some of the bonds. Generally, the value of bonds is determined by the impact on environment that polluters produce from their production activities. If the polluters can show that the value of environmental damages from their production activities is less than the cost of buying bonds, the value of the bonds will decrease. Therefore, polluters are incentivized to invest in research and development to produce more eco-friendly products or decrease the value of environmental damage[60].

(b) Deposit-refund systems

This class of tools aims to shift responsibility for controlling pollution, monitoring, and enforcement to individual producers and consumers who are charged in advance for the potential damage. Normally, the government is saddled with huge bills for cleaning up oil spills and contaminated land, for collection and treatment of hazardous waste, for reclamation of abandoned land after mining, and for reforestation after logging. In fact, a large portion of public environmental expenditures is for restoration of degraded environments which could have been prevented or paid for by the polluters or beneficiaries of responsible activities. The government can reduce its share of the cleanup and restoration bill, by instituting deposit-refund systems, environmental bonds, bank guarantees for compliance with environmental rules, presumptive charges based on engineering or statistical output-waste coefficients, etc., with refunds for improved efficiency[61].

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[60] Ibid.

[61] Panayotou, T. (1994, December). ECONOMIC INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT. International Environment Program Harvard Institute for International Development Harvard University. Retrieved September 12, 2021. Available online at https://core.ac.uk/download/pdf/48031478.pdf

(c) Liability insurance

Liability insurance has been used as a tool for pooling and sharing liability risks among liable parties. This insurance is mandated by law to induce socially responsible behavior by establishing legal liability for natural resource damage, environmental damage, property damage, damage to human health or loss of life, non-compliance to environmental laws and regulations, and nonpayment of due taxes. This approach the insurance companies will be responsible for the environmental risks of damages that may happen by collecting a premium from producers that may cause damage to the environment. In addition, this tool has an incentive by reducing insurance premiums if the insurers pollute lower than the limit that they set.

(d) Tradeable emission permits

The major applications of tradeable emission permits that have been used in the U.S. include trading of emission rights of pollutants regulated under the Clean Air Act, inter-refinery trading of lead credits, and trading of permits for water pollution control. In controlling global climate change, internationally tradeable CO2 emission permits are emerging as a major source for transferring financial and technological resources from developed to developing countries. This approach is a way in which the distributional impact of economic instruments can be mitigated or compensated for[62].

(2.4) Legal Requirements

Environmental legal requirements means all legal requirements which relate to the environment, pollution, or the emission, discharge, release, treatment, storage, disposal, management, remediation. In addition, it can be the other form of response to including, but no limited to hazardous materials, toxic substances, and wastes which are in the air, land, soil, surface water, and groundwater to block the negative impacts on the environment.

[62] Ibid.

(2.5) Other Privileges

Other privileges provide priorities to firms that are environmentally friendly. For example, in terms of green buildings, gross floor area (GFA) concession (i.e., density bonus), and expedited permitting are common privileges to encourage entrepreneurs to build the green buildings instead of traditional buildings[63].

[63] Fan, K., Chan, E. H., & Chau, C. K. (2018, August 8). Costs and Benefits of Implementing Green Building Economic Incentives: Case Study of a Gross Floor Area Concession Scheme in Hong Kong. *Sustainability, 10*(8), 1-19. Available online at https://www.mdpi.com/2071-1050/10/8/2814

CHAPTER 3

EFFICIENT PUBLIC POLICIES ON PROMOTING GREEN BUILDING DEVELOPMENT IN FOREIGN COUNTRIES

This chapter shows the successful public policies of the United States of America, the Republic of Singapore, and the People's Republic of China on promoting green building development in their countries. The reason that this paper studies on the United States of America because the United States is the leader of green building since it is the first country that launched green building standard called LEED. Also, this paper studies on the Republic of Singapore because Singapore has public policies on environmental protection and its location is nearby Thailand. In terms of the People's Republic of China, this paper studies on China because China is one of the superpower nations where is nearest to Thailand and it has the national agenda of environmental protection. Therefore, these foreign countries can be the good practices to study on their successful measures on promoting green building development. In addition, the policies can be divided into three measures: legal measure, tax measure, and financial measure.

3.1 Legal Measures on Promoting Green Building Development in Foreign Countries

A legal measure is an important instrument of public policies to drive the policies to meet their objectives. In this context, the legal measure means the law that enforces to people as a non-tax measure. Also, the legal measure in this research focuses on building development in three aspects: environmental impact, social impact, and energy conservation.

3.1.1 Legal Regulations on Environmental Impact in Green Building Development

Basically, legal regulations are the police power that governments use to control the societies. In terms of the environment, governments use their legislative power to lead all sectors to follow the rules and make their societies become green.

(1) United States of America

The U.S. Government mandates for green construction practices usually apply to buildings owned by the government itself. Since the federal government is the largest landowner in the United States, it mandates its agencies build green through executive orders. Two recent executive orders have greatly contributed to the green building movement. The first, executive order no. 13,423 was passed in January 2007 by President George W. Bush and mandated that new construction and major renovations of federal agency buildings comply with sustainable objectives, which are closely aligned with LEED[64]. The second, executive order no. 13,514 was passed in October 2009 by President Barack Obama for the purpose of establishing an integrated strategy towards sustainability in the federal government[65]. The executive order no. 13,514 also sets numerous goals for federal agencies, including increasing water use efficiency and management in federal buildings and implementing high-performance, sustainable building design, construction, operation, management, and maintenance.

In addition, government mandates are implemented at the state level as well. For example, in Maryland, all state buildings larger than 7,500 square feet (about 700 square meters) are required to achieve at least a LEED Silver or equivalent rating[66]. Also, some local governments require private buildings to follow sustainable construction practices. In Washington, D.C., the Green Building Act of 2006, which created green building mandates for public buildings, was extended in 2012 to require

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[64] Administration of George W. Bush. (2007, January 24). Executive Order 13423 — Strengthening Federal Environmental, Energy, and Transportation Management. Retrieved October 2, 2021. Available online at https://www.govinfo.gov/content/pkg/WCPD-2007-01-29/pdf/WCPD-2007-01-29-Pg70.pdf

[65] Administration of Barack H. Obama. (2009, October 5). Executive Order 13514 — Federal Leadership in Environmental, Energy, and Economic Performance. Retrieved October 2, 2021. Available online at https://www.govinfo.gov/content/pkg/DCPD-200900783/pdf/DCPD-200900783.pdf

[66] Stempler, M. J., & Dorfman, D. A. (n.d.). Green Building 101. Retrieved October 2, 2021. Available online at http://www.hwhlegal.com/5C2CB3/assets/files/Documents/stempler_green_building_101.pdf

new private, nonresidential projects of greater than 50,000 square feet to meet certain green standards[67].

(2) Republic of Singapore

Since Green Mark certification is issued by Building and Construction Authority (BCA), where is a government agency, Singapore government regulates that any building, both residential and non-residential buildings, where involve a gross floor area of 2,000 square meters or more must meet a minimum Green Mark score of 50 points. This power is conferred by section 49 of Building Control Act 2008[68].

(3) People's Republic of China

Even though China does not have any special act to promote green building development, it still uses the system of Environmental Impact Assessments (EIA) as a basic legal measure to control the degree of the environmental impacts of construction projects. Therefore, all building works have to pass all the EIA requirements before getting a permit to begin the construction. In addition, there are fines for violating the 2018 EIA law. Fines can be ranged from RMB 500,000 to RMB 2 million (THB 2,500,000 to THB 10 million) for the construction entity. Also, if staff of EIA agencies violates the certain EIA rules results in serious quality issues affecting the EIA documents, the main participants who prepared the EIA documents may face on criminal liabilities[69].

3.1.2 Legal Regulations on Social Impact in Green Building Development

The social impacts can be various from cultures, human rights to health and well-being. This paper focus on act that ensures quality of life and preserves community

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[67] Department of Energy & Environment. (n.d.). Green Building Act of 2006. West Group . Retrieved October 2, 2021. Available online at https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/Green_Building_Act_of_2006_B16-515.pdf

[68] Singapore Statutes Online . (n.d.). Building Control (Environmental Sustainability) REGULATIONS 2008. Retrieved October 2, 2021. Available online at https://sso.agc.gov.sg/SL/BCA1989-S199-2008

[69] Wu Qing, e. a. (2021, August 1). Environmental Law and Practice in China. Thomson Reuters Practical Law. Retrieved October 2, 2021. Available online at https://uk.practicallaw.thomsonreuters.com/3-503-4201?transitionType=Default&contextData=(sc.Default)&firstPage=true#co_anchor_a945886

cultures. In terms of health**,** most people spend over two thirds of their time indoors. The indoor air at home or in an office building, school and other workplaces could be contaminated by a variety of gas and particulate contaminants that are sometimes present in concentrations above those which cause adverse health effects. These indoor air pollutants (IAP) are mainly emitted from building materials, furnishings, office appliances, consumer products, cleaning materials, combustion processes (e.g., tobacco smoking, fuel-fired cooking or space heating), and outdoor air pollution. Based on the Wen-Tien Tsai paper, the concentrations of individual volatile organic compounds (VOC) in the indoor air are often higher than those outdoors because many building materials emit VOCs. Consequently, the indoor air quality (IAQ) has become an important health issue for the public and the decision makers because of its adverse impact on chronic symptoms or illness.

The sick building syndrome (SBS) has been used to describe building related symptoms, which include respiratory irritation, headache, dry cough, dry or itchy skin, dizziness and nausea, difficulty in concentrating, fatigue, and sensitivity to odors. In addition, formaldehyde has been listed as a Class 1 carcinogen, confirmed as a human carcinogen, by the International Agency for Research on Cancer[70].

In terms of human rights, this paper is focusing on universal design for people with disabilities to have equal rights to use facilities in the buildings.

Ultimately, this research will show zoning and planning act in foreign countries because zoning regulation is a tool for the government as holder of authority to protect all aspects of society such as health, welfare, and culture of communities.

(1) United States of America

Congress designed the Clean Air Act to protect public health and welfare from different types of air pollution caused by a diverse method of pollution sources. In section 7409, national primary and secondary ambient air quality standards, national primary ambient air quality standards shall be ambient air quality standards the

[70] Tsai, W.-T. (2017, December 28). Overview of Green Building Material (GBM) Policies and Guidelines with Relevance to Indoor Air Quality Management in Taiwan. *Environments, 5*(4), 1-10. Retrieved October 2, 2021. Available online at https://www.mdpi.com/2076-3298/5/1/4/pdf

attainment and maintenance of which in the judgment of the administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health. Moreover, the Clean Air Act has civil penalties. The administrator may issue an administrative order against any person assessing a civil administrative penalty of up to $25,000, per day of violation, whenever, on the basis of any available information, the administrator finds that such person.

However, this act also has awards as well. The administrator may pay an award, not to exceed $10,000, to any person who furnishes information or services which lead to a criminal conviction or a judicial or administrative civil penalty. Nonetheless, any officer, or employee of the United States or any State or local government who furnishes information or renders service in the performance of an official duty is ineligible for payment under this subsection. The Administrator may, by regulation, prescribe additional criteria for eligibility for such an award[71].

In terms of human rights, Americans with Disabilities Act (ADA) has been ruled out to protect individuals with disabilities from multiple discrimination in all areas of employment, as well as give them access to government and public services, transportation, and other important areas of life. In title III of ADA prohibits discrimination on the basis of disability in the activities of places of public accommodation, businesses that are generally open to the public such as restaurants, movie theaters, schools, day care facilities, recreation facilities, and doctors' offices and requires newly constructed or altered places of public accommodation as well as commercial facilities, nonresidential facilities such as factories, warehouses, or office buildings to comply with the ADA Standards. Furthermore, in section 12182, prohibition of discrimination by public accommodations, the general rule says that "No individual shall be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of any place of public accommodation by any person who owns, leases, or operates a place of public accommodation". The court also may protect the public interest, assess

[71] United States Environmental Protection Agency. (n.d.). Clean Air Act. Retrieved October 3, 2021. Available online at https://www.epa.gov/clean-air-act-overview/clean-air-act-title-i-air-pollution-prevention-and-control-parts-through-d

a civil penalty against the entity in an amount not exceeding $50,000 for a first violation; and not exceeding $100,000 for any subsequent violation[72].

Besides the public health and human rights concern, cultural preservation is another concern for green building development. Zoning is a legal tool to control and organize community. The specific of the USA cities is the local regulations which are tailored for each city. The regulations are prescribed by the planning commission regarding the local characteristics and city needs. Thus, zoning differs from city to city and results in the concrete problems which occur in the cities having their concrete planning answers. Recommendations for implementation of incentive zoning mainly concern the Floor Area Ratio (FAR) bonus to encourage developers do not destroy cultural heritage and find a better location to building work. However, the cities must know in advance what public services they need, and prescribe bonuses on this basis, but must also leave sufficient space for negotiations with contractors, to obtain the necessary services[73].

(2) Republic of Singapore

In Singapore, where the climate is hot and humid, Singaporean rely heavily on air conditioning and mechanical ventilation (ACMV) system to provide thermal comfort in sealed indoor environments. Poor air quality in indoor air-conditioned workplaces can result in potential health and comfort problems for occupants. Some severe health effects associated with poor IAQ include coughs, headaches and eye irritation or connotatively referred to as sick building syndrome. This can then lead to the consequential decline in work productivity when sickness-absenteeism prevails. Good IAQ is therefore essential to ensure the health and wellbeing of all people in indoor environments such as buildings and offices. Recognizing the need for practical guidance in the management of IAQ in buildings

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[72] AMERICANS WITH DISABILITIES ACT OF 1990. (n.d.). Retrieved October 3, 2021. Available online at https://www.ada.gov/pubs/adastatute08.htm#12182

[73] Dinić, M., & Mitković, P. (2011, January). PLANNING REGULATIONS IN THE USA AND THEIR IMPLICATIONS ON URBAN DESIGN IN THE CENTRAL CITY ZONE. *Architecture and Civil Engineering, 9*(2), 289-299. Retrieved October 3, 2021. Available online at https://www.researchgate.net/publication/274829367_Planning_regulations_in_the_USA_and_their_implications_on_urban_design_in_the_central_city_zone

and/or workplaces, this set of guidelines was developed. It will also supplement the Singapore Standard SS 554: 2009, code of practice for indoor air quality for air-conditioned buildings, in the effective establishment and on the ground implementation of the IAQ Management Program. This set of guidelines is primarily aimed at building owners or occupiers of workplace who have direct control over the risks associated with poor IAQ[74]. Even though the Singapore Standard SS 554: 2009 does not enforce as a legal measure, it is widely adopted to be a measurement of green building certifications. In addition, there is a requirement that all Singapore buildings where involve a gross floor area of 2,000 square meters or more must meet a minimum Green Mark score of 50 points. Therefore, the section of indoor air quality, weighted 10 points, can help the buildings meet the legal regulation of Building Control Act[75].

In terms of human rights or universal design, Singapore does not issue law to regulate buildings directly, but the Building and Construction Authority (BCA) focuses on developing a user-friendly built environment through promoting the concept of Universal Design (UD) for buildings and public places where the young, the old, and persons with disabilities can work, live and play. It, therefore, initiated the Universal Design Mark in 2007 to encourage the adoption of universal design. However, the Universal Design Mark is a voluntary certification scheme. The benefits of the Universal Design Mark are not in terms of legal, but in marketing such as generating a positive effect on the corporate image, increasing in the number of visitors, and generating sales and revenue[76].

When it comes to zoning, Singapore has Planning Act that requires all

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[74] WSH Council. (n.d.). Workplace Safety and Health Guidelines. Retrieved October 4, 2021. Available online at https://www.tal.sg/wshc/-/media/TAL/Wshc/Resources/Publications/WSH-Guidelines/Files/WSH_Guidelines_on_Management_of_IAQ.pdf

[75] BCA Green Mark. (n.d.). GREEN MARK FOR NON-RESIDENTIAL BUILDINGS NRB: 2015. Retrieved October 4, 2021. Available online at https://policy.asiapacificenergy.org/sites/default/files/Green%20Mark%20for%20Non-Residential%20Buildings%20NRB%202015.pdf

[76] *Universal Design Mark Award*. (2020). Retrieved October 4, 2021, from Building and Construction Authority: https://www1.bca.gov.sg/buildsg/bca-awards/universal-design-mark-award

development and subdivision of land to obtain written permission in the form of a formal approval from the planning authority before they can be carried out. In Singapore, all development activities related to land use planning and land allocation are administrated and coordinated by a central planning authority, presently the Urban Redevelopment Authority (URA). URA has been ordered that a person must have a permit before doing any development within or outside a conservation area[77]. A contravention of unauthorized development by a person includes the demolition of a building or part of a building in a conservation area, the person convicted of an offence shall be liable to a fine not exceeding $500,000 or to imprisonment for a term not exceeding 12 months or to both. The example of conservation areas in Singapore can be seen the picture below (see Fig. 3.1)

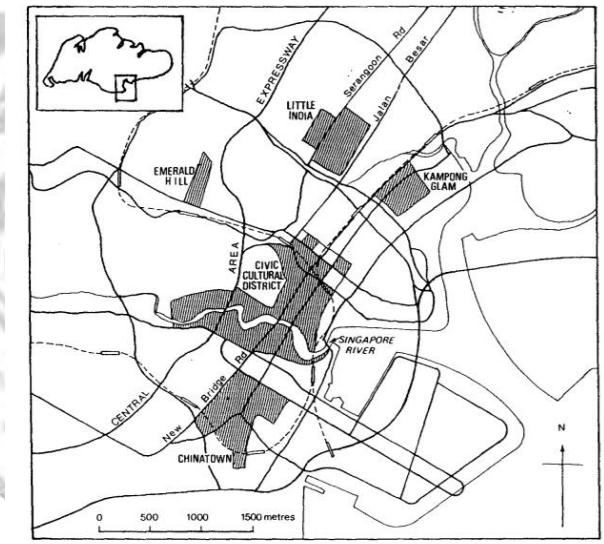

Figure 3.1 Conservation areas in the Central Area of Singapore[78]

Figure 3.1 shows a cultural preservation of Singapore. The Planning

[77] Kong, L., & Yeoh, B. S. (1994, March). Urban Conservation in Singapore: A Survey of State Policies and Popular Attitudes . *Urban Studies , 31*(2), 247-265. Retrieved October 5, 2021. Available online at https://ink.library.smu.edu.sg/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2982&context=soss_research

[78] *Planning Act*. (1998). Retrieved October 5, 2021, from Singapore Statues Online: https://sso.agc.gov.sg/Act/PA1998

Act pays attention on cultural heritage to does not be disturbed by development. The aim of this law, therefore, is to protect ethnic communities such as Chinatown, Little India, and Kampong Glam where is a Muslim community.

(3) People's Republic of China

Even though the Air Pollution Prevention Act of the People's Republic of China addresses the prevention of air pollution, but it enforces only outdoor air pollution. However, China has a voluntary standard for indoor air quality (IAQ), named Code for Indoor Environmental Pollution Control of Civil Building Engineering. This code addresses the control of indoor air pollution in newly constructed or renovated building. In addition, the code divides buildings into two groups as follows: Group I - residential apartments and houses, hospitals, old age homes, kindergartens, schools and, Group II - office buildings, shops, hotels, entertainment halls, bookstores, libraries, galleries, gymnasiums, public transportation waiting rooms, restaurants, barber shops. The reason of categorizing is to provide the right regulation to each type of building. The example of some limitations on IAQ can be seen in the table below (see Table 3.1).

Table 3.1 Limited Concentration of Indoor Pollutants in a Building[79]

Pollutant	Building Group I	Building Group II
Ammonia (mg/m3)	≤0.2	≤0.5
Benzene (mg/m3)	≤0.09	≤0.09
Formaldehyde (mg/m3)	≤0.2	≤0.5
TVOC (mg/m3)	≤0.5	≤0.6

Table 3.1 shows the difference requirements between building group I and building group II. Normally, the limited concentration of indoor pollutants, besides Benzene, in building group II is allowed higher than building group I because the places in the group II is usually more visitors. The indoor pollutants, therefore, should be

[79] Bai, Z., Jia, C., Zhu, T., & Zhang, J. (2002). INDOOR AIR QUALITY RELATED STANDARDS IN CHINA. *Indoor Air*, (pp. 1012-1017). Retrieved October 5, 2021. Available online at https://www.irbnet.de/daten/iconda/CIB7659.pdf

higher than the group I. In other words, China issued this standard on the believe that one size cannot fit all. Thus, this is the reason why it categorized the buildings and provided different criteria on each group.

In terms of historical and cultural preservation, China has Urban and Rural Planning law. Article 4 of it is about the conservation of land, intensive development, and planning before construction. Also, the aims of this law are to preserve cultivated land and historical and cultural heritage, and to maintain the local and ethnic features and traditional cityscape. Therefore, all constructions must concern on the conservation of land in their construction plans to get a construction permit[80].

In the aspect of human rights, China issued a law named Construction of a Barrier-Free Environment on August 1, 2012. This law requires all newly built roads and buildings in urban areas to meet the barrier-free construction standards to provide accessibility to people with disabilities. Article 9 says "Newly built, rebuilt, or expanded roads, public buildings, public transportation facilities, residential buildings, and residential areas in cities and towns shall comply with the construction standards for barrier-free facilities". The objective of this law is to preserve the human rights of disabilities to access all public buildings and transportation facilities in urban areas. In addition, it mentions that the construction and development of townships and villages should gradually meet the standards for barrier-free facilities construction[81].

3.1.3 Legal Regulations on Energy Conservation in Building Development

Since buildings consume a lot of energy, concerning on energy conservation is very important. Legal regulations on energy conservation in building development are the rules that governments use their legislative power to preserve energy for the future generations and protect the environment in the end.

(1) United States of America

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[80] (2007). *Urban and Rural Planning Law of the People's Republic of China.* Retrieved October 5, 2021. Available online at https://urbanlex.unhabitat.org/sites/default/files/urbanlex//urban_and_rural_planning_law_of_the_peoples_republic_of_china_2007.pdf

[81] General Office of the State Council. (2012, July 10). *State Council of the People's Republic of China*. Retrieved October 6, 2021, from Central government portal: http://www.gov.cn/zwgk/2012-07/10/content_2179864.htm

The Energy Policy Act of 2005, signed by President Bush on August 8, 2005, is the first energy legislation. The measures of this law aimed at the federal government's own energy efficiency and water consumption range from the treatment of energy costs in the federal budget and procurement processes to specific requirements for upgrading equipment in congressional office buildings. In section 101 of the act is about energy and water saving measures in congressional buildings. It requires the Architect of the capitol to plan and implement an energy and water conservation strategy for congressional buildings and other federal buildings. In addition, the act also requires federal agencies to purchase products found to be energy and cost effective. As part of new building performance standards, federal buildings must be designed to achieve energy consumption levels that are at least 30% below the current ASHRAE standard 211-2018[82], which is a standard for commercial building energy audits[83]. In addition, some local governments require energy standard for public buildings (see Appendix).

(2) Republic of Singapore

The Government Land Sales (GLS) program sites in selected strategic areas required higher Green Mark standards for buildings wholly or partly within area that is on or after 5th May 2010 under the GLS program to maximize the potential for cost-effective energy savings. The building works subject to this requirement are to be designed and certified to meet the prescribed BCA Green Mark certification (see Table 3.2).

[82] *ASHRAE Standards and Guidelines*. (2021). Retrieved October 6, 2021, from ASHRAE: https://www.ashrae.org/technical-resources/ashrae-standards-and-guidelines

[83] *ENERGY POLICY ACT.* (2005, August). Retrieved October 6, 2021, from Congress Public Law: https://www.congress.gov/109/plaws/publ58/PLAW-109publ58.pdf

Table 3.2 Requirements for Building under the GLS Program in Selected Strategic Areas[84]

Selected Strategic Areas	Requirements for building under the GLS Program
Marina Bay	BCA Green Mark Platinum Rating
Downtown Core (including areas within the CBD located next to Marina	BCA Green Mark Gold^{PLUS} Rating
Jurong Lake District	BCA Green Mark Gold^{PLUS} Rating
Paya Lebar Central	BCA Green Mark Gold^{PLUS} Rating
Kallang Riverside	BCA Green Mark Gold^{PLUS} Rating

Table 3.2 shows designated areas in Singapore to promote energy savings under the GLS program. All buildings in the designated areas must meet Green Mark criteria in each level of Green Mark standard. The buildings in Marina Bay must meet the standard at Platinum level. In addition, the four areas in Singapore: downtown and central business district, Jurong lake district, Paya lebar central, and Kallang riverside must meet Green Mark requirements at Gold^{PLUS} level. Thus, this measure tries to restrict the energy consumption in the areas that are high consuming energy in Singapore.

