

# Taxation on Waste Will Lead to Optimal Portfolio Allocation in Green Investment

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## Introduction

This article examines the current portfolio allocation in Sustainable Development Goal (SDG) and Green projects. Traditional investments are focusing on rates of return and risk associated with investment. SDG, Environmental, Social and Corporate Governance (ESG) or Green factors are additional components which investors have to pay attention to. It will be shown that the current different definitions of SDG, ESG or Green factors will lead to distorted allocations in portfolio investments. In order to bring portfolio allocations to a desirable direction, global taxation on pollution or a Green credit rating based on emissions of various waste are recommended.

## Sustainable Development Goals

The United Nations set up 17 SDGs with a target date of 2030. The main agenda is to “leave no one behind”. SDGs provide a shared blueprint for peace and prosperity for people and the planet in the current generation and future generations. The UN global agenda clarified the importance of the development of Green energy and reducing pollution, such as CO<sub>2</sub>, NO<sub>x</sub>, and plastics; however, data show that, based on the current mechanism, it is not possible to achieve these goals. If the current trajectory of global fossil-fuel use continues, the planet’s temperature is likely to rise by 4–6 C above the pre-industrial level. Greenhouse gas (GHG) emissions cause climate change and global warming is now indisputable. In order to reduce GHG emissions, investors are requested to make their investment decisions based on not only the rate of return but also the SDG or greenness of companies. The most disappointing aspect of the contemporary global Green economy is the low rate of investment (*Handbook of Green Finance: Energy Security and Sustainable Development*, by Jeffery Sachs, Wing Thye Woo,

Naoyuki Yoshino and Farhad Taghizadeh-Hesary, Springer, Tokyo, 2019).

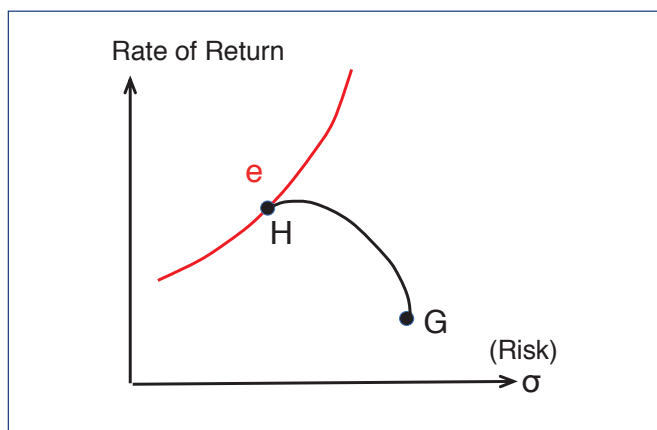
In order to increase the rate of return in Green investment, a tax should be levied on emissions of CO<sub>2</sub>, NO<sub>x</sub>, and plastics, and the revenues can be distributed to Green sectors in order to increase the rate of return on Green investment so as to attract more investors.

However, institutional investors use the services of different consulting firms, which define the criteria of SDGs. Traditionally, investors are observing (1) rate of return from investments and (2) risks associated with investments. The SDG component is an additional factor that investors must consider. Investors are now setting their portfolio allocations by studying three factors: (i) risk, (ii) rate of return, and (iii) SDGs. As the criteria of SDGs by each consulting firm are different, their measurements are also different, and these can distort optimal portfolio investments. Much academic literature shows the importance of Green finance and investment in the deployment of renewable energy projects for GHG emission reduction. However, we could not find any study that developed a model for calculating optimal portfolio allocations for investment in SDGs, and in this regard this study is novel. This article will show that the best policy will be taxing GHGs and waste such as CO<sub>2</sub>, NO<sub>x</sub>, or plastics globally by applying the same tax rate, forcing investors to focus on rate of return and risk after-tax.

*Chart 1* shows a portfolio frontier between asset H and Green investment G. It also shows an investor’s utility function by a red curve. If the rate of return from Green investment is lower than asset H and if the risk associated with investing in Green energy is higher than asset H, no investor would like to invest into Green projects. It is important to increase the rate of return from Green projects by injecting collected taxes from CO<sub>2</sub>, NO<sub>x</sub>, and plastics so that private investors will be interested in investing in Green projects.

CHART 1

### Low rate of return on Green investment



Source: Compiled by the authors

### Different Definitions of SDGs

Different consulting companies provide different criteria for measuring SDGs, resulting in investors having different portfolio allocations in SDGs. In this section, we consider the criteria that three major consulting firms follow to measure SDGs based on different indicators.

Klynveld Peat Marwick Goerdeler (KPMG) is a multinational professional service (financial audit, tax, and advisory) network, and one of the Big Four accounting organizations with its headquarters in Amstelveen in the Netherlands. KPMG sets an SDG Industry Matrix to attract greater private sector action into each relevant SDG. The SDG Industry Matrix has been jointly managed by the United Nations Global Compact and KPMG. Four main groups of indicators were considered to measure the consistency of each SDG: (i) demographics (population prediction in specific countries or regions), (ii) income growth, (iii) technology (renewable energy sources, knowledge-sharing cultures, among others), and (iv) collaborations (between governments, companies, international organizations, and academia, among others). The higher the levels of these four indicators, the more actively SDG investments can be made.