(3) People's Republic of China

China is one of the largest CO_2 emitters in a global manner. It accounts

[84] *Mandatory Higher Green Mark Standard for GLS Sites in Selected Areas*. (2020, June). Retrieved October 11, 2021, from Building and Construction Authority: https://www1.bca.gov.sg/buildsg/sustainability/minimum-environmental-sustainability-standard-for-new-buildings-and-existing-buildings-undergoing-major-additions-and-alterations/mandatory-higher-green-mark-standard

for nearly 27% of total global emissions[85]. Green Building is importantly to reduce emissions, as the construction boom in China led to the retrofitting of many buildings. To promote green building development in China, the Ministry of Housing released the 12th Five-Year Plan (FYP) for green building and eco-city development from 2011 to 2015. In addition, it issued the 13th FYP for building energy conservation and green building development from 2016 to 2020, which set target standards for building energy efficiency. Moreover, this law does not require to only the government agencies, but it also regulates to residential and commercial buildings. Nevertheless, China has a law which is named Renewable Energy Law of the People's Republic of China. Article 17 of the law says that the state shall encourage entities and individuals to install and use solar water heating systems, solar heating and refrigeration systems and solar photovoltaic electricity generation systems[86].

3.2 Tax Measures on Promoting Green Building Development in Foreign Countries

A tax measure is a robust instrument of fiscal policies to drive the policies to meet their objectives. Normally, a tax measure is a choice by government what to tax or does not to tax on things or services. Also, the tax measure may negatively or positively influence the country's economy. In this context, the tax measures on promoting green building development are about tax incentives and tax penalties to change the behavior of building owners to build more green buildings.

3.2.1 Tax Incentives for Green Building Development

Tax incentives for green building development are designed to encourage building owners to concern on sustainability. The tax incentives in this paper can be divided into three aspects: income tax, property tax, and consumption tax in three countries which are the United States of America, the Republic of Singapore, and the People's Republic of China.

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[85] Shen, Y., & Faure, M. (2020, July 10). Green building in China. *International Environmental Agreements: Politics, Law and Economics*, 183-199. Retrieved October 11, 2021, from https://link.springer.com/article/10.1007/s10784-020-09495-3

[86] Renewable Energy Law of the People's Republic of China. (2009, December). Retrieved October 12, 2021, from https://www.greengrowthknowledge.org/sites/default/files/downloads/policy-database/CHINA%29%20Renewable%20Energy%20Law%20%282009%29.pdf

3.2.1.1 The Incentives on Income Tax for all Stakeholders

Income tax can be divided into two types: Personal income tax and Corporate income tax. Personal Income Tax (PIT) is a direct tax collected on income of a person. Corporate Income Tax (CIT) is a direct tax levied on a juristic company or partnership carrying on business in a country or not carrying on business in that country but deriving certain types of income from that country. This paper will focus on tax incentives on personal income tax and corporate income tax of all stakeholders in a green building: green building owners and green building development companies.

(1) Green Building Owner

The green building owners are one of the stakeholders in green building development. They will be benefit off when governments use the tax incentive tools to promote green building development.

(1.1) United States of America

According to title 26 U.S. Code §136, which is administered by Internal Revenue Service, energy conservation subsidies provided by public utilities, either directly or indirectly, are nontaxable: "Gross income shall not include the value of any subsidy provided directly or indirectly by a public utility to a customer for the purchase or installation of any energy conservation measure"[87]. This law aims to encourage people to buy or sell the energy efficiency tools such as solar water heat, photovoltaics, and so on without any worried on personal income tax from the government subsidy.

In addition, title 26 U.S. Code §25C: nonbusiness energy property allows a 10% credit for energy efficiency improvements to the building envelope of existing homes and capped amounts from $50 to $300 for the purchase of specific types of high-efficiency heating, cooling, and water-heating equipment. Efficiency improvements or equipment such as water heaters, air conditioners, and building insulation must have served a dwelling in the United States that is owned and used by the taxpayer as a primary residence. For purchases made in 2011-2020, the

[87] (2021). *Renewable Energy and Energy Efficiency Incentives.* Congressional Research Service. Retrieved October 13, 2021, from https://sgp.fas.org/crs/misc/R40913.pdf

maximum lifetime amount of homeowner credit for all improvements combined is $500 total. For purchases made in 2009 or 2010, the maximum amount of homeowner credit was $1,500 total. However, this law will be terminated after December 31st, 2021[88].

Also, 26 U.S. Code §179D: energy efficient commercial buildings deduction is a tax deduction. It is available to owners of new or existing buildings who install (1) interior lighting, (2) building envelope, or (3) heating, cooling, ventilation, or hot water systems that reduce the building's total energy and power cost by 50% or more in comparison to a building meeting minimum requirements set by ASHRAE Standard 90.1, the most recent Standard 90.1 published by the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE). However, the maximum deduction allowed is $1.80 per square foot. A reduced deduction may be available if a single system is upgraded (lighting, heating, and cooling, or building envelope) and the 50% reduction threshold is not met. Separate energy cost reduction percentage thresholds are specified for single-system upgrades. The maximum deduction for a single-system improvement is $0.60 per square foot. Government entities making energy-efficiency upgrades to public buildings, such as schools, can allocate the section 179D deduction to designers of energy-efficient commercial building property[89].

Moreover, several states in the United States have implemented incentive programs to encourage private sector building owners and developers to pursue LEED certification for their buildings. These incentives range from grants to tax credits, from expedited permitting processes to reduced permitting fees. In terms of personal income tax, some states' incentive programs for LEED certification can be seen in table below.

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[88] *Title 26 U.S. Code § 25C - Nonbusiness energy property*. (1926). Retrieved October 13, 2021, from Cornell Law School: https://www.law.cornell.edu/uscode/text/26/25C

[89] *Title 26 U.S. Code § 179D - Energy efficient commercial buildings deduction*. (1926). Retrieved October 14, 2021, from Cornell Law School: https://www.law.cornell.edu/uscode/text/26/179D

Table 3.3 Summary of Some States' Incentive Programs for LEED Certification in Tax Credit as Listed in the U.S. Department of Energy's Database of State Incentives for Renewables & Efficiency[90]

State	LEED Incentive Program
Hawaii	**Sustainable Energy Utility Green for Green Home Rebate:** provides $1,000 - $4,500 rebates to certain new homes that achieve LEED certification.
Illinois	**Green Energy Loans:** provides interest rate reductions on loans for certain energy efficiency and renewable energy upgrades. Projects can qualify by having a LEED certified professional working on the project with the intent to pursue LEED certification.
Maryland	**Local Option Property Tax Credit for High Performance Buildings:** allows counties and municipalities to provide a property tax credit for buildings that achieve a LEED silver certification.
Nevada	**Property Tax Abatement for Green Buildings:** provides property tax abatements for buildings or structures that earn LEED certification. The amount of the abatement increases with higher certification levels.
New Mexico	**Sustainable Building Corporate Tax Credit:** provides a corporate income tax credit for buildings with a LEED silver certification or higher.
New York	**Local Option Real Property Tax Exemption for Green Buildings:** allows municipalities to exempt LEED certified buildings from a portion of their local property taxes. The amount and duration of the exemption increases with higher certification levels.
North Carolina	**Local Option Green Building Incentives:** allows counties and cities to provide reductions or partial rebates of building permit

[90] *NC Clean Energy Technology Center*. (2021). Retrieved October 14, 2021, from Database of State Incentives for Renewables & Efficiency: https://www.dsireusa.org/

State	LEED Incentive Program
	fees for buildings that meet guidelines established by LEED or other recognized certification programs.
Pennsylvania	**High Performance Building Incentives Program:** provides loans, grants, and loan guarantees to new construction and major renovation projects that achieve LEED gold certification and meet other requirements.

This table summarizes some states' incentive programs for LEED certification as listed in the U.S. Department of Energy's database of state incentives for renewables & efficiency. Many states and local governments also offer incentives that could be used to achieve LEED certification, but do not specifically require certification in order to qualify for the incentive.

Nevertheless, title 26 U.S. Code §25D - residential energy efficient property permits a taxpayer could claim a 35% credit for qualified expenditures for an installed system that serves a dwelling unit located in the United States, but the taxpayer's total adjusted tax burden must exceed $15,000 for a taxable year[91].

(1.2) Republic of Singapore

In Singapore, green building owners are allowed to claim commercial building allowances on capital expenditure. Singapore government encourages existing green property owners by giving a 200 percent tax allowance on capital expenditure on green initiatives in addition to normal capital allowances and tax deductions. Also, it provides a 50 percent reduction in tax payable on rental income derived from buildings that undergo green renovation and retrofitting[92].

[91] *Title 26 U.S. Code § 25D - Residential energy efficient property*. (1926). Retrieved October 13, 2021, from Cornell Law School: https://www.law.cornell.edu/uscode/text/26/25D

[92] Beng, T. (2019, January). *A greener Singapore: Proptech, tax incentives crucial*. Retrieved October 24, 2021, from The Business Times: https://www.businesstimes.com.sg/opinion/a-greener-singapore-proptech-tax-incentives-crucial

(1.3) People's Republic of China

In China, tax incentives as one of the key government methods to push forward sector development. China launched Green Policy in 2011. The revenues earned by energy conservation and water saving conservation projects, environmental protection, and clean development mechanism projects are eligible for a three-year exemption and three-year 50 percent reduction in corporate income taxes.

The corporate income tax law and its implementing regulations provide tax incentives to a number of areas in the green sector, includes purchases of environmental protection equipment, comprehensive use of resources, and high and new tech enterprises. In terms of green building, the jurisdiction of green building owners can claim a 10 percent of the investment in the special-purpose equipment[93].

(2) Green Building Development Company

The green building development companies or developers are one of the stakeholders who play the important role in green building development since they are the building developers. Therefore, the tax incentives in public policies normally are provided to the developers.

(2.1) United States of America

Title 26 U.S. Code §45L: new energy efficient home credit allows producers of manufactured energy efficient homes to a tax credit for each qualifying new home they build that is purchased before 2022. The amount of the credit is equal to $2,000 per home for homes built by contractors and $1,000 per manufactured home. To be eligible, an energy-efficient new home is required to have annual heating and cooling consumption that is at least 50% below a comparable unit, but 30% in the

[93] *Selected Tax Incentives in China's Renewable Energy Sector*. (2011, June 15). Retrieved October 25, 2021, from China Briefing: https://www.china-briefing.com/news/selected-tax-incentives-in-chinas-renewable-energy-sector/

case of manufactured homes. Contractors and manufacturers claiming this credit are required to submit certification to an eligible certifier before claiming the credit[94].

(2.2) Republic of Singapore

Singapore government provides a 50 percent tax exemption on gains by developers from sale of green buildings, both commercial and residential[95].

(2.3) People's Republic of China

China does not have any income tax rebate policies for green building developers.

(3) Green Building Buyer or Tenant

Normally, buyers or tenants in green buildings are the most economic actors in green building development since they consume the amber products or units of green building development such as green office buildings, green residence, green condominium, and so on. If public policies provide tax incentives to the green building consumers, the need in green building products will increase. This can drive public policies to achieve the Sustainable Goals because the more consumption in green building product is the more achievement in the Sustainable Development Goals. Therefore, public policies should concern on green building consumers.

(3.1) United States of America

In terms of tax incentives, the United States does not provide tax rebate for buyers or renters. However, it provides for the buyers in non-taxation such as fund, grant, and soft-loan.

(3.2) Republic of Singapore

Surprisingly, Singapore government does not need to

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[94] *Title 26 U.S. Code § 45L - New energy efficient home credit*. (1926). Retrieved October 14, 2021, from Cornell Law School: https://www.law.cornell.edu/uscode/text/26/45L

[95] Beng, T. (2019, January). *A greener Singapore: Proptech, tax incentives crucial*. Retrieved October 24, 2021, from The Business Times: https://www.businesstimes.com.sg/opinion/a-greener-singapore-proptech-tax-incentives-crucial

provide the income tax to the green buyers since these buyers do not care much about the money. When asked if buyers are willing to pay more to buy a home in a Green Mark building as compared to one in a non-Green Mark building, 54% of the homeowners mentioned that they would be willing to pay a premium of 3% and 4% for a Green Mark building due to the benefits of green buildings such as lower utility bills, healthier environment, and so on[96].

(3.3) People's Republic of China

Same as other countries, China government does not provide the exemption of income tax to the green building buyers. However, the buyers and tenants usually can enjoy the benefits of saving energy-cost.

3.2.1.2 The Incentives on Property Tax

Local Property Tax (LPT) is a self-assessed tax charged on the market value of residential properties in the state. Some local governments provide tax incentives on property tax.

(1) United States of America

The United States is one of the greatest complexities of local government countries in the world. While municipal systems among many states are similar in policy, method, and practice, there are numerous variations, exceptions, and differences in form and function. These differences may even exist within states. For example, property tax excludes for solar energy systems in California[97].

(2) Republic of Singapore

Singapore government allows 30 percent property tax rebate for green property owners[98].

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[96] Wong, R., Kaul, A., & Wei, X. (2017). *Perception towards Green Buildings in Singapore.* A Frost & Sullivan Summary Report. Retrieved November 8, 2021, from https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/summary_report_survey_on_bca_green_mark.pdf

[97] *Active Solar Energy System Exclusion*. (2021). Retrieved October 24, 2021, from California State Board of Equalization: http://www.boe.ca.gov/proptaxes/active-solar-energy-system.htm#Description

[98] Beng, T. (2019, January). *A greener Singapore: Proptech, tax incentives crucial*. Retrieved October

(3) People's Republic of China

China reduces property tax for the owners of green buildings. However, the rates are varied. They depend on where the buildings are located in[99].

3.2.1.3 The Incentives on Consumption Tax

A consumption tax is a tax you pay when you purchase a good or service. This category includes things like sales tax, excise tax, and import duties. Consumers who are willing to pay more for retail items can expect to pay higher consumption taxes. However, tax rates are dependent on the type of item consumed as well. This paper focuses on equipment that is used in green building development.

(1) United States of America

The United States does not provide any consumption tax incentives to green building owners.

(2) Republic of Singapore

Singapore is same as the United States is. It does not have any consumption tax incentives to green building owners.

(3) People's Republic of China

China government has provided VAT exclusion to energy-efficient equipment since 2008. This includes resources such as green building materials, combined heat and power pollutions, reclaimed wastewater. In the green building sector, wind turbine component importers and wind power equipment users also receive VAT benefits[100].

24, 2021, from The Business Times: https://www.businesstimes.com.sg/opinion/a-greener-singapore-proptech-tax-incentives-crucial

[99] Germanwatch. (2013). *Financing for energy efficiency in buildings in China and Germany.* A scoping study, Climate and Finance Policy Center. Retrieved October 31, 2021, from https://germanwatch.org/sites/default/files/publication/8546.pdf

[100] *Selected Tax Incentives in China's Renewable Energy Sector*. (2011, June 15). Retrieved October 25, 2021, from China Briefing: https://www.china-briefing.com/news/selected-tax-incentives-in-chinas-renewable-energy-sector/

3.2.2 Tax Penalties for the Polluted Buildings and Low Energy Efficient Buildings: Polluter Pays Principle

The polluter pays principle is the ordinarily accepted practice that people who produce pollution should carry the costs of managing it to prevent damage to human health or the environment. For instance, a factory that produces a potentially poisonous substance as a by-product of its activities is usually held responsible for its safe disposal. The polluter pays principle is part of a set of broader principles to guide sustainable development worldwide.

3.2.2.1 The Penalties on Direct Environmental Taxes: Changing Bad Behavior through Pigouvian Tax

A Pigouvian tax may be used by the government to address the problem of market failure due to an externality such as pollution. In this paper, it shows how the Pigouvian tax is used as a tool to change people's behaviors by punishment.

(1) Air Pollution Tax

The emission of air pollutants has detrimental effects on the environment and on human health. Taxes on air pollution are applied by many countries. This paper shows air pollution tax in three countries: The United States of America, Republic of Singapore, and People's Republic of China.

(1.1) United States of America

In the United States, the federal government concerns on air pollution tax by issuing carbon pricing policy. Carbon pricing has great potential as a U.S. policy toolkit to fight global warming. The federal government and local government pursue carbon pricing programs, along with other policies to cut emissions, as the best way to get to net zero emissions by 2050 Cap-and-trade programs reduce greenhouse gases over time by lowering the cap of allowable emissions. With a carbon tax, the higher the price, the greater the emissions reductions. A $50/ton tax on carbon

in the U.S. would help drive emissions reductions of about 40 percent, or around 2,620 million metric tons of CO2 equivalent by 2030, below 2005 levels[101].

(1.2) Republic of Singapore

In Singapore, it has air pollution tax named Carbon Tax. The carbon tax rate is set at S$5/t$CO_2$e in the first chance from 2019 to 2023. This tax applies to direct emissions from facilities emitting 25 ktCO_2e or more in a year, covering carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons. It covers around 80 per cent of Singapore's total emissions. The carbon tax does not apply to land transport fuels, for which there already are excise duties to encourage the reduction of their use.

The carbon tax was introduced in 2019 through the Carbon Pricing Act (CPA). The carbon tax will incentivize emissions reductions across all sectors and support the transition to a low-carbon economy. There are no exemptions for covered facilities, to maintain a transparent, fair, and consistent price signal across the economy[102].

(1.3) People's Republic of China

China's Environmental Protection Tax (EPT) is levied on the enterprises, public institutions and other producers and operators that directly discharge pollutants into the environment. The agricultural and mobile sources including motors, vessels, and aircrafts are exempt from the tax. Sulfur dioxide (SO_2), Nitrogen oxide (NO_X), and Carbon monoxide (CO) are the major pollutants subject to the EPT in almost all provinces in China. SO_2, NO_X and CO are the three pollutants subject to this tax across all regions. According to the EPT Law in China, the taxes for air pollutants vary from 1.2 RMB to 12 RMB per pollution kilogram, depending on the region (see Fig. 3.2).

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[101] Casale, M. (n.d.). *CARBON PRICING 101*. Retrieved October 25, 2021, from U.S. PIRG Education Fund, Environment America Research & Policy Center and Frontier Group: https://uspirg.org/feature/usp/carbon-pricing-101

[102] *Carbon Pricing Act*. (2021, October 22). Retrieved October 25, 2021, from Ministry of Sustainability and the Environment: https://www.mse.gov.sg/policies/climate-change/cpa

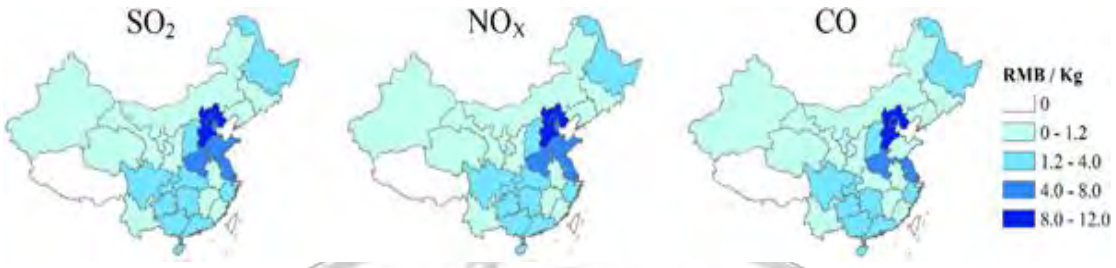

Figure 3.2 Environmental Protection Tax Rates in Each Province of China[103]

Figure 3.2 shows the environmental tax rates in provinces in China. The Jing-Jin-Ji area has been set at the maximum tax amount controlled under the law. Also, Shanghai, Jiangsu, Shandong, and Henan have a relatively higher air pollution tax. However, Liaoning, Jilin, Anhui, Jiangxi, Fujian, and some areas in the Northwest of China have used the lower tax level within the range.

(2) Water Pollution Tax

Water pollution taxes have been advocated by environmental economists as a regulatory approach to cost effectively achieve water quality improvements. This paper shows the examples of countries that enforce the water pollution tax in their countries.

(2.1) United States of America

The U.S. Environmental Protection Agency's combined sewer policy came out in 1994. Every year, more cities sign a consent law with the EPA. When cities sign a law, they usually agree to expand storage and treatment capacity to reduce the amount of polluted runoff during rainstorms. Separate fees for stormwater are an increasingly common way to pay for new sewer systems that will deal with rain and snowmelt. Most fees are no more than $US 5 per month and are based on the amount of hard surface such as driveways, roof, and pavement located on a property. Local governments establish most stormwater fees, but a few are mandated

[103] Hu, X. (2019, May 13). The impact of environmental protection tax on sectoral and spatial distribution of air pollution emissions in China. *Environmental Research Letters, 14*(5), 1-13. Retrieved October 26, 2021, from https://iopscience.iop.org/article/10.1088/1748-9326/ab1965/pdf

by state law. Baltimore is one of several Maryland cities that are required to charge a stormwater fee to reduce polluted flows into the Chesapeake Bay. The prices of water pollution taxes in other cities in the United States can be seen in the picture below (see Fig. 3.3).

Figure 3.3 The Price of U.S. Water, Sewer, and Stormwater for Households in 30 major U.S. Cities[104]

Figure 3.3 shows the price of a monthly bill for water, sewer, and stormwater service varies greatly across the United States in 2015. Also, Atlanta and Seattle have the two highest combined water, sewer, stormwater prices in the nation. Moreover, these two cities represent good green cities in the U.S. This means the higher tax is the greener city.

(2.2) Republic of Singapore

Since Singapore has limited land to collect and store rainwater, it has faced with drought, floods, and water pollution. These challenges inspired Singapore to strategies and seek innovative ideas, develop capabilities, and secure a sustainable supply of water. One of the tools that Singapore government has been used is water conservation tax to preserve fresh water in its country. The tax is now set at 30% of water consumption, but 45% for the consumption above 40 m^3 per

[104] LaFond, K. (2015, April 24). *Price of U.S. Water, Sewer, and Stormwater*. Retrieved October 26, 2021, from Circle of blue: https://www.circleofblue.org/2015/world/infographic-2015-price-of-u-s-water-sewer-and-stormwater/

month. However, for the industry water using, Singapore government levied on industrial water tariffs at S$0.43/$m^3$ [105].

(2.3) People's Republic of China

Before the 2015, the pollution discharge fee was 0.7 yuan per unit of water pollution. After the new regulations, the pollutant discharge fee was abolished in 2015. According to the Finance Ministry, local governments have been had more autonomy to set a range for the taxes from 1.4 yuan to 14 yuan for each unit of water pollution emitted to reflect the different regional environmental and economic conditions since 2018. China government does not implement a direct emission tax to the water pollution, but it imposes a tax on industry output based on the chemical oxygen demand (COD) discharge intensity. The estimates of the tax rates for each province are given in Figure 3.4.

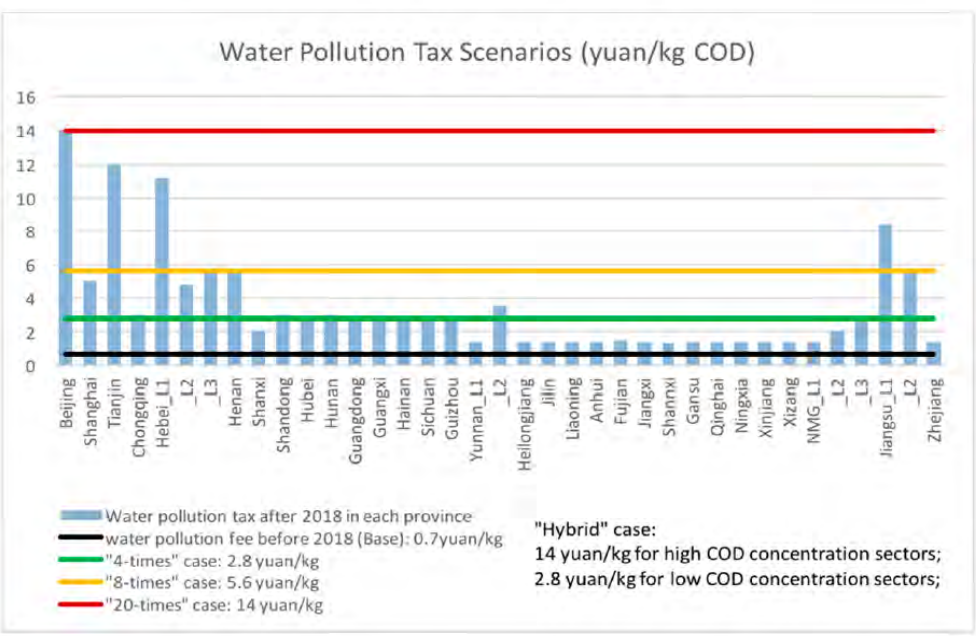

Figure 3.4 The Water Pollution Tax Rates in Each Province of China[106]

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[105] Lin-Heng, L. (2010, June). *Water Management in Singapore.* Retrieved October 26, 2021, from IUCN Academy: https://www.iucnael.org/en/component/docman/?task=doc_download&gid=952

[106] Guo, X., Ho, M. S., You, L., Cao, J., Fang, Y., Tu, T., & Hong, Y. (2018, November 27). Industrial Water Pollution Discharge Taxes in China: A Multi-Sector Dynamic Analysis. *Water, 1742*(10), 1-21. Retrieved October 27, 2021, from https://cn.chinaproject.harvard.edu/files/china-cn/files/water-10-01742-v2.pdf

Figure 3.4 shows that China government raises the COD tax up to 14 yuan/kg allowed by the Ministry of Finance. This new policy tax started in 2018 to change people's behaviors to more concern in water pollution. In addition, the higher tax is based on the higher pollution that the industry produced in each province. The highest water tax rates are 14, 11.9, 11.2, and 8.4 yuan/kg in Beijing, Tianjin, Hebei, and Jiangsu respectively.

(3) Land Pollution Tax

Land pollution tax is slightly different from Landfill tax. On one hand, landfills are solid waste disposal sites, where waste is deposited and compacted, and then covered over with a layer of soil. Their purpose is to minimize the volume of non-recyclable solid waste and store it with minimal danger to the public. All Landfill sites must be licensed by the government and to use them people must pay a Landfill tax. On the other hand, Land pollution tax or Contaminated land tax is levied on common property which is not specific to landfills. Also, it does not a license before paying the tax. Contaminated land is a land whose contamination is causing or has the potential to cause harm to living organisms, and damage to the ecosystem[107].

(3.1) United States of America

Instead of levied on the contaminated properties. The U.S. government provides property tax incentive to the land that is contaminated if the owner can turn it green. This program is called Brownfields Redevelopment Act. The purpose of this act is to reduce public health and environmental hazards on existing commercial and industrial sites that are abandoned. The tax incentives are depended on each state. However, the brownfield redevelopment incentive is a one-time tax credit. It is given in the year of finished project[108].

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[107] Davies, J. (2021). *Contaminated Land*. Retrieved October 27, 2021, from Lovell Consulting: https://lovellconsulting.com/contaminated-land-the-big-clean-up/

[108] *BROWNFIELD REDEVELOPMENT INCENTIVE*. (2021). Retrieved October 27, 2021, from New Jersey Economic Development Authority: https://www.njeda.com/brownfield-redevelopment-incentive%E2%80%8B/

(3.2) Republic of Singapore

Under Section 51 of the Environmental Protection and Management Act, all compensation, damages, fees, costs, and expenses to be paid. Basically, Singapore does not tax on contaminated land directly, but the polluter is primarily responsible for cleanup. Therefore, Singapore government changes people behaviors through non-taxation policy. However, the property owners may be liable on any polluting matters or toxic substance into any land[109].

(3.3) People's Republic of China

According to Law of the People's Republic of China on prevention and control of soil contamination, Article 69 mentions that the state adopts fiscal, taxation, pricing, financial and other economic policies, and measures that are favorable to the prevention and control of soil contamination[110]. Also, the government levies 5 yuan per ton of coal waste and 1,000 yuan per ton of hazardous waste[111].

(4) Noise Pollution Tax

Noise pollution can harm to health, biodiversity, social and economic effects. It is more severe and widespread than ever before, and will continue to increase worldwide because of mechanization, urbanization, and population growth. Noise pollution is the second most harmful pollution in Europe, behind air pollution[112]. Therefore, there are some countries have levied on noise pollution.

(4.1) United States of America

The U.S. government does not tax on common noise

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[109] Baker & McKenzie. (2015). Contaminated Land. Retrieved October 27, 2021, from https://www.bakermckenzie.com/-/media/files/insight/publications/2015/10/international-contaminated-land-guide/qrg_environmental_contaminatedlandguide_oct15.pdf?la=en

[110] *Environmental Laws*. (2019, January 1). Retrieved October 27, 2021, from Ministry of Ecology and Environment of the People's Republic of China: http://english.mee.gov.cn/Resources/laws/environmental_laws/202011/t20201113_807786.shtml

[111] Reuters Staff. (2016, December 25). *China to levy new taxes in bid to strengthen pollution fight*. Retrieved October 27, 2021, from Reuters: https://www.reuters.com/article/us-china-environment-idUSKBN14E05T

[112] Ezcurra, M. V. (2018, May 15). Noise pollution taxes: a possibilityto explore. *Academia*, 113-126. Retrieved October 27, 2021, from https://www.academia.edu/44322142/Noise_pollution_taxes_a_possibility_to_explore

pollutions, but it taxes on specific noise pollutions such as aviation industry. The tax on noise pollution has been applied to aircrafts during take-off and the sound produced by the engines. However, the U.S. government still control the noise through the office of noise abatement and control that relates to non-taxation. Under §7641 of Clean Air Act, the administrator must study noise pollutions and their effects on the public health and welfare[113].

(4.2) Republic of Singapore

Singapore government does not use a tax penalty to the noise pollution, but it uses tax incentives to facilitate effective measures to counter noise hazards. The customers who buy a certain industrial equipment of qualifying criteria which is related to satisfied noise levels. This incentive is applied to expenditure incurred from 1 January 1998 onwards[114].

(4.3) People's Republic of China

In China, the industrial noise is taxed in categories from 1–3 dB above standard to 16 dB or more above standard. Industrial noise polluters are levied 350 yuan per month if they exceed limits by 1-3 decibels, 700 yuan for 4-6 decibels, and 11,200 yuan per month for 16 decibels and more[115].

(5) Light Pollution Tax

Light pollution is an environmental degradation that comes from the reflective glass of building materials and the excessive artificial lighting sources such as electronic billboards, neon signs, building lights, neighbor's porch lights and so on. The pollution would affect to human health and ecosystem like a drop

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[113] *Clean Air Act Title IV - Noise Pollution*. (2021, August). Retrieved October 28, 2021, from United States Environmental Protection Agency: https://www.epa.gov/clean-air-act-overview/clean-air-act-title-iv-noise-pollution

[114] Ezcurra, M. V. (2018, May 15). Noise pollution taxes: a possibilityto explore. *Academia*, 113-126. Retrieved October 27, 2021, from https://www.academia.edu/44322142/Noise_pollution_taxes_a_possibility_to_explore

[115] Reuters Staff. (2016, December 25). *China to levy new taxes in bid to strengthen pollution fight*. Retrieved October 27, 2021, from Reuters: https://www.reuters.com/article/us-china-environment-idUSKBN14E05T

of stars visible in the sky, and eye irritation. Therefore, some countries control the light pollution through light pollution tax to reduce the pollution in their counties.

(5.1) United States of America

The U.S. government does not use taxation to reduce the light pollution, but it uses a fine to control the pollution. Most state laws are limited to outdoor lighting fixtures installed on the grounds of a state building or on a public roadway. The most common dark skies legislation requires the installation of shielded light fixtures which emit light only downward. For example, in New Mexico, the local government has the Night Sky Protection Act that regulates outdoor lighting fixtures to preserve the state's dark sky while promoting safety, conserving energy, and protecting the environment for astronomy. This act requires all outdoor lighting fixtures to be shielded, except incandescent fixtures of 150 watts or less. It prohibits outdoor recreational facilities from using lighting after 11:00 p.m. Also, it provides for a fine of up to $25 for any person, firm or corporation in violation of the law[116].

(5.2) Republic of Singapore

Even if Singapore is one of the green leader countries in the world, it does not pay enough attention on light pollution. Also, it has no tax or legal measure on the light pollution. This is the reason why Singapore has been ranked the most light polluted country in the world with the use of artificial light exceeds the level of light pollution[117].

(5.3) People's Republic of China

Although the scope of taxation of the new environmental protection tax law includes only air pollutants, water pollutants, solid waste, and noise pollution, China's local laws and regulations have light pollution prevention. For example, Guangzhou Municipal People's Government enforced Guangzhou outdoor advertising and signboard management methods in 2014 in order to manage outdoor

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[116] *States Shut Out Light Pollution*. (2021, October 21). Retrieved October 28, 2021, from National Conference of State Legislatures: https://www.ncsl.org/research/environment-and-natural-resources/states-shut-out-light-pollution.aspx

[117] Kumar, R. (2019, April 25). *Time to tackle light, noise pollution*. Retrieved October 29, 2021, from The Straits Times: https://www.straitstimes.com/forum/letters-in-print/time-to-tackle-light-noise-pollution#:~:text=a%2

advertisement signboards and to beautify the environment. Also, it issued Guangzhou building glass curtain wall management measures in 2017 in order to reduce the environmental impacts of light pollution and to ensure public safety[118].

3.2.2.2 The Penalties on Indirect Environmental taxes: Earmarked Tax for Environmental Improvement

The environmental earmarked taxes are the taxations whose revenues must be used for environmental purposes, usually via fiscal bodies, agencies, and so on which collect the tax revenue. This activity causes the raising price of polluted products or services. The idea of earmarked tax is different from the polluter pays principle because the earmarked tax is levied on the polluted product which is considered as an indirect environmental tax to improve the environment.

(1) United States of America

Basically, the U.S. government uses a carbon tax as an earmarked tax to reduce environmental problems. The carbon tax can influence GHG emissions from the combustion of fossil fuels in residential and commercial buildings as the tax is passed through in fuel prices. In addition, buildings are also the largest source of electric demand in the U.S. energy system because consumers use fossil fuels for air heating and water heating. They must carry on the carbon tax from purchasing the fossil fuels. Therefore, the carbon tax encourages customers to reduce their consumption of energy services through fuel switching, building shell improvements, energy system management strategies, and replacing existing appliances with more efficient equipment. However, fuel producers can also decarbonize fuels upstream to avoid the tax. For example, renewable natural gas can be considered without the natural gas system. Consumers will have different fuel and technology options to choose the greener type in order to save their money without paying the earmarked tax[119].

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[118] Guanglei, W., Ngarambe, J., & Kim, G. (2019, July 23). A Comparative Study on Current Outdoor Lighting Policies in China and Korea: A Step toward a Sustainable Nighttime Environment. *Sustainability, 14*(11), 1-17. Retrieved October 29, 2021, from https://www.mdpi.com/2071-1050/11/14/3989/htm

[119] Larsen, J., Mohan, S., Marsters, P., & Herndon, W. (2018). *ENERGY AND ENVIRONMENTAL IMPLICATIONS OF A CARBON TAX IN THE UNITED STATES.* AN INDEPENDENT REPORT, Columbia University, THE SCHOOL OF INTERNATIONAL AND PUBLIC

(2) Republic of Singapore

Singapore is a country that relies heavily on fossil fuels because it is the world's third-largest exporter of refined petroleum products. However, the Singapore government pays attention on the long-term development, it imposes carbon tax as an earmarked tax to petroleum products to protect the environment. This causes the increasing operating cost of refiners up to US$ 7 per barrel to support the environmental fund. Therefore, the carbon tax has an impact to fossil fuel consumers such as car users, water heating users, and so on[120].

(3) People's Republic of China

China uses earmarked taxes levied on enterprises as fees. In terms of the environmental issue, China levies on local city maintenance and construction fee and river maintenance fee. The fee rates can be varied in each province, mostly 7% in city level, 3% in municipal level, and 1% in village level. The tax bases depend on types of fee and provinces such as from net VAT and excises, annual sales, and so on[121].

3.3 Financial Measures on Promoting Green Building Development in Foreign Countries

Besides tax measures, financial measures also play an important role on supporting environmental protection. Financial measures mostly include grants, soft loans, funds, feed-in tariffs, economic benefits, fees, and fines. The financial measures can be used as an incentive tool or a punishment tool to promote green building development.

AFFAIRS, New York. Retrieved October 29, 2021, from https://energypolicy.columbia.edu/sites/default/files/pictures/CGEP_Energy_Environmental_Impacts_CarbonTax_FINAL.pdf

[120] Nakano, J. (2017, March 8). *Singapore Proposes Carbon Tax*. Retrieved October 29, 2021, from Center for Strategic and International Studies: https://www.csis.org/analysis/energy-fact-opinion-singapore-proposes-carbon-tax

[121] International Monetary Fund. (2018). *People's Republic of China Tax Policy and Employment Creation.* FISCAL AFFAIRS DEPARTMENT, Washington, D.C. Retrieved October 29, 2021, from https://www.imf.org/-/media/Files/Publications/CR/2018/cr1892.ashx

3.3.1 Financial Incentives for Green Building Development

Financial incentives have become a core component of private lands conservation program because of their ability to motivate stewardship behavior. However, there are some concerns about the durability of stewardship behaviors after payments end. Payments for performance may impact people only the present engagement with an incentive program to protect the environment. Although the financial incentives are not considered as the most powerful equipment to support environmental protection, they are a good tool to start driving green building development.

3.3.1.1 Grant

Normally, a grant can be defined as a gift or an award. Grants are non-repayable. Once people are awarded the grant money, there is no need to worry about monthly payments or piling up on debt. Repayment is the fundamental difference between a grant and a loan. The examples of grants for promoting green building development are money award for creating renewable energy technology, resources for doing research and development on green building development, funding to the existing building improvement, and so on.

(1) United States of America

There are plenty of grant programs to support green building development in the U.S. For example, Bank of America Charitable Foundation launched a $500,000 grant program to help the buildings in U.S. cities to achieve the sustainability and green building certification. Initial grant recipients include San Jose, California; Denver, Colorado; Phoenix, Arizona; Atlanta, Georgia; Washington, D.C.; and Chicago, Illinois. Each grant will consist of financial assistance to aid in the pursuit of LEED for certification. LEED certification is granted when the builder or architect applies to the U.S. Green Building Council (USGBC), documenting their compliance with the LEED rating system. The LEED Green Building Rating system is made up of points. These award levels include Certified (26-32); Silver (33-38); Gold (39-51); and Platinum (52-69). LEED for Cities enables local governments to measure and track citywide performance by focusing on outcomes, rather than intent. Cities are evaluated across 14 key metrics such as energy, water, waste, transportation, education, health,

safety, equitability, and so on. Washington, D.C., and Phoenix, Arizona are the first cities to achieve certification through the program and earned LEED Platinum, the highest level of certification[122].

(2) Republic of Singapore

The Singapore government provides a grant as a cash incentive for projects which achieve the BCA Green Mark Gold rating or higher is shown in Table 3.4.

Table 3.4 Grants for BCA Green Mark Incentives[123]

Green Mark Level	**Minimum Energy Saving**	**Green Mark Incentive (for building owners or developers)**		**Green Mark Incentive (for architects and engineers)**	
		Rate (per 1,000 m^2)	**Max**	**Rate (per 1,000 m^2)**	**Max**
Gold	-	$3,000 for new GFA	$300,000	$500 (each)	$50,000 (each)
Gold^{PLUS}	25%	$5,000 for new GFA	$2,500,000	$800 (each)	$80,000 (each)
Platinum	30%	$6,000 for new GFA	$3,000,000	$1,000 (each)	$100,000 (each)

This table shows funding to the stakeholders of green building development. If a building owner or developer achieve BCA green mark at Gold level, they will receive a money award $3,000 SGD per 1,000 m^2 for new gross floor area with the maximum at $300,000 SGD. For the architects and engineers, they will deserve

[122] Long, M. (2019, May 22). *U.S. Green Building Council Receives $500,000 Grant From Bank of America for LEED for Cities and Communities Program*. Retrieved October 30, 2021, from U.S. Green Building Council: https://www.usgbc.org/articles/us-green-building-council-receives-500000-grant-bank-america-leed-cities-and-communities-pr

[123] Building and Construction Authority. (n.d.). Guidelines for Application of Green Mark Incentive Scheme. Singapore. Retrieved October 30, 2021, from https://www.bca.gov.sg/greenmark/others/GMIS_guide.pdf

a grant for Gold level achievement $500 SGD per 1,000 m^2 per person with the maximum at $50,000 SGD per person.

(3) People's Republic of China

In China, the government grants the incentives of green building development through funding money awards with 45 RMB and 80 RMB for green building label at two stars level and three stars level respectively[124].

3.3.1.2 Soft Loan

A soft loan is basically a loan on comparatively courteous terms and conditions as compared to other loans available in the market. The easy terms may be in the form of lower interest rates, prolonged repayment duration, and so on. In addition, a soft loan mostly is provided from the government bank which is established for supporting government policies. In terms of green construction soft loans, the green loan market reached nearly $56 billion with real estate entities issuing 32 percent of green loans by amount[125]. This can be assumed that many countries in the world use soft loans to promote green building development.

(1) United States of America

In the United States, there are ample soft loan programs to support green building development. For example, Green Business Loan Program launched by Minnesota government provides low-interest loans to Minnesota businesses seeking financing to install new energy technologies. Loan amounts range from $20,000 to $300,000 by the Minnesota Department of Commerce. Also, there is New Hampshire Better Buildings Program in New Hampshire. The program is set up to serve residential customers through loans for efficiency energy projects, renewable energy projects, and improved home performance with Energy Star projects. In addition, Colorado Residential Energy Upgrade Loan Program is a statewide residential loan program

[124] Zhou, Y. (2014). *Comparison of Chinese Green Building Standard with Western Green Building standards.* Bachelor of Science Thesis, KTH Royal Institute of Technology, KTH Industrial Engineering and Management. Retrieved October 30, 2021, from http://www.diva-portal.org/smash/get/diva2:735240/FULLTEXT01.pdf

[125] World Bank. (n.d.). *Building the Market for Green Buildings.* A Finance and Policy Blueprint. Retrieved October 30, 2021, from https://olc.worldbank.org/system/files/4_1.pdf

sponsored by the Colorado Energy Office. It provides low-cost, long-term financing for energy efficiency and renewable energy improvements. The Colorado loans provide loans from $500 up to $35,000 with the started rate at 2.75% and terms from 3 to 15 years[126].

(2) Republic of Singapore

The Singapore government also has a soft loan for real estates that maintain the requisite BCA green mark standard. For instance, there was the first building that received soft loans with $1.2 billion USD to refinance the existing loans in order to keep the green building exist. This example shows how the Singapore government has devoted to green building development through soft loans[127].

(3) People's Republic of China

In China, financial support from the central government is channeled to the provincial and local governments that then distribute it potentially with additional finance from the local governments to project developers and investors. Even though the main instruments such as grants, low interest loans for building owners are provided. However, the soft loans are not provided to building developers only, but it is provided to the buyers of green buildings as well[128].

3.3.1.3 Feed-in Tariff

Feed-in tariffs (FIT) are fixed electricity prices that are paid to renewable energy producers for each unit of energy produced. The payment of the FIT is guaranteed for a certain period of time, usually between 15-25 years. FIT are usually paid by electricity operators with the context of Power purchasing agreements

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[126] American Council for an Energy-Efficient Economy. (2017, July). *Financial Incentives*. Retrieved October 30, 2021, from State and Local Policy Database: https://database.aceee.org/state/financial-incentives

[127] The Straits Times. (2019, July 17). *Frasers Property secures novel A$500m green loan for two Singapore properties*. Retrieved October 30, 2021, from The Straits Times: https://www.straitstimes.com/business/companies-markets/frasers-property-secures-novel-a500m-green-loan-for-two-singapore

[128] Germanwatch. (2013). *Financing for energy efficiency in buildings in China and Germany.* A scoping study, Climate and Finance Policy Center. Retrieved October 31, 2021, from https://germanwatch.org/sites/default/files/publication/8546.pdf

(PPA) which are generally the primary contracts between the public and private sector parties[129].

(1) United States of America

There are various feed-in tariff rates in the United States. The rates depend on the policies of each state. For instance, the Florida government launched Solar Feed-in Tariff program in 2009 which was the first feed-in tariff in the United States. The period of this municipal program is set for 20 years. Also, the feed-in tariff rates range from $0.15/kWh to $0.21/kWh depending on project size. However, the total program size is capped at 4 MW/year[130].

(2) Republic of Singapore

The Singapore government does not subsidize on feed-in tariffs to promote renewable energy. Instead of subsidies, Singapore has taken proactive steps by funding for research and development to support renewable technology development[131].

(3) People's Republic of China

The Chinese feed-in tariff has strict limits by local governments on the maximum operating hours per month that wind and solar panel output will be compensated and guaranteed grid purchase. However, the government normally provides a feed-in tariff at 1.15 Yuan or $0.18 USD/kWh to support renewable energy generating[132].

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[129] Laumanns, U., Michel, A., Neumann, D., Helbig, F., & Ziegler, F. (2019, July 11). *Feed-in Tariffs (FIT)*. Retrieved October 31, 2021, from Energypedia: https://energypedia.info/wiki/Feed-in_Tariffs_(FIT)

[130] U.S. Energy Information Administration. (2013, May). *Feed-In Tariffs and similar programs*. Retrieved October 31, 2021, from U.S. Energy Information Administration: https://www.eia.gov/electricity/policies/provider_programs.php

[131] Bhunia, P. (2017, October 29). *How the Singapore Government plans to boost solar power capacity to 1 gigawatt peak beyond 2020 from 140 megawatt peak today*. Retrieved October 31, 2021, from Open Gov Asia: https://opengovasia.com/how-the-singapore-government-plans-to-boost-solar-power-capacity-to-1-gigawatt-peak-beyond-2020-from-140-megawatt-peak-today/

[132] National Development and Reform Commission (NDRC). (2011). *CHINA: Notice No. 1594 of 2011 on Improving Solar PV Feed-in Tariff*. ( ) Retrieved October 31, 2021, from National Energy Administration: https://policy.asiapacificenergy.org/node/3182

3.3.1.4 Economic Benefits

The economic benefits of green building development are ample such as: reduction in capital costs, reduction in operating costs, marketing advantages, faster approvals, staying ahead of regulations, reduced risk and increased productivity, and so on[133].

(1) United States of America

In the United States, there are a lot of economic benefits for being a green building. For instance, the Colorado government can significantly speed up approvals to green building projects. Since time is money, American people pay attention on time strictly. Therefore, the streamlining approvals has become a driving strategy behind the green building movement[134].

(2) Republic of Singapore

The government provides floor area ratio (FAR) bonus to green buildings which attain higher tier green mark rating for reducing capital costs as an economic benefit. The details of the bonus can be seen from the table below.

Table 3.5 Green Mark FAR Bonus[135]

Green Mark Rating	Green Mark FAR Bonus
Platinum	Up to 2% additional of Gross Floor Area (subject to cap of 5,000 sqm)
Gold^{PLUS}	Up to 1% additional of Gross Floor Area (subject to cap of 2,500 sqm)

[133] Council of Development Finance Agencies. (2021). *Green Building Finance*. Retrieved October 31, 2021, from Council of Development Finance Agencies: https://www.cdfa.net/cdfa/cdfaweb.nsf/pages/greenbuildingfactsheet.html#:~:text=Green%20building%20is%20the%20practice,using%20an%20integrated%20design%20approach.

[134] Ibid.

[135] *GREEN MARK GROSS FLOOR AREA (GM GFA) INCENTIVE SCHEME.* (2016, June 2). Retrieved October 31, 2021, from Asia Pacific Energy: https://policy.asiapacificenergy.org/sites/default/files/BCA%20GM%20GFA%20Scheme.pdf

Table 3.5 shows the bonus of floor area ratio for each higher green mark level. The buildings that attains BCA green mark at Platinum level will enjoy the benefit of the 2% addition FAR with the maximum of 5,000 sqm. For the Gold^{PLUS} buildings, they will receive 1% addition FAR with the maximum of 2,500 sqm.

(3) People's Republic of China

Without any government subsidy, the green building technologies still help to reduce operating costs from water and energy saving over 80% compared to traditional buildings in Zhejiang[136].

3.3.2 Financial Penalties for the Polluted Buildings and Low Energy Efficient Buildings

A Financial penalty is named as a fine. Fines can be fixed in the legislation or variable. These depend on the rules of each jurisdiction. Also, the administrative fines, what are determined by a government authority or a police power, are often used to promote environmental conservation[137].

3.3.2.1 Compensatory Damages

Compensatory damage is money awarded to a claimant to compensate for damage, injury, or other loss incurred. Also, the compensatory damages are awarded in the civil court cases where there has been a loss as a result of another party's negligence or unlawful conduct[138]. Normally, the compensatory damages are the most founded cases between developers and people who live nearby the construction sites. The main construction contaminants can affect people from their generating air pollution, water pollution, land pollution, noise pollution, and light pollution. When people have been

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[136] Weng, J., & Gui, X. (2018, December 7). The development of green building in China and an analysis of the corresponding incremental cost: A case study of Zhejiang Province. *Lowland Technology International, 20*(3), 321-330. Retrieved October 31, 2021, from https://www.researchgate.net/publication/332834476_The_development_of_green_building_in_China_and_an_analysis_of_the_corresponding_incremental_cost_A_case_study_of_Zhejiang_Province

[137] OECD. (2009). *DETERMINATION AND APPLICATION OF ADMINISTRATIVE FINES FOR ENVIRONMENTAL OFFENCES.* Paris. Retrieved November 1, 2021, from https://www.oecd.org/env/outreach/42356640.pdf

[138] Bhavana. (2021, September 23). *Compensatory Damages*. Retrieved November 1, 2021, from Cleartax: https://cleartax.in/g/terms/compensatory-damages

recently diagnosed with a medical condition involving the polluted building construction, their personal damages may be entitled to compensation. In addition, property damages are also evolved with the compensatory damages through the polluted buildings and low energy efficient buildings. Therefore, most states have issued law to mitigate such situation.

(1) United States of America

The United States has a comprehensive system for imposing civil liability for natural resource damages. The American Superfund program was enacted in 1980 as CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act). This legislation provides the federal Environmental Protection Agency (EPA) with a varied and potent set of tools to effectuate hazardous waste cleanup. Also, the compensatory damage approach is one of its tools. However, there are some believe that common law tort remedies inadequately compensate people injured by hazardous pollutions. Procedure and substantive barriers, as well as exorbitant transaction costs, have prevented victims from collecting in court for their damages. Recognizing this inadequacy, Congress launched the Comprehensive Hazardous Substance Cleanup and Emergency Relief Act of 1984. The Bill would reform traditional tort causes of action for hazardous waste injuries and create a federal administered compensation system for the victims of hazard pollution injuries[139].

(2) Republic of Singapore

In Singapore, victim is entitled to the default remedy of a prohibitory injunction to restrain the defendant from continuing with the nuisance activities. However, injunctions are normally allowed only where damages would be an inadequate remedy for the plaintiff. In addition, considerations of public interest versus individual rights of landowners are paramount. Therefore, the compensatory damages in Singapore are aware of public interest first[140].

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[139] Bronston, D. E. (1983). Compensating Victims of Hazardous Substance Pollution in the United States and Japan: A Comparative Analysis. *Fordham International Law Journal, 7*(3), 501-533. Retrieved November 1, 2021, from https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1093&context=ilj

[140] YEW, G. C. (2019). ENVIRONMENTAL POLLUTION CONTROL IN SINGAPORE: THE INTERSECTION OF TORTS, STATUTES, REGULATIONS AND COMMUNITY

(3) People's Republic of China

Chapter V of the Environmental Protection Law mentions on legal liability. Under Section 28 of the Act, enterprises discharging pollutants more than the prescribed national or local discharge standards are liable to pay a fee for excessive discharge according to state provisions and are required to assume responsibility for eliminating and controlling the pollution. In addition, the law recognizes categories of damages including damages to public property, private property, damage to human person leading to injuries or death and damage to natural resources such as land, forests, water, minerals, fish, wild animals, and wild plants. The liabilities for environmental pollution under the law include warnings, fines, the closure or suspension of the offending facility, and compensation to the unit or individual that suffered direct losses. In addition to the above, a polluter whose activity has led to a serious environmental pollution accident, leading to the consequences of heavy losses of public or private property or human injuries or deaths of persons shall be investigated for criminal responsibility according to law[141].

3.3.2.2 Punitive Damages

Punitive damages are only awarded to an injured plaintiff when the defendant's conduct was despicable or reprehensible. Punitive damages are designed to punish a wrongdoer for the wrongful conduct and discourage similar conduct in the future[142].

(1) United States of America

Claims for punitive damages in environmental tort cases have raised a number of interesting state-law and constitutional issues. For instance, there are some limits the amount of punitive damages in each state. For example, six neighbors of

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NORMS. *Vietnamese Journal of Legal Sciences, 1*, 77-88. Retrieved November 1, 2021, from https://sciendo.com/pdf/10.2478/vjls-2020-0005

[141] UNEP. (2003, December). ENVIRONMENTAL LIABILITY & COMPENSATION REGIMES: A REVIEW. Retrieved November 1, 2021, from https://wedocs.unep.org/bitstream/handle/20.500.11822/29241/EnvLCRev.pdf?sequence=1&isAllowed=y

[142] Diana Legal. (2019, September 17). *Civil Litigation*. Retrieved November 1, 2021, from Diana Legal: https://www.dianalegal.com/fraud-i-damages-i-civil-litigation-punitive-damages-vs-compensatory-damages/

Smithfield Foods, the world's largest pork producer, filed a nuisance lawsuit about excessive noise, odor, flies, and other negatives to their quality of life against Smithfield Foods. The jury awarded $75 million in punitive damages to each of the six neighbors, for a total punitive damages award of $450 million. The jury also awarded between $3 million to $5 million in compensatory damages to each neighbor. However, the North Carolina punitive damages cap is expected to lower the amount of punitive damages to $1.5 million or $250,000 for each of the six neighbors. Therefore, there is still a reasonable limit on the amount of punitive damage even the idea of punitive damages to punish a wrongdoer[143].

(2) Republic of Singapore

Since Singapore follows Traditional English, the punitive damages are commonly used in Singapore legal system. The are many types of punitive fines in Singapore. For example, Singapore water law provides that any person who puts oil, oily mixtures, refuse, garbage, plastics, waste matters or noxious liquid substances into Singapore waters is liable upon conviction for a fine not exceeding S$ 10,000, a prison term not exceeding two years, or both[144].

(3) People's Republic of China

Even though the National People's Congress passed new Tort Liability Law on December 26, 2009, this law mentions only on liability for environmental pollution. In other words, the law allows to compensate a victim for his loss and to prevent future harm only, but not to punish the violation[145].

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[143] Blount, G., Droze, W., & Hopkins, K. (2018, August 7). *Punitive Damages in North Carolina Hog Farm Cases Reduced*. Retrieved November 2, 2021, from Environmental Law and Policy Monitor: https://www.environmentallawandpolicy.com/2018/08/punitive-damages-north-carolina-hog-farm-cases-reduced/

[144] Singapore's Environmental Management System: Strengths and Weaknesses and Recommendations for the Years Ahead. (1998, October). *William & Mary Environmental Law and Policy Review, 23*(1), 178-179. Retrieved November 2, 2021, from https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=1270&context=wmelpr

[145] Kelley, J. E. (2011). Seeking Justice for Pollution Victims in China. *Seattle University Law Review, 35*(5), 529. Retrieved November 2, 2021, from Seattle University: https://digitalcommons.law.seattleu.edu/cgi/viewcontent.cgi?article=2069&context=sulr

Inconclusion, the successful public policies of foreign countries on promoting green building development are kind of slightly different in each country. This means the ways to success of public policies can be various. They depend on people beliefs, cultures, government strategies, locations, and national wealth of their countries. However, the same thing that all the public policies have is the effective on promoting green building development. Therefore, it would be a great idea if Thailand adapts some the effective measures to improve Thai measures to become the better ones to achieve the sustainable development goals. The legal measures, tax measures, and financial measures on promoting green building development in the United States of America, the Republic of Singapore, and the People's Republic of China can be summarized into table 3.6.

Table 3.6 Summary of Legal, Tax, and Financial Measures in the United States of America, the Republic of Singapore, and the People's Republic of China

(Please see the next page)

Measure	United States of America	Republic of Singapore	People's Republic of China
Legal Measure	1. Required to meet green building standards - Executive order no. 13,423 - Executive order no. 13,514 - Some local government regulations such as in Maryland and California.	1. Required to meet green building standards - Section 49 of Building Control Act 2008: buildings must meet a minimum Green Mark score of 50 points.	1. Required to meet green building standards - Environmental Impact Assessments (EIA)
	2. To protect public health - Clean Air Act	2. To protect public health - Not available (the Singapore Standard SS 554: 2009 is a voluntary program)	2. To protect public health - Not available (Code for Indoor Environmental Pollution Control of Civil Building Engineering is a voluntary program)
	3. To protect human rights - Americans with Disabilities Act (ADA)	3. To protect human rights - Not available (Universal Design Mark is a voluntary program)	3. To protect human rights - Construction of a Barrier-Free Environment
	4. To protect cultural heritage	4. To protect cultural heritage	4. To protect cultural heritage

Measure	United States of America	Republic of Singapore	People's Republic of China
	- Land use and zoning laws	- Planning Act	- Urban and Rural Planning law
	5. To improve energy and water saving - Energy Policy Act of 2005	5. To improve energy and water saving - Mandatory Higher Green Mark Standard for GLS Sites in Selected Areas	5. To improve energy and water saving - Article 17 of Renewable Energy Law - Five-Year Plan (FYP)
Tax Measure	1. Subsidized on income tax - Title 26 U.S. Code §25C of the Internal Revenue Code (IRC): allowing a 10% credit for energy efficiency improvements - Title 26 U.S. Code §25D: permitting a 35% credit for qualified expenditures - Title 26 U.S. Code §45L: allowing producers of manufactured energy efficient homes to a $2,000 tax credit for each qualifying new home they build	1. Subsidized on income tax - Giving a 200 percent tax allowance on capital expenditure - Providing a 50 percent reduction in tax payable on rental income - Offering a 50 percent tax exemption on gains by developers from sale of green buildings	1. Subsidized on income tax - Green Policy: providing a three-year exemption and three-year 50 percent reduction in corporate income taxes - Allowing a 10 percent of the investment in the special-purpose equipment to green building owners

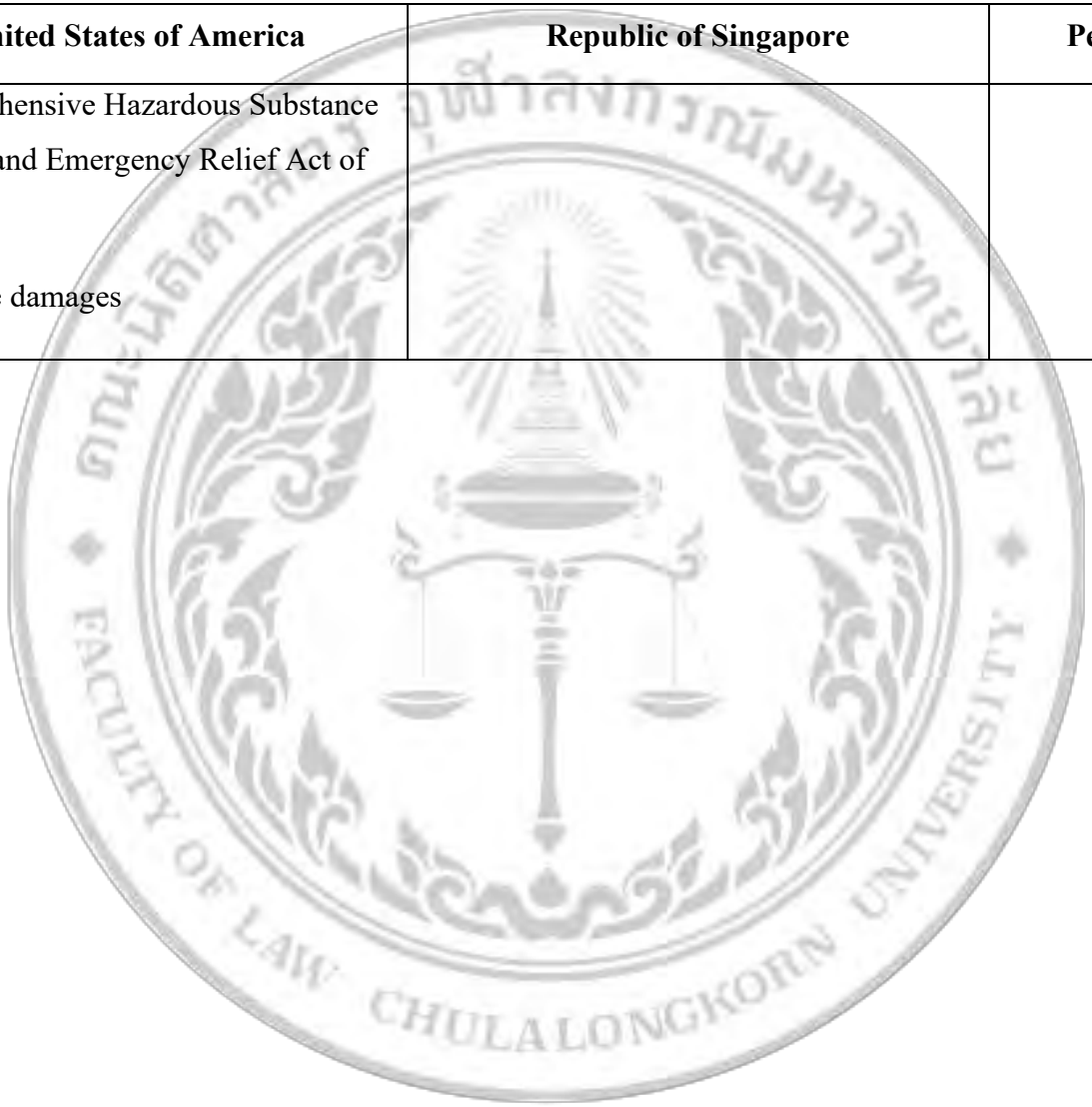
Measure	United States of America	Republic of Singapore	People's Republic of China
	- Title 26 U.S. Code §136: free tax on gross income for the profit from selling the renewable energy equipment - Title 26 U.S. Code §179D: allowing a tax deduction of $1.80 per square foot for improving energy efficiency in buildings - Some local government incentives such as New Mexico allows a corporate income tax credit for buildings with a LEED silver certification or higher		
	2. Subsidized on property tax - Property tax excludes for solar energy systems in California. - Brownfields Redevelopment Act: a one-time tax credit	2. Subsidized on property tax - Allowing a 30 percent property tax rebate for green property owners	2. Subsidized on property tax - Local government incentives: reducing property tax for the owners of green buildings

Measure	United States of America	Republic of Singapore	People's Republic of China
	- The government of Maryland allows a property tax credit for buildings that achieve a LEED silver certification. - Local government incentives in other states		
	3. Subsidized on consumption tax - Not available	3. Subsidized on consumption tax - Not available	3. Subsidized on consumption tax - VAT exclusion to energy-efficient equipment

Measure	United States of America	Republic of Singapore	People's Republic of China
	4. Penalized on environmental tax - Carbon pricing: air pollution tax - EPA sewer policy: water pollution tax - Earmarked tax: carbon tax	4. Penalized on environmental tax - Carbon Pricing Act (CPA): air pollution tax - Water conservation tax - Earmarked tax: carbon tax	4. Penalized on environmental tax - China's Environmental Protection Tax (EPT): air pollution tax - Water pollution tax - Law of the People's Republic of China on prevention and control of soil contamination - Noise pollution tax - Local laws and regulations in light pollution prevention - Earmarked tax: local city maintenance and construction fee and river maintenance fee.

Measure	United States of America	Republic of Singapore	People's Republic of China
Financial Measure	1. Provided money - Grant programs - Soft loan programs - Feed-in tariff	1. Provided money - Grant programs - Soft loan programs - Funding for research and development to support renewable technology development	1. Provided money - Grant programs - Soft loan programs: provided to both the owners and the buyers of green buildings - Feed-in tariff
	2. Provided economic benefits - Faster approvals - FAR bonus	2. Provided economic benefits - FAR bonus	2. Provided economic benefits - Not available
	3. Fines - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	3. Fines - Compensatory damages - Punitive damages	3. Fines - Environmental Protection Law: Paying a fee for excessive discharge - Tort Liability Law

Measure	United States of America	Republic of Singapore	People's Republic of China
	- Comprehensive Hazardous Substance Cleanup and Emergency Relief Act of 1984 - Punitive damages		



CHAPTER 4

THE LIMTATION OF PUBLIC POLICIES ON PROMOTING GREEN BUILDING DEVELOPMENT IN THE KINGDOM OF THAILAND

Thailand have intended to promote the prevention of global warming since 1992 by launching several environmental acts including: Energy Conservation Promotion Act, B.E. 2535 (1992), Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), and Public Health Act, B.E.2535 (1992), but these acts are not enough to pursue the climate change prevention since the world temperature keeps rising. Moreover, the Green Growth Index of Thailand is still quite low.

Nevertheless, the development of green building in Thailand is also not as good as it supposed to be. Besides the number of green buildings, LEED Accredited Professionals (LEED AP) is another indicator to show how popular green building in that country is. In Thailand, the said ratio is at 0.85 (85 advisors per 100 green buildings) which is lower than the world's average of 1.43 and lower than Asian countries including Singapore, Japan, and the Philippines at 2.24, 1.73, and 1.67 respectively[146]. Therefore, the shortage of the number of green buildings and LEED AP in Thailand can be assumed that public policies on promoting green building development in Thailand have some limitations.

4.1 The Limitation of Thai Legal Measures: Inadequate Requirements for Promoting Green Building Development

Thai legal measures do not require the rules of building construction higher enough to meet the sustainable development goals. Normally, green building standards concern all aspect of sustainable development from economy to society and to

[146] Umsakul, K. (2018, July 4). *The value of green building... a new building trend that looks beyond just saving the planet*. Retrieved November 19, 2021, from SCB Economic Intelligence Center: https://www.scbeic.com/en/detail/product/4817

environment. It would be a great idea if Thai public policies follow the green building standards. The limitation of Thai legal measures on promoting green building development can be divided into three aspects: environmental impact, social impact, and energy conservation.

4.1.1 The Limitation of Legal Regulations on Environmental Impact

Thai legal measures such as Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), Building Construction Control Act, B.E. 2522 (1979), and so on do not cover in the specific details of site and landscape in the prevention of environmental impacts like the standards of green building provide. For example, in terms of heat island effect, Thai's Rating of Energy and Environmental Sustainability (TREES) requires buildings to reduce heat island effects in the urban area from project development. The heat island effect is the different temperature between developed and not developed area. In order to get the scores from this topic, there are three ways from TREES that buildings have to meet the criteria. Firstly, green roof or vertical garden must have a specific number of areas. Secondly, hardscape area received direct solar radiation not more than 50% of the total hardscape area. Then, having big native trees that can shade the building efficiently and do not damage the building at the Western, Eastern, and Southern sides of the building.

However, the Thai legal measures require only the basic rules for building construction. The rules do not enforce buildings to concern on being green enough. For example, the Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992) only requires for the specific types of building such as a building with a height of 23 meters or more and located near or on the river/ lake shore or beach or in a national park must do the Environmental Impact Assessment (EIA). Even though the law requires building developers must employ a legal entity licensed by the Office of Natural Resources and Environmental Policy and Planning to be an agent to do EIA, it is not strict enough to prevent the climate change.

In short, Thai legal measures have intended to preserve the clean environment and prevent the environmental impacts, but their measures are quite out-of-date. There is still no updated law which is more effective in prevent the global warming and pursue

the sustainable development goals. While Thailand still keeps using the EIA, the United States and Singapore have shifted to apply the green building standards: LEED, BCA green mark respectively to their building construction law that all buildings must meet the minimum criteria of the green building standards.

4.1.2 The Limitation of Legal Regulations on Social Impact

In terms of social impact, Thailand has several laws such as: Public Health Act, B.E.2535 (1992), Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), Building Construction Control Act, B.E. 2522 (1979), Town Planning Act, B.E. 2518 (1975), and so on to reduce the social impacts, but there is no rule to prevent the sick building syndrome. For example, Public Health Act, B.E.2535 (1992) focuses on mitigate the impacts by giving the power to local officers to issue a written order to the owner or the possessor of the building requiring that person to repair or demolish the hazard items. However, this act can only mitigate the impacts while the United States and Singapore use the prevention strategy by forcing all buildings must meet the requirement of Indoor Air Quality (IAQ) in their law. The IAQ for buildings requires only in Engineering Institute of Thailand Standard. This standard is not law. It is a Thai engineering standard or guideline to improve public safety and sustainability. Therefore, Thai measures still lack in social impact prevention.

4.1.3 The Limitation of Legal Regulations on Energy Conservation

Energy Conservation and Promotion Act, B.E.2535 (1992) is sort of too board to encourage developers to build the energy efficient buildings because it does not specify the details of how buildings must reduce their energy consumption to meet the requirements of this law. Section 17 of Energy Conservation and Promotion Act, B.E.2535 (1992) only requires all buildings must meet one of the seven methods in energy conservation inside the buildings. However, this section does not provide the details of how much the reducing in energy consumption. It is different from the United States and Singapore that require all buildings must meet the green building standards with the specific details[147].

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[147] *Energy Conservation and Promotion Act, B.E.2535.* (1992). Retrieved November 27, 2021, from http://www.eppo.go.th/images/law/ENG/nation2.pdf

4.2 The Limitation of Thai Tax Measures: Too Indirect Green Building Promotion

Tax measures on promoting green building development in Thailand do not appear directly in Thai taxation system because both tax incentives and tax penalties have been put in the public policies that promote green building development indirectly. The public policies mostly are in the form of tax incentive, but they also can be found in the form of tax penalty. However, these public policies are not effective very well since they promote the green building development in the way that is too indirect.

4.2.1 The Limitation of Tax Incentives: No Direct Tax Incentive

The most effective public policy for tax incentives on green building development is Investment Promotion Act, B.E. 2520 (1977). The aim of this act is to stimulate Thai economy by providing tax and non-tax incentives to both foreign and Thai investors. BOI Announcement No.1/2564 under the Investment Promotion Act offers a 3-year corporate income tax (CIT) exemption on the revenue of an existing project, accounting for 50 percent of the investment under this measure excluding cost of land and working capital. Also, it offers exemption of import duty for machinery. This measure is promoting investment to improve the efficiency of energy conservation, alternative energy utilization or environmental impact mitigation, upgrading and replacing machinery, research and development or engineering design, and upgrading of production line to acquire international sustainability certification. However, this measure does not promote to green building developers directly since the incentive does not favor the developers properly. It offers the imported machinery exemption while the most cost of green building development is the green material. While the measure is good for the green factories, it does not work for the green buildings. Even though this measure can make the domestic green material cheaper from the lower cost of green material production, it still lacks to support the green building development directly. Therefore, it would be great if the public policies

provide tax incentives for green building development directly by making the green materials more affordable[148].

4.2.2 The Limitation of Thai Tax Penalties for the Polluted and Low Energy Efficient Buildings: No Direct Tax Penalty

Thai taxation does not tax through the Polluter Pays Principle (PPP). It taxes on the polluted products. In terms of polluted and low energy efficient buildings, Thai tax penalties exist only on indirect environmental taxes through excise tax and earmarked tax.

4.2.2.1 The Limitation of the Tax Penalties on Direct Environmental Taxes

Thailand has no regulatory body and law on clean air[149]. However, under the Constitution of the Kingdom of Thailand, B.E. 2560 (2017) provides rights on collecting taxes to local governments and people. It offers that communities have rights to manage, maintain and utilize their natural resources, environment, and biodiversity in a sustainable manner, in accordance with the procedures as provided by law[150]. Nevertheless, there is still no direct environmental tax in Thailand such as air pollution tax, water pollution tax, and land pollution tax. The penalty taxes only appear on indirect environmental taxes.

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[148] *Investment Promotion Act, B.E. 2520* . (1977). Retrieved November 27, 2021, from http://www.boi.go.th/english/download/boi_forms/proact_eng.pdf

[149] Boonlert, T. (2021, June 16). Retrieved November 27, 2021, from Bangkok Post: https://www.bangkokpost.com/life/social-and-lifestyle/2133183/the-never-ending-story

[150] Sribuaiam, K. (2010). Linkage between "Community Rights" and "Natural Resources and Environment" under the Thai Constitution B.E. 2560. *Ramkhamhaeng Law Journal*, 1-40. Retrieved November 27, 2021, from http://www.lawjournal.ru.ac.th/abstract/1538637466_%E0%B8%9A%E0%B8%97%E0%B8%84%E0%B8%A7%E0%B8%B2%E0%B8%A1%E0%B8%84%E0%B8%99%E0%B8%B6%E0%B8%87%E0%B8%99%E0%B8%B4%E0%B8%88%20%E0%B8%A8%E0%B8%A3%E0%B8%B5%E0%B8%9A%E0%B8%B1%E0%B8%A7%E0%B9%80%E0%B8%AD%E0%B8%B5%E0%B9%88%E0%B8%A2%E0%B8%A1%20%E0%B8%84%E0%B8%A7%E0%B8%B2%E0%B8%A1%E0%B9%80%E0%B8%8A%E0%B8%B7%E0%B9%88%E0%B8%AD%E0%B8%A1%E0%B9%82%E0%B8%A2%E0%B8%87%E0%B8%AA%E0%B8%B4%E0%B8%97%E0%B8%98%E0%B8%B4%E0%B8%8A%E0%B8%B8%E0%B8%A1%E0%B8%8A%E0%B8%99%20%E0%B8%AA%E0%B8%B4%E0%B9%88%E0%B8%87%E0%B9%81%E0%B8%A7%E0%B8%94%E0%B8%A5%E0%B9%89%E0%B8%AD%E0%B8%A1%20%E0%B8%A3%E0%B8%B1%E0%B8%90%E0%B8%98%E0%B8%A3%E0%B8%A3%E0%B8%A1%E0%B8%99%E0%B8%B9%E0%B8%8D%2060%20-%20Copy.pdf

4.2.2.2 The Limitation of the Tax Penalties on Indirect Environmental Taxes

Normally, Thailand imposes the excise tax on fuel. Moreover, Thailand also has an earmarked tax called Oil Fund[151]. This tax levy on petroleum products. These measures encourage people who use gasoline vehicles to change to use electric vehicles instead. Therefore, buildings have to adapt themselves by providing the electric vehicle charger to their workers and customers who use the electric vehicles. In short, Thailand has tax penalties to promote green building development, but the way of its promotion is too indirect.

4.3 The Limitation of Financial Measures on Promoting Green Building Development in the Kingdom of Thailand: Hard to Reach

Thailand has several financial measures on promoting green industries. However, the measures do not drive by the government sector. Thai government encourages Thai commercial banks to offer soft loan to enterprises that are going green. For example, Siam Commercial Bank provides the special loan that is lower interest rate and longer payment than normal loan to enterprises that are improving their energy consumption efficiency. Even though Thai government uses Thai Credit Guarantee Corporation to guarantee enterprises' debt to commercial banks, the enterprises are still hard to get the loan because the commercial banks make the decision to approve the loan. In addition, the financial penalty measures appear in Thai taxation system as well, but they are quite hard to change the polluted buildings turn to be green buildings because the punitive damages are hard to reach in Thailand.

4.3.1 The Limitation of Financial Incentives

Even though Thai public policies support green building development through grant, soft loan, and economic benefit, all these measures are kind of hard to reach the incentives because there are plenty of conditions that the building developers have to follow the criteria. For example, one of the grant public policies is ESCO Revolving

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[151] Energy Policy and Planning office (EPPO). (2021). *Retail price structure*. Retrieved November 27, 2021, from Ministry of Energy: http://www.eppo.go.th/index.php/th/petroleum/price/structure-oil-price?issearch=1&isc=1&xf_6=20

Fund. The aim of this fund is to encourage private investments in renewable energy and energy efficiency projects by offering financing to building developers. However, ESCO Revolving Fund will make equity investment in Energy efficiency or renewable energy projects through Energy for Environment Foundation instead of just providing a grant. The size of equity investment is 10% to 50% of total equity but limited to 50 million baht per project, and not to be the major shareholder. When it comes to the exit method, Energy for Environment Foundation will sell back to the project developer with agreed price in the shareholder agreement. It is not easy to receive the grant because the overall project budget of ESCO Revolving Fund is only 300 million baht. Therefore, this amount cannot cover the green building development in the entire country.

In addition, the economic benefits such as FAR bonus, faster approval, and so on are not receive easily because Thai government organizations work separately in each organization. For example, Bangkok's city plan stipulates an extra construction area incentive or FAR bonus to green buildings in Bangkok, but there is no official organizer to certify the buildings that these buildings will be green for sure[152]. Therefore, the incentive of FAR bonus is hard to reach since all buildings still have to build the completed green buildings first. After the buildings are certified by the Thai Green Building Institute or any other organization approved by the city planning committee, they will be able to enjoy the FAR bonus. This way is complicate to building developers.

Moreover, Feed-in Tariff (FIT) in Thailand has many barriers. One of the barriers is the complicated process. A typical residential-scale solar project sized larger than 3.7 kW is required to acquire many permits such as factory license, energy production license, and so on. Therefore, this long process makes building owners hard to receive 3.66 baht/kW due to its complicated procedure.

[152] *The Bangkok Comprehensive Plan, B.E.2556*. (2013). Retrieved November 27, 2021, from http://iad.bangkok.go.th/sites/default/files/21.City%20Planning%20Department.pdf

4.3.2 The Limitation of Financial Penalties

Thai public policies on financial penalty for polluted buildings are used in form of fee, fine, compensation, and crime. Wastewater treatment fee is commonly used in the local governments to protect the environment. However, the fee is insufficient amount to punish the polluted and low energy efficient buildings to change them to be green buildings. Nevertheless, Thai local governments follow the formular that "User Fee = Operation cost at break-even point + management cost", but this way is not enough to support green building development. For example, wastewater treatment fees in Sansuk Municipality are still quite low compared to the United States wastewater prices. The wastewater treatment fee rates can be seen from the table below.

Table 4.1 Wastewater Fee Rates in Sansuk Municipality[153]

Class of Users	Wastewater (m^3/month)	Wastewater Fee Rates (baht/m3)
1. Residential	≤ 20	2.00
2. Commercial I	≤ 200	3.00 – 3.50
3. Commercial II	>200 but ≤500	4.50
4. Industry I	≤ 200	3.00 – 3.50
5. Industry II	>200 but ≤500	4.50
6. Others I (not in 1-5)	≤ 200	3.50
7. Others II (not in 1-6)	>200 but ≤500	4.50

Table 4.1 shows the wastewater fee rates in Sansuk municipality. It seems like there are several rates in the municipality. However, the rates are the same between Commercial and Industry. Also, these rates are very low compared to the United States. While the lowest average rate for wastewater in the United States is about \$2.50/m^3 or 82.50 THB/m^3, the highest rate in Sansuk municipality, where is one of the clean and green model cities in Thailand, is only 4.50 THB/m^3. In short, this table represents the

[153] Simachaya, W. (2017). *Environmental Financing Strategies: User Charges in the Wastewater Sector in Thailand.* Retrieved December 7, 2021, from Pollution Control Department: http://infofile.pcd.go.th/water/Water_Usercharges.pdf

insufficient amount of wastewater treatment fees in Thailand by using Sansuk municipality as the best practice.

In addition, Thailand currently does not have punitive damage in environmental law. The highest fine and crime in Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992) is 500,000 THB. Section 98 of the act says "Any person who violates or fails to comply with the order issued by virtue of section 9 or obstructs any act carried out in compliance with such orders must be punished by a term of imprisonment not exceeding one year or a fine not exceeding one hundred thousand baht, or both. In the case where a person who violates or fails to comply with the order or obstructs any act in compliance with such orders is the person responsible for causing danger or damage arisen from pollution, such person shall be punished by a term of imprisonment not exceeding five years or a fine not exceeding five hundred thousand baht, or both"[154].

Basically, this act enforces the violators in form of crime and fine penalties. However, this act still cannot be considered as the law of punitive damages because it does not provide enough burden to the violators. Therefore, financial penalties for the polluted and low energy efficient buildings in Thailand lacks to support green building development due to their low efficiency to change the polluter behaviors. In other words, green building developers are hard to bring the financial penalties to induce the polluted and low energy efficient building to turn green because punitive damages are still unavailable in Thailand.

[154] *Enhancement and Conservation of National Environmental Quality Act, B.E. 2535*. (1992). Retrieved November 28, 2021, from http://greenaccess.law.osaka-u.ac.jp/wp-content/uploads/2019/03/Enhancement-and-Conservation-of-the-National-Environmental-Quality-Act.pdf

CHAPTER 5

PROBLEM ANALYSIS AND GUIDELINES FOR IMPROVING TAX MEASURES TO ACHIEVE THE SUSTAINABLE DEVELOPMENT GOALS OF THE KINGDOM OF THAILAND

In analyzing the problems of Thai tax measures, this paper found that Thai tax measures and other measures on promoting green building development had not enough efficiency because the growth rate of green building development in Thailand and the green growth index of Thailand were not so good as mentioned earlier in Chapter 2. Even though the green buildings in Thailand had increased, the percentage of growth rate of green building dropped down significantly. Therefore, this chapter will analyze the problems of Thai tax measures and provide guidelines to improve Thai tax measures by adopting the suitable foreign tax measures to make Thai tax measure achieve the sustainable development goals in the future.

5.1 Evidence of Failure on Tackling Environmental Issue and Promoting Green Building Development in the Kingdom of Thailand

Thai tax measures and non-tax measures on promoting green building development failed to their objectives on supporting the green buildings and protecting the environment. This problem can be proved from various indicators such as green building development growth rate, green growth index, and air quality index. Since green growth index is already shown in Chapter 2, this chapter will show the higher of air quality index and the lower of green building development in Thailand.

5.1.1 The Higher of Air Quality Index: High PM2.5 Concentration

The best empirical evidence to prove that Thai tax measures are failed to protect the environment is natural disaster that has appeared a lot recently in Thailand. Thailand has encountered with severe several natural disasters from floods to earthquakes, and from wildfire to droughts. However, one of the most dangerous disasters that have been

getting more severe every year is toxic smog disaster. The high PM2.5 concentration increases annually in Thailand (See Fig 5.1).

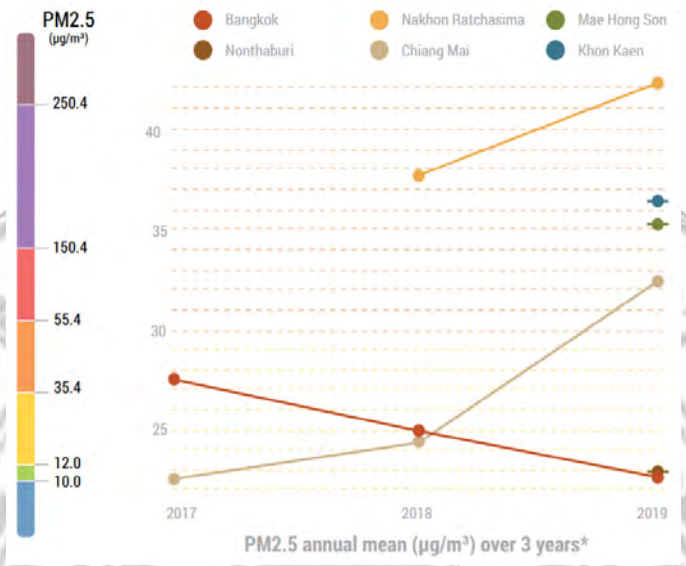

Figure 5.1 Number of PM2.5 in Thailand[155]

Figure 5.1 shows the graphs of numbers of PM2.5 in 6 cities of Thailand in year 2017, 2018, and 2019. The 6 cities include Bangkok, Nonthaburi, Nakhon Ratchasima, Chiang Mai, Mae Hong Son, Khon Kaen. The number of PM2.5 in Nakhon Ratchasima in year 2018 was above 35.4 µg/m³. This number meant public and individuals in particular were at risk to experience irritation and respiratory problems. Also, the number of PM2.5 in Nakhon Ratchasima increased to reach almost 55.4 µg/m³ in 2019. That number meant the unhealthy level that can affect to the heart and lungs among general public.

In addition, the numbers of PM2.5 in Chiang Mai increased continuously from 21 µg/m³ to 24 µg/m³, and to 33 µg/m³ in 2017, 2018, and 2019 respectively. Mae Hong Son and Khon Kaen were also at the level of risky unhealthy. However, the numbers of PM2.5 in Bangkok were seemed to be looking good, but truth be told, the cause was

[155] IQAir. (2020). *The 2019 World Air Quality Report.* Retrieved December 1, 2021, from https://www.greenpeace.org/static/planet4-thailand-stateless/2020/02/91ab34b8-2019-world-air-report.pdf

from the abrupt change in the weather pattern with winds blowing away PM2.5[156]. This means Thai tax and non-tax measures have problems in tackling environmental issues.

5.1.2 The Lower of Green Building Development: Low Green Building Growth Rate

In terms of green building development, there are tax and non-tax measures in Thailand that support green building development such as Investment Promotion Act, B.E. 2520 (1977), Energy Conservation and Promotion Act, B.E.2535 (1992), Water Resources Act, B.E. 2561 (2018), and so on. However, these measures are not effective very well because the growth rate of green building development in Thailand has dropped down (See Fig. 5.2).

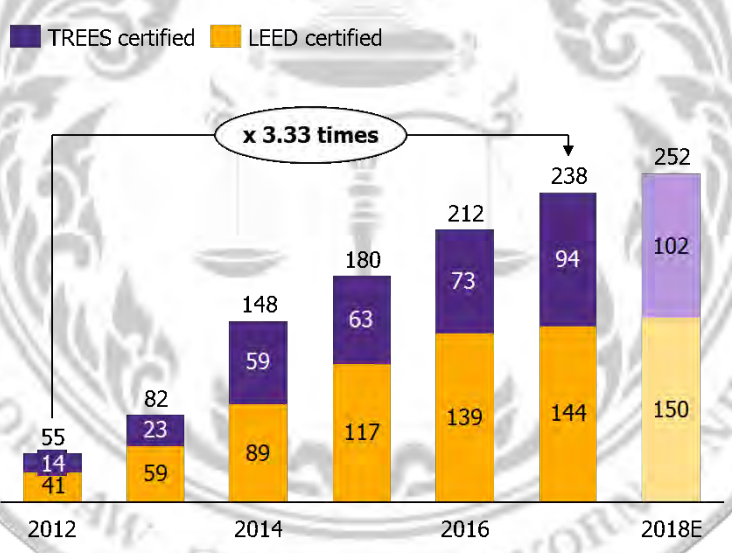

Figure 5.2 Number of Green Buildings in Thailand[157]

This figure shows the increased number of certified green buildings in Thailand about 3.33 times from year 2012 to 2017. However, the annual growth rate of green buildings has been declining dramatically. It dropped from 49 percent in 2013 to 22

[156] Marks, D. (2020, December 23). *Drive less to help solve Bangkok's air pollution*. Retrieved December 1, 2021, from Bangkok Post: https://www.bangkokpost.com/opinion/opinion/2039775/drive-less-to-help-solve-bangkoks-air-pollution

[157] Umsakul, K. (2018, July 4). *The value of green building... a new building trend that looks beyond just saving the planet*. Retrieved November 19, 2021, from SCB Economic Intelligence Center: https://www.scbeic.com/en/detail/product/4817

percent in 2016, and to 12 percent in 2017. The average of annual growth rates was only 27 percent anually. This means the tend of green building development in Thailand will be in stasis in the future.

While the annual growth rate of green buildings in Thailand has been declining sharply, the number of green buildings in foreign countries has been soaring. For example, the annual growth rate of green buildings in China has been skyrocketed from year 2011 to 2017[158] (See Fig. 5.3).

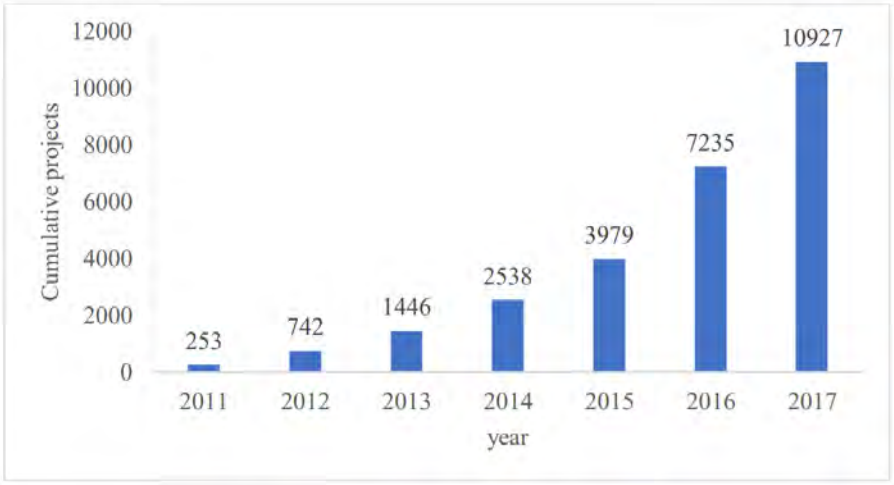

Figure 5.3 Number of Green Buildings in China

Figure 5.3 shows the numbers of green buildings in China that have been soaring since 2011. the annual growth rates of green buildings in China were 95 percent, 82 percent, 51 percent in 2013, 2016, 2017 respectively. The average of annual growth rates was 76 percent annually. This means the number of green building will be soaring in the future because the growth tend looks like an exponential graph.

In short, Thai measures failed to tackle environmental issues and promote green building development in Thailand. The high number of PM2.5 in Thailand, the low annual growth rate of green buildings in Thailand, and the low ranking of green growth index could be the empirical evidence that proved the measures were ineffective.

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[158] Duwei Zhang, D. Z. (2020). Research on the Development of Green Buildings in China. *IOP Conference Series: Earth and Environmental Science* (pp. 1-7). IOP Publishing. doi:10.1088/1755-1315/555/1/012095

5.2 The Analysis of Applying Foreign Legal Measures on Promoting Green Building Development to the Kingdom of Thailand

Since Thai legal measures have inadequate requirements on supporting green building development in Thailand, the policy makers should adjust their measures by adopting the successful measures from foreign countries. The analysis of applying foreign legal measures on promoting green building development can be divided into three aspects: environmental impact, social impact, and energy conservation.

5.2.1 The Relation between Green Building Standards and Foreign Legal Measures

There are several strategies on promoting green building development. On one hand, some countries use their police power to enforce all buildings to meet the requirements of green building standards by law. On the other hand, some countries use incentives to promote green building development instead. This topic will show the relation between green building standards and legal measures in the United States, Singapore, and China.

5.2.1.1 LEED in U.S. Legal Measures

LEED (Leadership in Energy and Environmental Design) is the most widely used green building rating system in the United States and in the world. Available for virtually all building types, LEED provides a framework for healthy, highly efficient, and cost-saving green buildings. LEED certification is a globally recognized symbol of sustainability achievement and leadership. In terms of legal measure, the federal government and some U.S. local governments have brought the standard of LEED to their regulations to require the new and existing buildings to achieve LEED certification. The examples of U.S. regulations related to LEED are executive order no. 13,423 and 13,514, City of Oakland green building policies and requirements, Maryland high performance green building program, and so on. These regulations require buildings to meet the LEED standard. Therefore, the U.S. strategy is knotting LEED to its legal measures.

5.2.1.2 Green Mark in Singapore Legal Measures

The BCA Green Mark Scheme is an initiative to create a more sustainable built environment in Singapore by promoting sustainable design, and best practices in construction and operations in buildings. The aim of BCA Green Mark scheme is to encourage environmental friendliness in buildings by using the five key criteria including energy efficiency, water efficiency environmental protection, indoor environmental quality, and other green features focusing on landlord's contributions in the policy named going green. In terms of legal measure, all new buildings are required by law, under the Building Control Regulations to meet standards equivalent to Green Mark Certified rating[159]. Therefore, Singapore uses the same strategy on promoting green building development as the United States does.

5.2.1.3 GBL in China Legal Measures

Green Building Label (GBL) is commonly known as the Three-Star rating system in China. GBL focuses more on the relationship between people and the environment. It aims to develop the high-quality buildings. China has been in the spotlight lately for its exponentially growing number of green buildings. The government has even created their own green building system to run concurrently with the widely recognized American system, LEED. The Chinese government has taken its support for green buildings a step further by giving government subsidies to support building green. However, in terms of legal measure, the government does not tie GBL to its legal system. This national standard is just a voluntary standard. Therefore, the Chinese strategy on promoting green building development is totally different from the United States and Singapore. China does not put GBL or other green building standards to the law. Instead, China offers incentives to the certified buildings.

5.2.2 Solving the Problem of Inadequate Requirements on Thai Legal Measures: Adding Green Building Standards to the Law

In order to overcome the shortcoming, this paper suggests that Thailand should improve Thai legal measures on green building development by adopting the successful

[159] Government of Singapore. (2021, August 30). Retrieved December 12, 2021, from Energy Efficient Singapore: https://www.e2singapore.gov.sg/overview/buildings

ways that have used in foreign countries. Also, the analysis of suggestions on Thai legal regulations can be divided into three aspects: environmental impact, social impact, and energy conservation.

5.2.2.1 A Guideline for Improving Thai Legal Regulations on Environmental Impact in Green Building Development

Since the shortage of specific details in Thai Legal regulations on environmental impact is the main problem, the simplest way to solve this problem is adopting the guidelines from the United States and Singapore by adjusting the law to require the new and existing buildings must meet at least the minimum of recognized green building rating systems such as LEED, BCA Green Mark, TREES, and so on. This way is a good way to solve the problem because it matches with the neoclassical economics theory that emphasizes the importance of pure air and water and renewable resources as well as the need for government intervention in public and private properties to protect environment. Therefore, Thai government should intervene the private rights to protect environment by adding green building standard into the law.

5.2.2.2 A Guideline for Improving Thai Legal Regulations on Social Impact in Green Building Development

In order to solve the problem of Thai legal regulations that still lack in social impact prevention, Thailand should do the same way as the solution of improving Thai legal regulations on environmental impact does. Adding green building standards to Thai legal regulations on social impact is also consistent with Hand formula[160]. The Hand formula is an algebraic formula (B = PL), according to which liability turns on the relation between investment in precaution (B) and the product of the probability (P) and loss (L) of harm resulting from the accident. If PL exceeds B, then the defendant should be liable. Thus, it is a commonsense that the building owners have less burden of indoor air quality precaution since the number of buildings is fewer than the number of people. Therefore, it is hard to deny that the building owners should be responsible to the burden of indoor air quality precaution instead of the people who reside because

[160] Grossman, P. Z., Cearley, R. W., & Cole, D. H. (2007, December 6). Uncertainty, insurance and the Learned Hand formula. *Law, Probability and Risk, 5*(1), 1-18. Retrieved December 16, 2021, from https://academic.oup.com/lpr/article/5/1/1/990799

the burden of indoor air quality precaution is way too high compared to the building owners. In short, Thailand should add green building standards to the law because the burden of indoor air quality precaution on the green building owner side is cheaper than the people side.

5.2.2.3 A Guideline for Improving Thai Legal Regulations on Energy Conservation in Green Building Development

Adding green building standards to the law is also a good way to improve Thai legal regulations on energy conservation because the standards or green building rating systems already provide the specific details how buildings must reduce their energy consumption to meet the requirements of the standards. This approach also accords with international standards for electrical appliances that usually provide the suggested number on energy consumption of electrical appliance. Therefore, adding green building standards to the law is kind of the most admitted way to make Thai legal regulations on energy conservation become more effective.

5.2.3 Why do the Guidelines suit Thai Legal Measures

In order to prove that adding green building standards to Thai legal measures such as Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), Building Construction Control Act, B.E. 2522 (1979), and so on, this topic will explain why adding green building standards suit Thai legal measures by showing the pros and cons of it and explaining how the guidelines are according with economics theories.

5.2.3.1 Pros and Cons of Following Foreign Legal Measures: Meeting Green Building Standards is Required by Law

If meeting green building standards is required by law, there will be a lot of pros and some cons as follows:

(1) Pros

Pros means the advantages of something. In terms of adding green building standards to the law, the pros can be various from saving the energy to government expenditure. However, these pros reflect from the benefits of green building development and from using the approach of adding green building standards

to the law. The two majors' pros from green building development are preserving energy and environment, and increasing quality of life and work efficiency.

(1.1) Preserving Energy and Environment

One of the most important green building benefits is to protect our climate and the natural environment. Also, green buildings can reduce the negative impacts on the environment by consuming less water and energy than the traditional buildings. Therefore, the guideline of improving Thai legal measures by adding green building standards to the law will generate a huge impact to Thailand and our world.

(1.2) Increasing Quality of Life and Work Efficiency

When it comes to quality of life, green buildings can offer the improved indoor environment by reducing the indoor allergen agents from dust mites, mold, viruses, bacteria, spores, volatile organic compound, and other materials that contribute to poor IAQ. The ways that green buildings use to manage the poor IAQ are specifying on building materials that usually not generate the allergen, and requiring for proper building ventilation. Also, green buildings can increase work efficiency to people. According to 2017 SHRM Annual Conference & Exposition[161], the studies found that, compared with those working in non-green-certified buildings, occupants of green-certified buildings had, on average:

- A 26.4% higher cognitive function score.
- A 73% higher crisis response score.
- A 44% higher applied activity level score, which reflects the ability to make decisions that achieve workplace goals.
- A 38% higher focused activity level score, which reflects the capacity to pay attention to the task at hand.
- 30% fewer self-reported sick-building symptoms such as respiratory problems, fatigue and skin irritations.
- A 6.4% higher sleep quality score.

[161] Molinski, M. (2017). *Green Buildings May Boost Productivity, Cut Down on Sick Days.* Retrieved December 23, 2021, from https://www.shrm.org/resourcesandtools/hr-topics/employee-relations/pages/green-workplaces.aspx

In addition, since many employees spend a majority of their time working inside a building, it makes sense that job applicants increasingly consider a green certified building when interviewing. The workplace environment could contribute to his or her overall health, personal performance, level of engagement and accomplishment.

(1.3) Saving Government Expenditure

When governments subsidize on providing tax incentives to encourage building owners to do more green building development, it means the increasing in government expenditure. However, if the government uses legal measures instead of tax measures, it will save government expenditure. Therefore, adding green building standards to legal measures can help the government save their expenditure.

(2) Cons

Cons means the disadvantages of something. In terms of adding green building standards to the law, the cons can be found a few things. Since the adding building standards to the law is the burden to building owners and developers, the rising cost of building construction cannot be avoided. Also, this can make people or consumers hard to afford the buildings at the end.

(2.1) Rising Cost of Building Construction

Usually, green buildings may rise the cost of building construction because the greener building materials is the more expensive. However, some studies found that if investor invest 3% additional cost in the design phase, then at construction stage cost can be reduce by 10%. Also, the studies found that ROI expected to improve 6.6%; increase in building values expected around 7.5%; Rents expected to rise by 3%, Occupancy expected to increase by 3.5% [162]. In short, the rising cost of building construction may appear when adding the green building standards to the law, but it can be reduced from planning since the design phase, and the increasing in room rents and building values.

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[162] Shabrin, N., & Asem, S. B. (2017, April). A COMPREHENSIVE COST BENEFIT ANALYSIS OF GREEN. *International Journal of Advances in Mechanical and Civil Engineering, 4*(2), 100-108. Retrieved December 23, 2021, from http://www.iraj.in/journal/journal_file/journal_pdf/13-359-1497352102100-108.pdf

(2.2) Hard to Afford Buildings

After the rising cost of building construction, the increasing in the building price and rent will happen swiftly. This can make people or consumers are hard to afford the buildings at the end due to the higher price of buildings than the old buildings before adding the green building standards to the law. However, the increasing price of green buildings can be traded-off with the healthier, greener, and more energy saving than the old buildings. Therefore, using this guideline may make people are harder to afford buildings than before enforcing it, but this disadvantage can be compensated with the benefits of using the guideline.

5.2.3.2 In Accordance with Economics Theories

The solution of the problem of inadequate requirements on Thai legal measure by adding the green building standards to the law is not considered by the applying of foreign legal measures only, but it is also considered by economics theories. This topic will show the economics theories that relate to the guideline.

(1) Neoclassical Economics Theory: Need for Government Intervention in Environmental Protection

Since the neoclassical economics theory emphasizes on the importance of pure air and water and renewable resources as well as the need for government intervention in public property to protect environment, Thai government should intervene in public property to protect environment by issuing the law that requires all government buildings and public buildings must meet the green building standards. Also, the guideline of adding the green standards to the law will drive Thailand to achieve the sustainable development goals because green buildings support the 2 out of 17 goals of the essence of sustainable development which are guided by the United Nations. The first goal is goal 7: ensuring access to affordable, reliable, sustainable, and modern energy for all. The second goal is goal 11: making cities and human settlements inclusive, safe, resilient, and sustainable. In short, the guideline of adding the green building standards to the law accords with neoclassical economics theory in the intervention in public property to protect environment and to drive the public policies to achieve the sustainable development goals.

(2) Classical Economics Theory: Invisible Hand of Green Building Development

When the guideline of adding the green building standards to the law enforces to public buildings only, it means the private buildings do not need to improve anything. However, this guideline can create a competition between public and private buildings as well because it can force the private buildings to improve themselves to become green buildings like the public ones. In other words, this guideline generates the supply of green buildings into the market. The more green buildings in public sector creates the more green buildings in private sector. This situation can be explained by using the classical economics theory that emphasizes on free market and economic maximization. In terms of classical economics theory, the competition between public and private buildings to become green buildings is called "invisible hand of green building development". Basically, Adam Smith's "invisible hand" represents the unseen instincts of human nature that motivate to direct behavior. Therefore, the invisible hand can generate a beneficial social order by influencing the private buildings to become green buildings like the public ones that are enforced by the law. When there are ample green buildings in society, the achieving in sustainable development goals will happen soon.

In conclusion, this guideline is so suitable to Thai legal measures because it links to both neoclassical economics theory and classical economics theory. On one hand, the idea that government must intervene in public property to protect environment is from the neoclassical economics theory. On the other hand, letting free market plays independently can create the supply of green buildings through invisible hand of green building development which is the idea of classical economics theory.

5.3 The Analysis of Applying Foreign Tax Measures on Promoting Green Building Development to Thai Tax Measures

Since Thai tax measures on promoting green building development in Thailand do not appear directly in Thai taxation system, Thailand should adjust its measures by selecting some successful tax measures of foreign countries. However, Thailand should select the foreign measures carefully because each country has different fiscal status. Therefore, this topic will show the relation between fiscal discipline and tax measure

in foreign countries. Also, it will show the problem solution of too indirect green building promotion in Thai tax measures.

5.3.1 The Relation between Fiscal Discipline and Tax Measure

The relation between fiscal discipline and tax measure is important because it shows the concordance between government strategies and their wealthy. Some governments use budget deficit on their public policies to solve the environmental problem while other countries use fiscal sustainability on their public policies. Therefore, this topic will present the intersection of fiscal status and environmental policy in the United States, Singapore, and China.

5.3.1.1 The Intersection of the U.S. Fiscal Status and Environmental Policy: Budget Deficit for Climate Change Combat

Gross Domestic Product (GDP) per capita of the United States was $63,544 USD in 2020[163]. However, the federal government ran a deficit of $3.1 trillion in fiscal year 2020, more than triple the deficit for fiscal year 2019. The 2020 year's deficit amounted to 15.2% of GDP, the greatest deficit as a share of the economy since 1945[164]. During that period of time, the environmental policies were under Trump administration. Trump said his priorities were clean water and air, but he also had sought to boost U.S. production of oil and natural gas. Therefore, Trump's objectives often worked against each other. Even though the directions of environmental policies were unclear, the local governments still contributed to support green building development as usual. Nevertheless, Trump finally supported legislation that removes garbage from oceans, allocated additional funding for national parks and public lands, and put $38 billion USD toward clean water infrastructure[165]. That was such a huge amount of money because it was about 60 % of GDP in 2020. Inconclusion, the intersection of the United

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[163] World Bank. (2021). *GDP per capita*. Retrieved November 2, 2021, from The World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

[164] Bipartisan Policy Center. (2021, December 13). *Deficit Tracker*. Retrieved December 16, 2021, from Bipartisanpolicy: https://bipartisanpolicy.org/report/deficit-tracker/

[165] Leibenluft, J. (2020, December 23). *Rethinking the Intersection of Climate Policy and the Federal Budget*. Retrieved December 16, 2021, from Americanprogress: https://www.americanprogress.org/article/rethinking-intersection-climate-policy-federal-budget/

States fiscal status and its environmental policies in 2020 was using budget deficit for climate change combat. Also, this strategy tends to keep continuing in Joe Biden administrator because Biden announced his climate change policy by pushing the United States on a path toward net-zero carbon emissions by 2050, with an intermediate goal of ridding the power sector of carbon pollution by 2035[166].

5.3.1.2 The Intersection of Singapore Fiscal Status and Environmental Policy: Fiscal Sustainability

Gross Domestic Product (GDP) per capita of Singapore was $59,798 USD in 2020[167]. Also, the Singapore government usually use balanced budget and budget surplus to maintain their fiscal sustainability strategy. Although Singapore had deficit budget $65 billion SGD in 2020, Budget 2021 is still a significant fiscal expend considering that it is about 3.5 times the size of the 10-year average fiscal surplus prior to 2020[168]. In terms of environmental policy, Singapore always goes beyond the incentive providing. It often offers funds to research and development in environmental advanced technologies to make its society green sustainably under Green Plan 2030. This means Singapore normally uses the strategy of fiscal sustainability to response to Singapore Green Plan 2030.

5.3.1.3 The Intersection of China Fiscal Status and Environmental Policy: Budget Deficit for Tax Subsidy on Renewable Energy Power Generation Policy

Gross Domestic Product (GDP) per capita of China was $10,500 USD in 2020[169]. However, China fiscal balance recorded a deficit equal to 5.8 % of its GDP in

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[166] Moore, E. (2020, October 16). *Trump's and Biden's plans for the environment*. Retrieved December 16, 2021, from NPR: https://www.npr.org/2020/10/16/920484187/trumps-and-biden-s-plans-for-the-environment

[167] World Bank. (2021). *GDP per capita*. Retrieved November 2, 2021, from The World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

[168] Seah, I. (2021, Febuary 17). *Singapore's budget for recovery and sustainability*. Retrieved December 16, 2021, from Development Bank of Singapore: https://www.dbs.com.sg/corporate/aics/templatedata/article/generic/data/en/GR/022021/210217_insights_singapore.xml

[169] World Bank. (2021). *GDP per capita*. Retrieved November 2, 2021, from The World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

202 [170] . In terms of environmental policy, Chinese Communist Party general secretary Xi Jinping announced that China aims to peak emissions before 2030 and go carbon-neutral by 2060 in accordance with the Paris climate accord. Also, China reduces property tax for the owners of green buildings. However, the rates are varied. They depend on where the buildings are located in. Moreover, China government has provided VAT exclusion to energy-efficient equipment since 2008. This includes resources such as green building materials, combined heat and power pollutions, reclaimed wastewater. In the green building sector, wind turbine component importers and wind power equipment users also receive VAT benefits[171]. In conclusion, China uses tax subsidy on renewable energy power generation policy even China has had budget deficit during in the past 10 years[172].

5.3.2 Solving the Problem of Too Indirect on Green Building Promotion in Thai Tax Measures: Combining Thai Fiscal Status and Principles of Good Taxation to Adjust Thai Tax Measures

In order to solve the problem of extremely indirect on green building promotion in Thai tax measures, this paper suggests that Thailand should improve the Thai tax measures by adopting the successful ways that have used in foreign countries and combining the foreign ways with principles of good taxation. Also, the analysis of suggestions on Thai tax measures can be divided into two aspects: a guideline for improving Thai tax incentives and a guideline for improving Thai tax penalties.

5.3.2.1 A Guideline for Improving Thai Tax Incentives: Adjusting Incentives through Economic Efficiency Principle

Since Thai tax incentives on green building development have worked too indirect, they need to be adjusted by bringing the principles of good taxation; especially,

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[170] CEIC. (2021). *China Consolidated Fiscal Balance: % of GDP*. Retrieved December 16, 2021, from CEIC: https://www.ceicdata.com/en/indicator/china/consolidated-fiscal-balance--of-nominal-gdp

[171] *Selected Tax Incentives in China's Renewable Energy Sector*. (2011, June 15). Retrieved October 25, 2021, from China Briefing: https://www.china-briefing.com/news/selected-tax-incentives-in-chinas-renewable-energy-sector/

[172] CEIC. (2021). *China Consolidated Fiscal Balance: % of GDP*. Retrieved December 16, 2021, from CEIC: https://www.ceicdata.com/en/indicator/china/consolidated-fiscal-balance--of-nominal-gdp

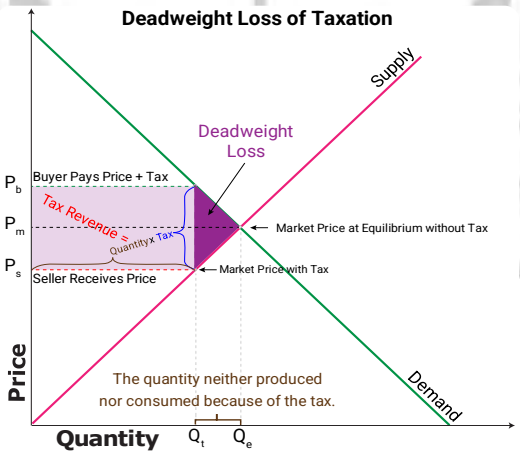
economic efficiency principle. The main incentives that are from BOI do not go straight to green building stakeholders such as owners, developers, and tenants because the aims of BOI Announcement No.1/2564 under Investment Promotion Act, B.E. 2520 (1977) offers to the green factories that need the benefit of zero import duty from importing the advanced machineries. Even though the green building stakeholders will gain the passive benefit of the cheaper green building materials from the BOI announcement, they can receive limitedly due to the indirect incentives. In order to solve the problem of the extremely indirect incentives, Thailand should adopt the solution way from foreign countries by changing the incentives from providing import duty exemption to offering corporate income tax credit and tax allowance from buying the green materials instead. In terms of the allowing percentage of tax credit and tax allowance, it can be set from various variables such as fiscal status of the country, equity, economic efficiency, administrability, coherence, and so on.

In foreign countries, the United States offers a 10% tax credit on income tax to all green building owners. Also, it offers a 35% tax credit on income tax to the green building owners with the condition that the adjusted income tax must exceed $15,000. Additionally, Singapore gives provides a 50 percent reduction in tax payable on rental income derived from buildings that undergo green renovation. It also provides a 200 percent tax allowance on capital expenditure on green initiatives in addition to normal capital allowances and tax deductions. In China, the revenues earned by energy conservation and water saving conservation projects, environmental protection, and clean development mechanism projects are eligible for a three-year exemption and three-year 50 percent reduction in corporate income taxes. Also, the jurisdiction of green building owners can claim a 10 percent of the investment in the special-purpose equipment. Moreover, China provides incentives on property tax to promote green building development.

Even though those measures have succeeded in their countries, Thailand has to aware of its fiscal status since Gross Domestic Product (GDP) per capita of Thailand is only $7,189 USD in 2020 which is lower than 9, 8, 1.5 times to the United States, the

Republic of Singapore, and the People's Republic of China[173]. Also, Thailand should consider the factor of fiscal discipline because it can have a huge impact to the government public policies; especially, environmental policy. In Thailand, the rate of capital expenditure is legally binding[174]. Thus, it is hard to know the exact percentage of money that contributes to the environmental protection policies. The setting of tax incentive rates to green building stakeholders is very comprehensive. However, this paper highly advice that Thailand should bring economic efficiency, one of the principles of good taxation, to consider the tax incentive rates since it is very important to Thai economy and fiscal status. The economic efficiency that includes stability, simplicity, sufficiency, and productivity has ability to reduce the society cost that is created from taxation. Taxes create real costs, known as "Deadweight losses". The deadweight loss is a loss of economic welfare.

Therefore, if Thai government is going to run the budget deficit to promote green building through tax incentives, it has to make sure that the money that contributes to the tax subsidies is really going to clear the deadweight loss of taxation. Referring to Chapter 2 of this paper, the deadweight loss can be eliminated at the way to market price at equilibrium without tax.



(**Referring to Chapter 2:** Figure 2.4 Deadweight Loss of Taxation)

[173] World Bank. (n.d.). *Building the Market for Green Buildings.* A Finance and Policy Blueprint. Retrieved October 30, 2021, from https://olc.worldbank.org/system/files/4_1.pdf

[174] Senior Budget Officials. (2019). *Budgeting in Thailand.* OECD. Retrieved December 17, 2021, from https://sdgs.nesdc.go.th/wp-content/uploads/2021/05/Budgeting-in-Thailand-Full-Report.pdf

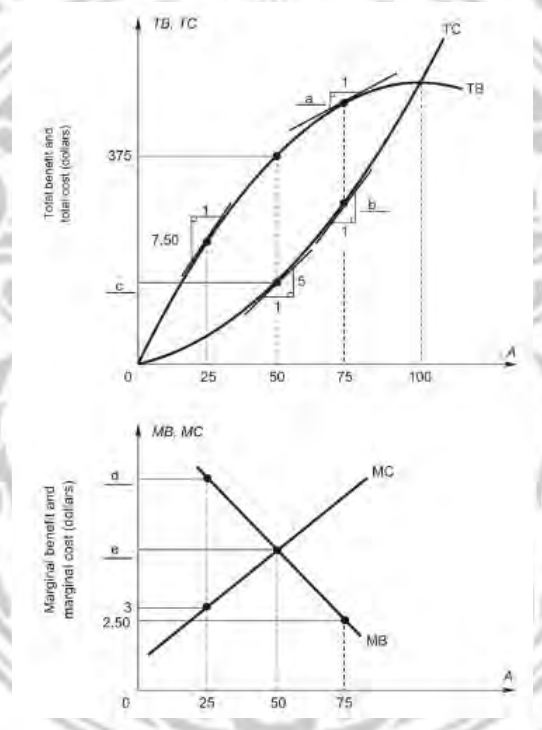
This means if Thailand lifts out all taxes on green buildings, the consumer surplus and the producer surplus will increase. Then, this situation will drive the tax incentive measures to meet the sustainable goals. When people are more consuming to green buildings, the benefits of green building that includes making a good environment, society, and economy will be generated to the country more and more simultaneously. However, making market equilibrium is too difficult. Therefore, Thailand should manage the tax incentive rates properly which is not too high and not too low in order to get the best of tax measure on promoting green building development.

In conclusion, Thailand recently provided the incentives to only the factories that produce green building materials. These incentives are too indirect to support green building development in Thailand. Therefore, Thailand should offer tax incentives through the income taxes of green building stakeholders instead. Also, Thailand should improve the tax incentive measures by adopting the principle of economic efficiency with considering in Thai fiscal discipline to eliminate the deadweight loss of taxation in order to get the most benefits of tax incentive measures at the end.

5.3.2.2 A Guideline for Improving Thai Tax Penalties: Adding Pigouvian Tax at the Optimal Level

Thai taxation does not tax through the Polluter Pays Principle (PPP). Also, it usually taxes on the polluted products that are the indirect taxation. In terms of polluted and low energy efficient buildings, Thai tax penalties exist only on indirect environmental taxes through excise tax and earmarked tax. In order to improve Thai tax penalties, Thailand should adopt the idea of Polluter Pays Principle (PPP) or Pigouvian tax. In foreign countries, the United States has air pollution tax and water pollution tax. While Singapore has the same types of pollution tax as the United States does, China has more taxes than these countries. China has air pollution tax, water pollution tax, land pollution tax, noise pollution tax, and light pollution tax. This means air pollution tax and water pollution tax are the most important taxes since every country in the list uses to penalize the polluted and low energy efficient buildings.

Therefore, Thailand should add the two Pigouvian taxes that includes air pollution tax and water pollution tax to Thai tax penalty measures for supporting green building development. However, Thailand has to consider the tax penalties carefully since the high burden of taxation to prevent the bad one will create the diminishing marginal benefit. Usually, tax penalties provide benefits of bad thing prevention. However, if tax penalty rates are set too high, the cost of operation in collecting tax this will way too much. Then, the higher tax rates will provide fewer benefits that their cost. Referring to Chapter 2 of this paper, the marginal benefit and marginal cost should be equal.



(**Referring to Chapter 2: Figure 2.5** Graphs of an Optimal Level (MB = MC))

This means Thailand should set tax rates of air pollution tax and water pollution tax at the optimal level between the marginal benefit and marginal cost. At the optimal level, it means the most efficient outcome from tax measures. In other words, social costs and social benefits are equal. Normally, the diminishing marginal benefit will occur when total benefit goes over the optimum point. Therefore, if Thailand is going to use Polluter Pays Principle (PPP) to tax air pollution tax and water

pollution tax, it should concern to the optimal level of pollution reduction when issuing these Pigouvian taxes.

In conclusion, Thailand should improve Thai tax penalty measure on supporting green building development by adding air pollution tax and water pollution tax at the optimal level to Thai tax system in order to change the polluted and low energy efficient buildings become green.

5.3.3 Why do the Guidelines suit Thai Tax Measures

In order to prove that both the guideline of improving Thai tax incentives by offering income tax incentives to green building stakeholders and the guideline of improving Thai tax penalties by adding air pollution tax and water pollution tax to Thai tax measures such as Investment Promotion Act, B.E. 2520 (1977), Thai Revenue Code, and so on are suitable to Thai tax system, this topic will explain why Thailand should offer income tax incentives and add the tax penalties through air pollution tax and water pollution tax by showing the pros and cons of the guidelines and explaining how the guidelines are according with economics tools for balancing between fiscal disciplines and tax incentives

5.3.3.1 Pros and Cons of Following Foreign Tax Measures: Using Budget Deficit for Green Building Tax Incentives

If Thailand uses budget deficit to promote green building by offering income tax incentives to green building stakeholders, there will be a lot of pros and some cons as follows:

(1) Pros

The advantages of offering income tax incentives to green building stakeholders can be various from increasing the number of green buildings to reducing climate change. However, these pros reflect from both using the approach of offering income tax incentives to green building stakeholders and the benefits of green building development itself. The two majors' pros from offering the income tax incentives are increasing the number of green buildings in the market and making green buildings easy to afford. Also, the most benefit from green building development itself is reducing climate change.

(1.1) Increasing the Number of Green Buildings

Normally, the increase in number of green buildings will appear after The Revenue Department is the largest tax-collecting agency in Thailand. It is contributing 70-80% to state revenue. Also, over 52% of the total tax that the department collects includes corporate income tax and personal income tax (see Figure 5.4).

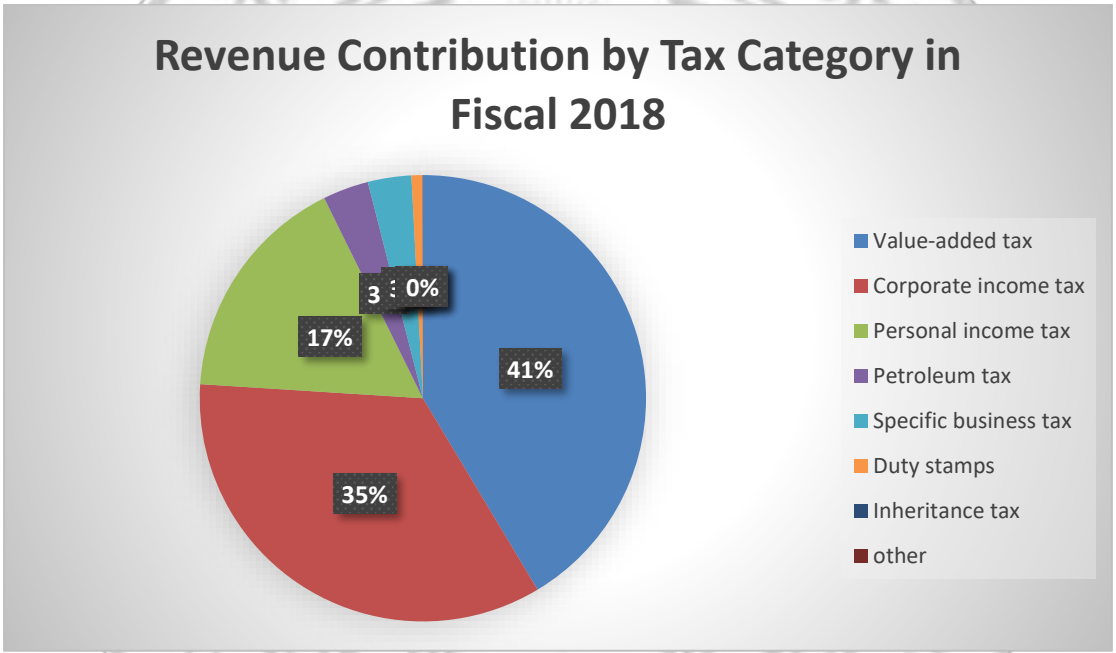


Figure 5.4 Revenue Contribution by Tax Category in Fiscal 2018[175]

This figure shows the percentage of each tax category that contributed to the Revenue Department in fiscal 2018. The percentage that the guideline of offering income tax incentives to green building stakeholders is 52% which includes corporate income tax (35%) and personal income tax (17%). Therefore, if Thailand uses the strategy of budget deficit by cutting the income taxes to promote green building

[175] Chantanusornsiri, W. (2019, November 4). *Palang Pracharath tax cut pledge could cost B70bn*. Retrieved December 26, 2021, from Bangkok Post: https://www.bangkokpost.com/business/1786559/palang-pracharath-tax-cut-pledge-could-cost-b70bn

development, the number of green buildings will increase suddenly due to the high incentive.

(1.2) Making Green Buildings Easy to Afford

When the number of green buildings increase due to the tax cut, it means there are more green buildings in the market. This situation can make the green buildings are cheaper than before using the tax cut on the income taxes. Then, green buildings will become more affordable and common in Thailand.

(1.3) Reducing Climate Change

After green buildings turn to common products, the benefits of its in environmental protection will be effective. The environmental-friendly materials and the energy efficiency of green buildings can help the world reduce climate change. As climate change could lead to the shortage of agricultural products, widespread poverty, hunger, and migration, the reducing in climate change will make a huge impact to all sectors in the world. In short, it is worth to use the guideline of using budget deficit for green building tax incentives because this guideline can reduce climate change which usually generate a huge impact to the world from agriculture to human being.

(2) Cons

Cons means the disadvantages of something. In terms of using the strategy of budget deficit the cons can be found a few things. Since the budget deficit strategy creates the burden to people by rising public debt, some people are not happy to let the government to use the budget deficit strategy. Also, this strategy can make the value of Thai Bath depreciates due to the high public debt and inflation.

(2.1) Rising Public Debt

It cannot deny that using budget deficit will rise public debt. Many people are worried about the high public debt because it will be the burden to them and their children in the future. However, Thai public debt in 2020 was about only

50% of Thai GDP[176]. Also, Thai budget deficit in 2020 was 4.7% of its GDP while the U.S. budget deficit in 2020 was 15.2% of the U.S. GDP, and the U.S. public debt in 2020 was 99.3% of the U.S. GDP. This means Thai public debt is quite low compared to the United States. Moreover, if Thailand adds the tax penalties such as water pollution tax, air pollution tax, and so on to Thai tax system, these taxes will help Thai fiscal status and the public debt relief a little bit because the taxes can raise Thai revenue as well. Therefore, rising public debt to promote green buildings in Thailand is not so scared because Thai public debt is still low and Thailand can raise its revenue by adding tax penalties to Thai legal measures.

(2.2) Depreciating Value of Thai Baht

If Thailand keeps doing budget deficit for a long time, it will make Thai Baht depreciate against other currencies. On one hand, Thai importers will suffer from the depreciating value of Thai Baht since the import price will rise. On the other hand, Thai exporters will appreciate this situation because they can gain from the depreciated value of Thai Baht. However, this disadvantage can avoid by well management between fiscal policy and other financial instrument such as raising the interest rate. When Thailand raises the interest rate, the inflation will reduce. Then, the Thai Baht depreciation will be better. Therefore, the disadvantage of depreciating value of Thai Baht is not so worried because some people may like while some people may not. Also, this advantage can avoid by the well management between fiscal tools and financial tools.

5.3.3.2 In Accordance with Economics Tools for Balancing between Fiscal Disciplines and Tax Incentives

The solution of the problem of extremely indirect on green building promotion in Thai tax measures by using budget deficit to offer income tax incentives to green building stakeholders and using tax penalties is not considered by the applying of foreign tax measures only, but it is also considered by economics theories. This topic will show the economics theories that relate to the guidelines.

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[176] O'Neill, A. (2021, November 17). *Thailand's budget balance in relation to GDP 2026*. Retrieved December 26, 2021, from Statista: https://www.statista.com/statistics/332486/thailand-budget-balance-in-relation-to-gdp/

(1) A Principle of Good Taxation: Economic Efficiency

A tax cut on income taxes to promote green building development relates to a principle of good taxation named economic efficiency. An economic efficiency refers to the cost to society. Since all types of taxation create a deadweight loss of taxation, the guideline of using budget deficit for green building promotion will make economic efficiency by eliminating the deadweight loss. When Thailand offers the tax cut, it means the reducing in the deadweight loss of taxation. This situation will create more consumer surplus and producer surplus. Therefore, this guideline accords with a principle of good taxation in economic efficiency because it can reduce the cost to society.

(2) Using Other Economics Tools: Pigouvian Tax

In terms of balancing between fiscal disciplines and tax incentives, Thailand has to concern its fiscal status because Thailand does not a very wealthy country. Therefore, the guideline of levying on tax penalties (such as air pollution tax and water pollution tax) is a good solution to maintain Thai fiscal status. In addition, the levying on tax penalties also relates to the economics tool named Pigouvian tax that is used for solving the environmental problems. A Pigouvian tax is a tax levied on a market activity that generates negative externalities. The environmental economic theory describes the concept of externality as a social cost. The social benefits correspond to a positive externality, but the social costs correspond to a negative externality. Negative externalities or social costs are related to the environmental consequences of production and consumption. In short, Pigouvian tax or tax penalty can reduce social costs and maintain the fiscal status because it does not have a burden to government expenditure.

5.4 The Analysis of Applying Foreign Financial Measures on Promoting Green Building Development to the Kingdom of Thailand

Thai financial measures on promoting green building development in Thailand do not drive by the government sector directly. Thai government encourages Thai commercial banks to offer soft loan to enterprises that are going green. Therefore, Thailand should adjust its measures by selecting some successful financial measures of

foreign countries. However, Thailand should select the foreign measures carefully because each country has different political belief and fiscal status. Therefore, this topic will show the political beliefs in foreign countries. Also, it will show the problem solution of hard access in financial measures for green building promotion in Thai financial measures.

5.4.1 The Political Science behind Financial Measures: Political Beliefs in Each Country

Adam Smith, David Ricardo, and John Stuart Mill are widely regarded as the originators of modern economics with the ideas of classical economics theory. Two trends divided the political from the economic analysis. First, governments began to reduce their direct control over the economy. Second, different political forms emerged: Europe went from almost exclusively monarchical to increasingly representative, and highly varied, forms of government. The classical economists believe that governments should intervene the market limitedly to fix the inequality and exploitation in society to improve social welfare of the majority. In other words, this idea is called conservatism. However, there are other schools of thought which are socialism and communism. Since the ideologies of socialism and communism need more support from the government than conservatism, the financial measures will be different. This topic will analysis Political Science behind financial measures in foreign countries.

5.4.1.1 Conservatism in U.S. Financial Measures

Even though the United States is conservatism based in its political belief, America is facing an unprecedented debt and spending crisis due to supporting other public policies such as environmental protection policy. Federal debt exceeded 100% of its GDP in 2016[177], and the fiscal path was unsustainable and dangerous to the national economic growth, stability, and the security of future generations. Therefore, the trend of financial conservatism was back during Trump administration. The government expenditure was cut in various types from social security to Medicare in

[177] Amadeo, K. (2021, December 23). *US National Debt by Year*. (E. Ernsberger, Editor) Retrieved December 27, 2021, from The balance: https://www.thebalance.com/national-debt-by-year-compared-to-gdp-and-major-events-3306287

2020 by tens of billions of dollars in each of his annual budgets[178]. In term of green buildings, the most of financial support is from the local governments. Therefore, the financial measures are different in each area. Also, the financial support to green building development is not affected a lot by the federal financial conservatism because each state has its own political belief. In short, even though the U.S. federal government is strict on financial measures, the financial measures of local governments on promoting green building development are still contributed by the local government budget.

5.4.1.2 Socialism in Singapore Financial Measures

Singapore is socialist democratic. In principle, socialism in Singapore is as opposed to libertarianism, where the needs of society are held to be more important than the needs of the people. In terms of economics, the system is very much a hybrid form of capitalism. However, prices are still regulated by the market. Government spending relative to GDP is not an adequate measure of whether a government is socialist because the Singapore government does not extremely provide the people need, but it provides in terms of R&D funding instead. In short, the Singapore government uses socialist policies by supporting research and development, but it gains revenue from the commercial companies which are considered as capitalism.

5.4.1.3 Communism in China Financial Measures

Communism means the ideology of living in communes in which all property would be shared, and all may benefit from everybody's work. Since all the benefit will be back to everyone at the end, the China government always extremely support the finance to state-own-enterprises. In terms of green buildings, China provides grant programs to support green building development. Also, it offers soft loan programs which provide to both the owners and the buyers of green buildings. In short, China does the different way of conservatism by intervening and controlling almost all the sectors including green building development because it believes in sharing, and everyone will be better off.

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[178] National Committee to Preserve Social Security and Medicare. (2021, January 22). *Biden Must Reverse Trump's Assault on Social Security*. Retrieved December 27, 2021, from NCPSSM: https://www.ncpssm.org/entitledtoknow/biden-must-undo-trumps-damage-to-social-security/

5.4.2 Solving the Problem of the Hard Access to Thai Financial Measures: Remain the Same Measures with a Slightly Adjustment

In order to solve the problem of the hard access to Thai financial measures, this paper suggests that Thailand should improve the Thai financial measures by adjusting a little bit through the successful ways that have used in foreign countries and combining with the political belief in Thailand. Also, the analysis of suggestions on Thai financial measures can be divided into two aspects: a guideline for improving Thai financial incentives and a guideline for improving Thai financial penalties.

5.4.2.1 A Guideline for Improving Thai Financial Incentives

Since Thai financial incentives on green building promotion are hard to reach, they need to be adjusted by bringing the successful ways of the United States and Singapore through allowing local governments to provide their own incentives to promote green building development in their areas and offering research and development fund to promote green buildings. There is no financial incentive from BOI. The main incentives usually are from commercial banks that provide the soft loan to enterprises to develop the energy efficiency buildings. Thai Credit Guarantee Corporation, a Thai government agency, only guarantees enterprises' debt to commercial banks. Therefore, the enterprises are still hard to get the loan because the commercial banks make the decision to approve the loan. This way is not good to promote green buildings in Thailand because enterprises are hard to reach the soft-loan. However, it is also not good if Thailand provides extremely financial support like China does because this way does not match to Thai political belief that is quite conservatism. Therefore, the guideline to improve Thai financial incentives should still remain in conservatism, but it should adopt the United States and Singapore ways by allowing local governments to provide their own incentives to promote green building development in their areas and offering research and development fund to promote green buildings.

5.4.2.2 A Guideline for Improving Thai Financial Penalties

Even though Thailand has some financial penalties, the amount of money is limited. The wastewater fee rates in Sansuk municipality can be the good example because this municipality is generating high wastewater due to a tourist attraction.

However, the fee is very low compared to foreign countries (lower than the United States about 20 times). In addition, Thailand currently does not have punitive damage in environmental law. The highest fine and crime in Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992) section 98 is 500,000 THB. However, this act still cannot be considered as the law of punitive damages because it does not provide enough burden to the violators. Thus, financial penalties for the polluted and low energy efficient buildings in Thailand lacks to support green building development due to their low efficiency to change the polluter behaviors. When Thailand punishes the polluted and low energy efficient buildings, the polluted and low energy efficient buildings will be scared to the fines. Then, all the buildings will turn to be green buildings at the end. Therefore, Thailand should adopt the foreign country way by adding punitive damages to the law to improve Thai financial measures on promoting green building development to become more effective.

5.4.3 Why do the Guidelines suit Thai Financial Measures

In order to prove that both the guideline of improving Thai financial incentives by allowing local governments to provide soft-loan and other incentives by themselves and offering R&D fund to promote green building development, and the guideline of improving Thai financial penalties by adding punitive damages to the law to Thai financial measures such as Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), Tambon Council and Tambon Administrative Authority Act, B.E. 2537 (1994), and so on are suitable to Thai financial measures, this topic will explain why Thailand should remain to use financial conservatism and to add punitive damages by showing the pros and cons of the guidelines and explaining how the guidelines are according with the essence of sustainable development.

5.4.3.1 Pros and Cons of Following Foreign Financial Measures: Using Financial Conservatism

If Thailand remains to use financial conservatism to promote green building development by limiting on financial support (only offers R&D fund and allows financial incentive by themselves), there will be a lot of pros and some cons as follows:

(1) Pros

The advantages of using financial conservatism can be various from reducing public debt to promoting free market because the financial conservatism creates the minimal government debt and free market.

(1.1) Reducing Public Debt

The strategy of financial conservatism is the general concept of recognizing expenses and liabilities. Also, it usually means the limited on financial support. Since the financial support always impacts on fiscal status, the financial conservatism will be able to reduce government burden that is also called public debt. when the government has less expenditure, the borrowing money will be meaningless. Therefore, using financial conservatism will help the nation reduce public debt.

(1.2) Appreciating Value of Thai Bath

After the public debt is low, it means the stronger in fiscal status. When Thai fiscal status is potential, the value appreciation of Thai Bath will happen. Normally, currency appreciation is an increase in the value of one currency in relation to another currency. Currencies appreciate against each other for a variety of reasons, including government policy, interest rates, trade balances, and business cycles. In addition, the strong Thai Bath can represent the good economy and reputation of Thailand because it shows the less public debt due to a surplus on balance of payments. Therefore, financial conservatism will create the value appreciation of Thai Bath that can make Thai economy is more reliable to invest.

(1.3) Promoting Free Market

The free market is an economic system based on supply and demand with little or no government control. Also, free markets are characterized by a spontaneous and decentralized order of arrangements through which individuals make economic decisions. In terms of green building market, using the financial conservatism means not providing extremely financial support like China does such as grant program, soft-loan both developer and buyer sides, and so on, but it offers only from a little soft-loan by local governments and provides research and development fund by central government. Thus, the competition between traditional buildings and

green buildings is still considered as free market since the price of green building still remain the same. The advantages of free market include increased efficiency, productivity, and innovation. Therefore, people or consumers will get the best building with the best price and best innovation in theory if Thailand uses the guideline of financial conservatism.

(2) Cons

Cons means the disadvantages of something. In terms of using financial conservatism, the cons can be found a few things. Since the financial conservatism strategy creates Lacking Incentive for Green Building Development, the green buildings will not be better-off from using this strategy. Also, this strategy can make the dominated by the polluted and low energy efficient buildings due to the cheaper price than the green buildings.

(2.1) Lacking Incentive for Green Building Development

To be sure, Thailand will lack financial incentive for green building development if it uses financial conservatism. However, Thailand can support the green building development through local government and R&D fund. In addition, if Thailand also follows the guideline of improving tax incentives, the disadvantage of lacking incentive for green building development in financial measures will be relieved.

(2.2) Dominated by the Polluted and Low Energy Efficient Buildings

When the polluted and low energy efficient buildings and the green buildings are in the free market, the polluted and low energy efficient buildings maybe dominate over the green buildings due to the cheaper costs since the green buildings are without financial incentive under the financial conservatism. However, this advantage can be remedied by the benefits from free market that all products must increase efficiency, productivity, and innovation to survive in free market. In addition, the guideline of improving financial penalties by using punitive damages can suppress the polluted and low energy efficient buildings. Therefore, the polluted and low energy efficient buildings will have to improve themselves to match the consumer needs. In short, using the strategy of financial conservatism can make the polluted and low

energy efficient buildings become dominant, but it also can be relieved from the free-market advantages and the financial penalties.

5.4.3.2 In Accordance with the Principles of Sustainable Development

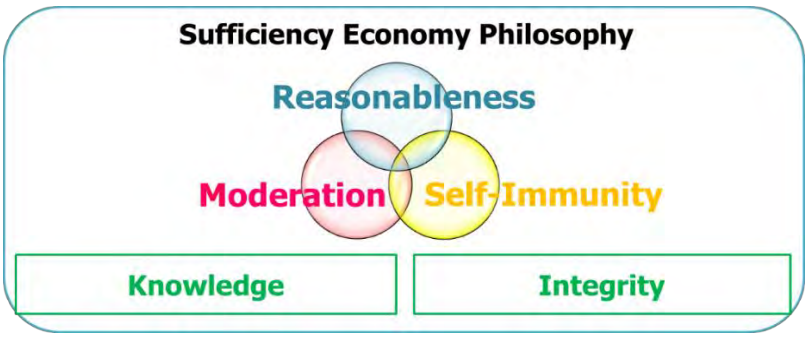
The solution of the problem of hard to reach on green building promotion in Thai financial measures measures by using financial conservatism to offer R&D fund and allow local governments to provide their own incentives and using punitive damages is not considered by the applying of foreign financial measures only, but it is also considered by the principle of sustainable development. This topic will show the principles of sustainable development that relate to the guidelines.

(1) 5Ps Model of Sustainable Development

Regarding Chapter 2, SDGs can be grouped into 5 Ps or categories: People, Prosperity, Peace, Partnership, and Planet. In addition, Prosperity includes SDG 7, 8, 9, 10, 11 and means ensuring that all human beings can enjoy prosperous and fulfilling lives and that economic, social, and technological progress occurs in harmony with nature. Moreover, the punitive damages on financial measures on promoting green building development relates to SDG 7: ensuring access to affordable, reliable, sustainable, and modern energy for all and SDG 11: making cities and human settlements inclusive, safe, resilient, and sustainable. Therefore, the guideline of using financial penalties through the punitive damage approach accords with Prosperity of 5Ps model. Thus, this punitive damage approach is a good way to improve Thai financial penalties since it accords with 5Ps model of sustainable development, especially in the category of Prosperity.

(2) Sufficiency Economy Philosophy

Regarding Chapter 2, Sufficiency Economy Philosophy (SEP) was introduced in 1974 by His Majesty the late King Bhumibol Adulyadej. The SEP model consists of moderation, reasonableness, and self-immunity with the 2 conditions of knowledge, and integrity.



(**Referring to Figure 2.2** SEP Model of Sustainable Development)

The guideline of using financial conservatism on promoting green building development relates to Figure 2.2 because this guideline provides incentives with reasonableness, moderation, and self-immunity through allowing local governments can offer the incentives by themselves based on their fiscal status. One on hand, if a municipality is rich, it can offer more incentives such as providing a soft-loan to promote green building development in its area. On the other hand, if a municipality is poor, it should not do the financial incentives, but it can do some tax incentives instead such as exception on property tax. Therefore, this guideline can be considered that it accords with the sufficiency economy philosophy as having the three components of SEP (Reasonableness: making a decision by using academic approaches, legal principles, moral values, and social norms, Moderation: in the sense of not too much and not too little, and Self-immunity: the preparation for the internal and external changes through having a good risk management).

In terms of Reasonableness, the guideline of using financial conservatism is based on the Thai social norm that believing in capitalism. When it comes to Moderation, financial conservatism does not provide too much and too little incentives. Then, in terms of Self-immunity, the financial conservatism guideline also provides research and development fund which relates to preparation for the internal and external changes. Therefore, the guideline of using financial conservatism on promoting green building development can be proved that it is a good way to improve Thai financial measures since it accords with Sufficiency Economy Philosophy that is one of the principles of sustainable development.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

As the problems of climate change, global warming, sea level rise, acid rain, ozone depletion, forest disappearing, and energy crisis have been shown repeatedly on the news, the environmental problems become an inevitable issue to humanity regardless of region, gender, and age because people breathe the same air and live in the same globe. All nations across the world believe that Sustainable Development Goals (SDGs) can be the best solution to make the better world. Since Thailand is one of the 193 countries in the world, it is necessary to have some measures for encouraging all sectors, including business sector, people sector, and government sector to achieve the 17 goals of sustainable development.

According to United Nation Environment Program[179], the building sector has the largest potential for significantly reducing greenhouse gas emissions compared to other major emitting sectors. Therefore, green buildings will be suitable to use as a tool to stop climate change and achieve the 17 goals of sustainable development. Even though Thailand has green building development measures, the green buildings in Thailand do not get enough support from the government due to the low efficiency of its measures on promoting green building development. The Thai measures on promoting green building development can be divided into 3 measures: Thai legal measures, Thai tax measures, and Thai financial measures.

Since the hypothesis of this paper is Thai tax measures on green building promotion need to be improved due to their low efficiency, the research result can be found that Thai tax measures are too indirect to promote green building development since they do not provide income tax incentives to green building stakeholders: owners, developers, and buyers or tenants. Moreover, besides Thai tax measures, Thai legal

[179] United Nations Environment Program. (2009). *Buildings and Climate change.* United Nations. Paris: Sustainable Buildings and Climate Initiative. Retrieved December 29, 2021, from https://www.uncclearn.org/wp-content/uploads/library/unep207.pdf

measures and Thai financial measures also need to be improved due to inadequate requirements and hard to reach for promoting green building development respectively.

6.2 Recommendations

In order to improve the low efficiency of Thai tax measures on green building promotion, Thai should apply foreign tax measures from the United States, Singapore, and China to adjust Thai tax measures on green building promotion become more efficient. The reasons that these foreign countries can be the best practices because the United States is the leader of green buildings. Singapore has public policies on environmental protection and its location nearby Thailand. Also, China is one of the superpower nations where is nearest to Thailand and it has the national agenda of environmental protection. From these reasons this paper suggests Thai tax measures should apply the foreign tax measures to Thai tax measures as follows:

6.2.1 Investment Promotion Act, B.E. 2520 (1977) Adjusting Incentives from Import Duty to Income Tax

The recommendations on improving Thai tax measures on green building promotion include adjusting incentives through economic efficiency principle and adding Pigouvian tax at the optimal level. In terms of adjusting incentives, it means changing the offering from import duty incentives to income tax incentives instead because this way will solve the problem of too indirect on green building promotion by providing the direct incentives to the green building stakeholders. Then, the number of green buildings in Thailand will increase.

6.2.2 Thai Revenue Code Adding Pigouvian Tax at the Optimal Level

Even though Thailand has excise tax on fossil fuel, the tax rates are not effective to protect the environment due to no relation with polluter pays principle. Another recommendation on improving Thai tax measures on green building promotion is adding Pigouvian tax at the optimal level to Thai Revenue Code. In terms of Pigouvian tax, it means the environmental penalty taxes such as air pollution tax, water pollution tax, noise pollution tax, and so on. Since most of the climate change is from

burning fossil fuels[180], the air pollution can be the first priority to impose the taxation on it. Besides having excise tax on fossil fuels, Thailand should add air pollution tax to Thai Revue Code to stop the climate change. Also, the tax rates of air pollution tax must be at the optimal level because the too high of it will create the diminishing marginal benefit. After using this measure, the polluted and low energy efficient buildings will develop themselves to become green buildings because they do not need to have the burden of air pollution tax.

In addition, this paper also provides other recommendations beyond Thai tax measures. Since Thai legal measures have inadequate requirements for promoting green building development, the recommendation to improve Thai legal measures is adding green building standards to Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), Building Construction Control Act, B.E. 2522 (1979), Town Planning Act (No. 4), B.E. 2558 (2015) to improve Thai legal measures on all three aspects: environmental impact, social impact, and energy conservation because the green building standards require the higher standard than Thai legal measures does.

Also, another recommendation is improving Thai financial measures by using financial conservatism on financial incentives through local governments and adding punitive damages to Maintenance of the Cleanliness and Orderliness of the Country, B.E. 2535 (1992) section 57 and Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992) section 98. In terms of financial incentives, Thailand should allow local governments can provide incentives by themselves through adding the key word that "subsidies for other agencies both government and non-government agencies" in Tambon Council and Tambon Administrative Authority Act, B.E. 2537 (1994) section 33[181]. Moreover, since the highest fine and crime in Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992) section 98 is only 500,000 THB, Thailand should add

[180] Natural Resources Defense Council. (2021, June 22). *Air Pollution: Everything You Need to Know*. Retrieved December 30, 2021, from NRDC: https://www.nrdc.org/stories/air-pollution-everything-you-need-know

[181] (1994). *Tambon Council and Tambon Administrative Authority Act, B.E. 2537.* Retrieved December 30, 2021, from http://thailaws.com/law/t_laws/tlaw0462.pdf

financial punitive damages to Conservation of National Environmental Quality Act, B.E. 2535 (1992) section 98 to suppress the polluted and low energy efficient buildings.

Therefore, after Thailand improves all the measures on promoting green building development: Thai tax measures, Thai legal measures, and Thai financial measures, the environmental problems will be reduced. Also, Thailand will achieve the sustainable development goals from driving of the improved measures. Then, Thai people and people in every place will live together in peace in the better world.

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APPENDIX

Regulatory Policies of Local Government in California

City of San Diego - Development Regulations

- Incentive Type: Solar/Wind Access Policy
- Eligible Renewable/Other Technologies: Solar - Passive, Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Solar Photovoltaics, Solar Pool Heating
- Applicable Sectors: Commercial, Construction, Industrial, Residential, Multifamily Residential, Low Income Residential

Summary

San Diego's Supplemental Development Regulations passed initially in 1997 but since has had many additions and alterations, some as recent as 2020. San Diego's Supplemental Development Regulations require that a "Shadow Plan" be developed when it is determined that structures or landscaping within a proposed development may have an impact on neighboring property's access to solar exposure. This is intended to ensure that potential impacts to solar access will be minimized. (§143.0410 section i)

The *Shadow Plan* is further fleshed out in §151.0301 – Permitted Development Controls. Detailing that "when, in the opinion of the City Manager, structures and major landscaping at maturity for a development project may have an impact on the solar access of adjacent property, the applicant shall submit a satisfactory shadow plan prior to the approval of a planned district development permit" (6.A).

Authorities

- Name: San Diego Municipal Code §143.0410
- Name: San Diego Municipal Code §151.0301

City of Santa Monica - Green Power Purchasing through Clean Power Alliance Utility

- Eligible Renewable/Other Technologies: Geothermal Electric, Biomass
- Applicable Sectors: Local Government
- Renewables % or Amount: 100%

Summary

The City of Santa Monica made history June 1, 1999, as green electricity began powering all municipal facilities -- including the Santa Monica Airport, City Hall and the Santa Monica Pier -- making it the first city in the world to switch to 100% renewable resources to meet the power needs of city facilities. Under the contract, the city purchases approximately 5MW of renewables. The proposed purchase is equivalent to the amount of electricity used by 5,000 to 6,000 homes. Commerce Energy (formerly "Commonwealth Energy") provided the City with 100% renewable energy for City facilities through the purchase of renewable energy certificates.

Beginning May 1, 2019, Santa Monica businesses began receiving 100 percent green power. The City of Santa Monica through Clean Power Alliance introduced Santa Monica residents to green power in February 2019. Through the change, electricity delivery and billing remained with Southern California Edison (SCE), but business customers have a choice of three Clean Power Alliance energy plans derived from 100 percent carbon-free energy sources.

Clean Power Alliance will purchase clean power and Southern California Edison (SCE) delivers it. Clean Power Alliance offers three new, competitively-priced options for your electricity, all cleaner than what Edison provides, and also reinvests funds back into the community.

- Web Site:

  https://www.santamonica.gov/press/2019/04/04/santa-monica-businesses-transition-to-green-power-starting-in-may

Authorities

- Name: Clean Power Alliance Utility

Santa Clara County - County Green Building Standards Code

- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Commercial, Construction, Local Government, Residential, Installers/Contractors, Multifamily Residential

Summary

The purpose of this chapter is to enhance public health and welfare and assure that green building principles and practices are incorporated into new development to limit impacts to the natural and human environment within unincorporated Santa Clara County, The green building provisions referenced in this chapter are designed to achieve the following goals:

- Increase energy efficiency in buildings
- Reduce potable water demand
- Encourage natural resource conservation
- Reduce waste generated by construction projects
- Provide durable buildings that are efficient, cost effective, and economical to own and operate
- Promote the health and productivity of residents and workers who occupy and live in buildings within the County

The additions and amendments to this chapter require the accommodation of electric vehicles through the implementation of electric vehicle charging stations (EVCS) and electric vehicle supply equipment (EVSE).

- Web Site:

  https://www.municode.com/library/ca/santa_clara_county/codes/code_of_ordinances?nodeId=TITCCODELAUS_DIVC3BU_CHIIICOGRBUSTCO

Authorities

- Name: County of Santa Clara Ordinance Code

City of Oakland - Green Building Policies and Requirements

- Administrator: City of Oakland Planning and Building
- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Commercial, Construction, Industrial, Residential, Low Income Residential

Summary

The City of Oakland adopted mandatory green building standards for private development projects on October 19, 2010. This ordinance prescribes minimum green building (see link for definition) requirements for private development (non City of Oakland) projects in Oakland.

On April 21, 2010, the City Planning Commission approved the proposed ordinance for forwarding to the City Council. The regulations apply to new construction, additions or alterations of a certain size, mixed-use, affordable housing, and large landscape projects, as well as the demolition of historic resources. The ordinance will become fully effective starting January 1, 2011, after which the project applicant will generally be required to submit a completed green building checklist, meet minimum green building requirements (LEED), and certify the project through a specific third-party green building rating system.

The ordinance supports one of the City Council's adopted goals to "Develop a Sustainable City," by "maximizing socially and environmentally sustainable growth, including conserving natural resources." The proposal also implements policies and actions in the Land Use and Transportation Element (LUTE), the Open Space Conservation and Recreation Element (OSCAR), the Historic Preservation Element (HPE) and the Housing Element of the General Plan. Furthermore, the ordinance was a key action item in the draft Energy and Climate Action Plan (ECAP) that was prepared by the Environmental Services Division.

In addition to Oakland's local Green Building Ordinance requirements, certain projects will also need to comply with the California Green Building Code known as CALGreen. CALGreen was adopted in January of 2010 and became effective in January 2011. The 2013 amendments to CALGreen require increased green building performance effective January 1, 2014.

Authorities

- Name: Oakland's Green Building Ordinance
- Name: CALGreen - California Green Building Code

City of Sebastopol - Mandatory Solar Requirement for Residential and Commercial Buildings

- Eligible Renewable/Other Technologies: Solar Photovoltaics
- Applicable Sectors: Commercial, Residential
- Residential Code: Specific system size requirements for photovoltaic systems vary according building size or energy usage
- Commercial Code: Specific system size requirements for photovoltaic systems vary according building size or energy usage

Summary

In 2013 The City of Sebastopol became the second U.S. city to require photovoltaics (PV) to be installed on new buildings. The ordinance applies to all new commercial and residential buildings, and additions to existing commercial and residential buildings. The ordinance defines additions to commercial buildings as any addition that increases the square footage by 1,800 or greater and all remodels, alterations or repairs of more than 50% of the structure. The ordinance defines additions to residential buildings as any addition that increases the square footage by 75% or greater and all remodels, alterations or repairs of more than 75% of the structure.

Requirement

Minimum system size may be calculated by either of two methods, prescriptive or performance. Buildings using the prescriptive method must install 2 watts per square foot of conditioned building area including existing, remodeled and new conditioned space. Buildings using the performance method must use modeling software or other methods approved by the official to demonstrate that the system installed will meet 75% of the building's annual electricity load.

Exemptions

The Building Official may exempt buildings from the requirement and impose reasonable conditions in lieu of full compliance if the Official determines that there are practical difficulties involved in meeting the requirement. The City Council may establish an in lieu fee as an acceptable alternative for full compliance.

Owners of multiple properties may install a single PV system meeting the aggregate energy generation requirement for all owned properties which require compliance with the requirement.

Authorities

- Name: Code of Ordinances § 15.72

Los Angeles County - Green Building Program

- Eligible Renewable/Other Technologies:

  Solar - Passive, Solar Water Heat, Solar Space Heat, Solar Photovoltaics, Wind (All), Biomass, Fuel Cells using Non-Renewable Fuels, Daylighting, Hydroelectric (Small), Fuel Cells using Renewable Fuels

- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Commercial, Construction, Industrial, Local Government, Nonprofit, Residential, Schools, Multifamily Residential, Institutional
- Residential Code: **Permit filed after 1/1/2009:** Must by 15% more energy efficient than Title 24 2005 CA Energy Efficiency Standards **Buildings with 5+ units; Permit filed after 1/1/2010:** Must be LEED, Green Point Rated, or California Green certified
- Commercial Code: **Permit filed after 1/1/2009:** Must be 15% more energy efficient than Title 24 2005 CA Energy Efficiency Standards **10,000-24,999 sq. ft.; Permit filed after 1/1/2010:** Must be LEED certified or equivalent **25,000 sq. ft. or more; Permit filed after 1/1/2010:** Must be LEED silver certified or equivalent **High-Rise Building; Permit filed after 1/1/2010:** Must be LEED silver certified or equivalent

Summary

Note: The Regional Planning Commission is considering amendments to the requirements outlined here. See the website above for the most recent information related to this process.

In November 2008, the Los Angeles County Board of Supervisors adopted a series of ordinances which created the Green Building Program. The ordinances included the Green Building Ordinance (2008-0065), the Drought Tolerant Ordinance (2008-0064), and the Low Impact Development Ordinance (2008-0063). These standards are updated periodically, and apply to new buildings constructed in Los Angeles County. If a reconstruction of a building exceeds 50% of its market value, it is subject to green building requirements. Registered historic sites and agricultural accessory buildings are exempt from the requirements. Requirements vary depending on the size and use of the building, as well as the date on which the building permit was filed. See above or the program web site for details.

After the adoption of Title 31 (Green Building Standards) of the County Code, the Board of Supervisors rescinded the green building ordinance and the drought tolerant landscaping ordinance in Title 22 (Planning and Zoning), effective April 28, 2016.

CalGreen, part of the California Building Standards Code, became effective on January 2, 2017. CalGreen mandates green building requirements throughout the state of California.

City of San Jose - Private Sector Green Building Policy

- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Commercial, Industrial, Residential
- Residential Code: Tier 1: Must complete a GreenPoint Rated Checklist or LEED Checklist Tier 2: Must be LEED certified or GreenPoint Rated High Rise Residential: Must be LEED certified
- Commercial Code: Tier 1: Must complete a GreenPoint Rated Checklist or LEED Checklist Tier 2: Must be LEED Silver certified

Summary

In October 2008, the City of San Jose enacted the Private Sector Green Building Policy (Policy No. 6-32). The policy was adopted in Ordinance No. 28622 in June, 2009. All new buildings must meet certain green building requirements in order to receive a building permit. Requirements are dependent on the size and type of the project.

- Tier 1 Commercial Projects include commercial industrial projects (non-residential) of less than 25,000 square feet, and less than a height of 75 feet. These projects are required to submit a completed GreenPoint Rated Checklist or LEED Checklist in order to receive a building permit.
- Tier 1 Residential Projects are single family detached residences or small residential projects consisting of 2-9 units. These buildings must also be less than 75 feet in height. Tier 1 Residential Projects are required to complete a GreenPoint Rated Checklist or a LEED Checklist.
- Tier 2 Commercial Projects include commercial industrial buildings (non-residential) of more than 25,000 square feet but less than 75 feet in height. These projects must LEED Silver certified.
- Tier 2 Residential Projects are multi-family buildings or multi-building residential projects consisting of 10 or more units. Buildings must be less than 75 feet in height. Tier 2 Residential projects must be LEED Certified or GreenPoint Rated.
- High-Rise Residential Projects are residential projects taller than 75 feet. These projects must be LEED Certified.
- Mix-Use Projects must submit a GreenPoint Rated Checklist or LEED Checklist and receive the minimum LEED certification required by the relevant standard in the Ordinance.

Authorities

- Name: Policy No. 6-32

- Name: Municipal Code Chapter 17.84

City of San Francisco - Green Building Code

- Eligible Renewable/Other Technologies: Solar - Passive, Solar Water Heat, Solar Space Heat, Solar Photovoltaics, Wind (All), Biomass, Fuel Cells using Non-Renewable Fuels, Daylighting, Wind (Small), Hydroelectric (Small), Fuel Cells using Renewable Fuels
- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Commercial, Residential

Summary

San Francisco adopted a mandatory green building code for new construction projects in September 2008, establishing strict guidelines for residential and commercial buildings according to the following schedule:

Building Type	**Year**	**Requirement**
Small Residential (four dwellings or fewer)	2009	25 Green Points (does not need to be rated)
	2010 and 2011	Must be GreenPoint Rated and building applications must demonstrate that a minimum of 50 GreenPoints will be earned
	2012	Building applications for new homes must demonstrate that at least 75 GreenPoints will be achieved
Mid-size Residential	2009	25 Green Points (does not need to be rated)
	2010	Must be GreenPoint Rated and building applications must demonstrate that a minimum of 50 GreenPoints will be earned
	2011 and 2012	Building applications for new homes must demonstrate that at least 75 GreenPoints will be achieved
High-rise Residential	2009	New permit applications must include documentation to achieve LEEDcertification (or 50 GreenPoints)

	2010	New permit applications must include documentation to achieve LEED Silver certification (or 75 GreenPoints). A number of specific LEED standards must also be met for landscaping, water use reduction, and construction debris management
	2012	Building applications must also meet LEED standards for the use of on-site renewable energy or the purchase of renewable energy credits
Mid-Size Commercial	2009	New permit applications don't need to meet LEED certification requirements but must meet LEED standards for building commissioning, landscaping, water use, and construction debris management
	2010	New permit applications must meet enhanced commissioning standards and tighter water use requirements
	2012	Building applications must also meet LEED standards for the use of on-site renewable energy or the purchase of renewable energy credits
Large Commercial	November 2008	New permit applications must include documentation to achieve LEED certification
	2009, 2010, 2011	New permit applications must include documentation to achieve LEED Silver certification
	2012	New permit applications must include documentation to achieve LEED Gold certification

Certain buildings will need to meet additional requirements by varying dates. See Ordinance 180-08 for the full implementation schedule.

Commercial Building Benchmarking Requirements

Ordinance 17-11, passed in February 2011, requires owners of commercial buildings over 10,000 square feet to annually measure their building's energy performance and to report the findings to the San Francisco Department of Environment. The ordinance also requires owners of commercial buildings over 10,000 square feet to have an energy audit conducted every five years, and to submit a report on those findings to the

Department of Environment. The Department of Environment will make certain aspects of these reports available to the public for every affected building. These requirements took effect in October 2011 for buildings over 50,000 square feet, and will be phased in for smaller buildings through 2013.

Authorities

- Name: San Francisco Building Inspection Commission (BIC) Code 13C.101, et seq.

Santa Clara County - Green Building Policy for County Government Buildings

- Eligible Renewable/Other Technologies:

  Solar Water Heat, Solar Photovoltaics, Fuel Cells using Non-Renewable Fuels

- Eligible Efficiency Technologies:

  Comprehensive Measures/Whole Building

- Applicable Sectors: Local Government
- Green Building Requirement:

  All new buildings over 5,000 square feet are required to meet LEED Silver certification levels

- Renewable Energy Requirement:

  New buildings must use renewable energy systems to the extent practicable

Summary

In February 2006, the Santa Clara County Board of Supervisors approved a Green Building Policy for all county-owned or leased buildings. The standards were revised again in September 2009.

All new buildings over 5,000 square feet are required to meet LEED Silver certification levels, but only buildings over 25,000 square feet must actually register and be certified by the USGBC. For buildings between 5,000 and 25,000 square feet, the building design and the LEED checklist must be reviewed by a LEED Accredited Professional (AP) or LEED Green Associate. The AP or Green Associate must be a registered engineer or architect and must have worked on at least 1 LEED certified building. County-owned residential buildings may use GreenPoint Rated Guidelines instead of LEED.

New buildings must also use renewable energy systems to the extent practicable.

For leased buildings, administration will strive for LEED Existing Building: Operation & Maintenance (EB:O&M) and/or LEED Commercial Interiors (CI) as appropriate.

The County is also working to develop a LEED EB:O&M Initiative for all existing buildings.

Authorities

- Name: Board of Supervisor's Policy Manual § 7.14

City of Berkeley - Green Building Standards for City Owned and Operated Projects

- Eligible Renewable/Other Technologies:

  Solar - Passive, Solar Water Heat, Solar Space Heat, Solar Photovoltaics, Wind (All), Daylighting, Wind (Small)

- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Local Government
- Green Building Requirement:

  City-sponsored projects started after January 1, 2006 to meet a minimum LEED Silver rating

Summary

The Berkeley City Council adopted Resolution 62284 on November 18, 2003 requiring that all city-sponsored building projects receive LEED certification. Its incorporation occurred in two phases, first requiring city-sponsored projects entering design and construction after January 1, 2004 to meet a minimum LEED Certified rating; and then requiring city-sponsored projects started after January 1, 2006 to meet a minimum LEED Silver rating. The resolution is restricted to new construction or renovation projects funded by the city or located on city-owned land of 5,000 square feet or more of occupied space, which have a construction estimate of $200,000 or more in 2003 dollars. An exception is made for buildings deemed historic under any federal, state or local law, though they are encouraged to achieve as many LEED points as feasible. The city will also grant exemptions from the resolution for building projects which can demonstrate through life-cycle cost analysis that achieving LEED Silver would defeat the purpose of the resolution or create an unreasonable burden on the construction project or the City Department.

City of San Diego - Sustainable Building Policy

- Eligible Renewable/Other Technologies:

  Solar - Passive, Solar Water Heat, Geothermal Electric, Solar Thermal Electric, Solar Photovoltaics, Wind (All), Biomass, Municipal Solid Waste, Fuel Cells using Non-Renewable Fuels, Landfill Gas, Tidal, Wave, Ocean Thermal, Daylighting, Wind (Small), Hydroelectric (Small), Fuel Cells using Renewable Fuels

- Eligible Efficiency Technologies:

  Clothes Washers, Dishwasher, Refrigerators/Freezers, Dehumidifiers, Water Heaters, Lighting, Heat pumps, Air conditioners, Comprehensive Measures/Whole Building, Other EE

- Applicable Sectors: Commercial, Construction, Local Government, Residential
- Green Building Requirement:

  All new City facilities and major building renovation projects (over 5,000 sq. ft.) achieve LEED "Silver" Level Certification and be constructed to be 15% more energy efficient than California's building code

- Equipment Efficiency Requirement:

  All energy-consuming equipment purchased must meet either Energy Star specifications or criterion that puts products in the upper 25% of energy-efficiency, based on criteria established by the U.S. Department of Energy.

- Renewable Energy Requirement:

  Newly constructed City facilities shall incorporate a minimum of 15% self-generation using renewable technologies when site factors allow for a reasonable payback

Summary

The City of San Diego's Sustainable Building Policy is directed by Council Policy 900-14. The policy contains regulations regarding building measures, private-sector incentives, health and resource conservation, outreach and education, and implementation.

Among the directives is a commitment that all new City facilities and major building renovation projects (over 5,000 sq. ft.) achieve LEED "Silver" Level Certification and be constructed to be 15% more energy efficient than California's building code. In addition to achieving LEED Certification, Council Policy 900-14 states that newly

constructed City facilities shall incorporate a minimum of 15% self-generation using renewable technologies when site factors allow for a reasonable payback. The policy also establishes requirements regarding water usage, indoor air quality, and the materials used in construction.

Additionally, Council Policy 900-18 requires the City of San Diego to purchase energy efficient equipment. All energy-consuming equipment purchased must meet either Energy Star specifications or criterion that puts products in the upper 25% of energy-efficiency, based on criteria established by the U.S. Department of Energy.

Authorities

- Name: City of San Diego Council Policy 900-14
- Name: City of San Diego Council Policy 900-18

Riverside County - Sustainable Building Policy

- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Local Government
- Green Building Requirement:

  All new county building projects must meet the criteria for LEED certification.

Summary

In February 2009, the County of Riverside Board of Supervisors adopted Policy Number H-29, creating the Sustainable Building Policy. The Policy requires that all new county building projects initiated on or after March 1, 2009 must meet the criteria for LEED certification. The Board of Supervisors may grant exceptions, especially for projects under 5,000 square feet. Additionally, all county building projects must have a LEED accredited professional on the development team. The policy also encourages existing structures to seek the LEED Existing Buildings certification, and encourages private construction projects to incorporate LEED building practices.

Authorities

- Name: Board of Supervisors Policy No. H-29

San Diego County - Design Standards for County Facilities

- Eligible Renewable/Other Technologies:

  Solar Photovoltaics, Wind (All), Biomass, Combined Heat & Power, Wind (Small), Fuel Cells using Renewable Fuels, Other Distributed Generation Technologies

- Eligible Efficiency Technologies:

  Comprehensive Measures/Whole Building

- Applicable Sectors: Local Government
- Green Building Requirement:

  All new county buildings or major building renovations obtain U.S. Green Building Council (USGBC) LEED Building Certification

Summary

The San Diego County Board of Supervisors established design standards for county facilities and property. Among other requirements, the policy requires that all new county buildings or major building renovations obtain U.S. Green Building Council (USGBC) LEED Building Certification. Renovations of over 5,000 square feet are considered major renovations. Buildings over 10,000 square feet require LEED Enhanced Commissioning. Additionally, county projects are required to attain the lowest EUI (Energy Use Intensity) possible within the client's program and project's budget. County projects are also required to exceed the current California Energy Code Title 24 by at least 20%.

- Web Site:

  http://www.sdcounty.ca.gov/general_services/Energy/Energy.html

Authorities

- Name: Board of Supervisors Policy No. G-15

City of Long Beach - Green Building Policy for Municipal Buildings

- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Local Government
- Green Building Requirement:

  Within three years of adopting the Green Building Policy for the City of Long Beach, all new municipal projects of over 7,500 square feet will meet the LEED Certified criteria. Within six years of adopting the Green Building Policy for the City of Long Beach, 60 percent of all new municipal construction projects will meet LEED Silver criteria.

Summary

Green Building Policy for New Municipal Building Projects

It is the policy of the City of Long Beach to plan, design, construct, manage, renovate, and maintain its facilities and buildings in a sustainable manner. The US Green Building Council's LEED rating system and Reference Guide shall be the design and measurement tools used to determine what constitutes sustainable building under this policy. This policy applies to new construction and additions to existing buildings and facilities whenever the gross area of the new construction is over 7,500 square feet.

Green Building Policy for Municipal Remodel and Tenant Improvements

The US Green Building Council is currently developing a LEED standard for remodel and tenant improvement projects. Since neither of these standards is final at the time of adoption of this policy, the City adopts the following policy. For municipal remodel projects which affect less than 50 percent of a building's total square feet, and which cost more than $35 per square foot, the project should incorporate green material and technology where possible. All municipal building rehabilitation and retrofit projects should adopt the green building best practices.

Infrastructure, Unoccupied Buildings, Park, and Industrial Projects

It is the policy of the City of Long Beach that infrastructure projects (streets, parking garages, etc.), unoccupied buildings, park equipment and recreation facilities (docks, playgrounds, etc.) and city industrial projects are not required to conform to the LEED standard as the standard does not address these types of projects. It is the policy of the City of Long Beach that green building techniques, methods and materials be incorporated into such projects as much as practicable.

Program Goals

Within three years of adopting the Green Building Policy for the City of Long Beach, all new municipal projects of over 7,500 square feet will meet the LEED Certified criteria.

Within six years of adopting the Green Building Policy for the City of Long Beach, 60 percent of all new municipal construction projects will meet LEED Silver criteria.

City of San Francisco - Green Building Requirements for City Building

- Administrator: Municipal Green Building Task Force
- Eligible Efficiency Technologies: Comprehensive Measures/Whole Building
- Applicable Sectors: Local Government
- Green Building Requirement:

  The minimum requirement for municipal construction projects of 10,000 square feet or more shall be LEED Gold certification by GBCI.

Summary

The Board of Supervisors for the City of San Francisco establishes the Municipal Green Building Task Force to oversee and assist in enhancing the environmental performance of City construction projects. The Task Force shall review municipal construction projects during their design and construction to ensure that the responsible City departments are complying with requirements outlined below, and may advise the Department of the Environment on matters of relatable policy.

The LEED rating system shall be used to certify the environmental design of the City's municipal construction projects. The minimum requirement for municipal construction projects of 10,000 square feet or more shall be LEED Gold certification by GBCI (Green Business Certification Inc.). Projects less than 10,000 square feet must meet alternative LEED credits outlined by the sponsoring City department. In order to achieve LEED Gold certification, municipal construction projects must meet selected San Francisco-specific LEED credit requirements as further specified by Section 706.

- Web Site:

  http://sfenvironment.org/buildings-environments/green-building/city-government-buildings

Authorities

- Name: San Francisco Environment Code

BIOGRAPHY

Wuttipong Limwarapus

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EDUCATION

Valparaiso University, Valparaiso IN
Master of Science in International Commerce and Policy, GPA: 3.62, May 2020

National Institute of Development Administration, Thailand
Master of Arts with honors in Integrated Tourism Management, GPA: 3.75, Oct 2016

Bangkok University, Thailand
Bachelor of Business Administration with 1st class honors in International Business Management, GPA: 3.86, May 2015

Study Abroad Program

Kunming, China	*Beijing, China*
Taipei, Taiwan	*Singapore*

COURSEWORK

Global Business Experience
Cross-Cultural Management
Strategic Management and Business Policy
International Economics and Trade Policies
Tourism Logistics and Value Chain Management

CERTIFICATIONS Business English: Meetings
University of Washington, issued Feb 2018

Business English: Networking
University of Washington, issued Feb 2018

Business English: Planning & Negotiation
University of Washington, issued Feb 2018

Intermediate Chinese
National Taiwan University, issued May 2019

Learning Chinese: Start from Scratch
National Taiwan University, issued Jun 2019

Chinese Culture and Contemporary China
Nanjing University, issued Jun 2019

Fundamentals of the Chinese character writing
Saint Petersburg State University, issued Feb 2020

中级商务汉语（入职与营销篇）
Peking University, issued Mar 2020

LANGUAGE SKILLS *Native language:* Thai
Professional working proficiency: English, Mandarin Chinese, Cantonese

OTHER SKILLS Analytical, organized, fast learner, quick thinker, good communicator, comfortable

EXPERIENCE **Hard Rock Casino and Hotel Lake Tahoe**, Stateline, NV, May - Aug 2015

*J-1 Visa Summer Work & Travel Program***: Environmental Services (EVS)**

- Cleaned the floors, emptied the trash, and disposed of the ashtrays throughout the casino.
- Maintained casino floor, machines, and upheld all storage facilities
- Provided excellent customer service, and greeted each client with a warm smile.

Confucius Institute at Valparaiso University, Valparaiso, IN, Sep 2019 – Mar 2020

- Event helper

Teeranid Shipping Corp. at Chicago, Chicago, IL, Mar – Jun 2020

- Marketing officer
- Warehouse operator

The Designated Areas for Sustainable Tourism Administration (DASTA), Bangkok, Thailand, Mar – July 2021

- Research assistant