Nomura Research Institute, Ltd. (NRI) is the largest Japanese management consulting and economic research firm. According to NRI, the consistency and contribution level to SDGs should be quantitatively defined. NRI sets four key performance indicators in investigating business activities: (i) innovation, (ii) business

opportunity, (iii) impact, and (iv) cost.

PricewaterhouseCoopers International Limited (PwC) is a multinational professional services network headquartered in London. PwC ranks as the second-largest professional services (financial audit, tax, and advisory) firm in the world and is considered one of the Big Four accounting firms. PwC has developed indicators that consider the business level for achieving global goals, including SDGs. The indicators include (i) leadership (business and financial strategies), (ii) employee engagement (awareness and bottom-up initiatives), (iii) reporting (risk assessment and management), and (iv) collaboration (among suppliers, consumers, government, NGOs, and others).

Table 1 summarizes the definition of SDGs by these three major consulting firms.

Chart 2 shows a comparison between traditional portfolio investment and investment taking SDGs into account. The red curve denotes the utility curve of the investors when they focused only on (i) rate of return and (ii) risks associated with investment. The blue curve between S1 and S2 denotes the efficiency frontier of two investments S1 and S2 in the first quadrant. The optimal portfolio allocation can be achieved at point e. When investors have to take SDG criteria into account, an additional second quadrant must be added for the allocation of portfolio investments. The second

TABLE 1

### Criteria of 3 major consulting firms for measuring SDGs

Consulting firm	Criteria for measuring SDGs
KPMG	<i>demographics</i> (the population prediction in specific country or region), <i>income growth</i> , <i>technology</i> (renewable energy sources, knowledge sharing cultures, among others), and <i>collaboration</i> (between governments, companies, international organizations academia among others)
NRI	<i>innovation</i> , <i>business opportunity</i> , <i>impact</i> , and <i>cost</i>
PwC	<i>leadership</i> (business and financial strategies), <i>employee engagement</i> (awareness and bottom-up initiatives), <i>reporting</i> (risk assessment and management), and <i>collaboration</i> (among suppliers, consumers, government, NGO and more)

Source: Compiled by the authors

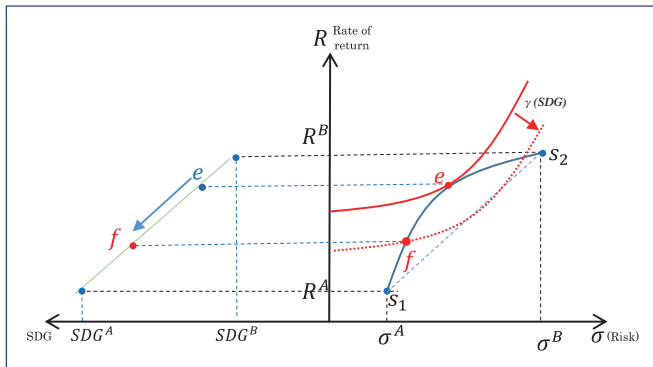
KPMG, UN Global Compact, 2016. SDG industry matrix: Energy, natural resources and chemicals, <https://d306pr3pise04h.cloudfront.net/docs/publications/%2F2017%2FSDG-industry-matrix-enrc.pdf>

Nomura Research Institute (NRI), 2019. How to quantify the contribution level to SDGs by the organizations units (Japanese). Nomura Research Institute Risk Management.

PwC, 2016. Navigating the SDGs: a business guide to engaging with the UN Global Goals, <https://www.pwc.com/gx/en/sustainability/publications/PwC-sdg-guide.pdf>

CHART 2

**Portfolio allocation when SDG is taken into account (in the second quadrant)**



Source: *Finance Research Letters*, Yoshino-Taghizadeh-Hesary and Otsuka (2020)

quadrant measures the degree of SDG criteria. Suppose investment S1 achieves higher SDG points compared to S2 investment. The investors have to allocate much more to S1 compared to S2 investment. The chart shows that the optimal portfolio allocation is not point e but has to be point f where much more investment is allocated to the S1 company.

However, depending on which consulting company each investor will hire, the degree of SDG will be different, as is shown in *Table 1*. Point f is not a unique point, but there are many different allocations

TABLE 2

**Green Bond Principles (GBP) 2018**

(i) renewable energy
(ii) energy efficiency
(iii) pollution prevention and control
(iv) environmentally sustainable management of living natural resources and land use
(v) terrestrial and aquatic biodiversity conservation
(vi) clean transportation
(vii) sustainable water and wastewater management
(viii) climate change adaptation
(ix) eco-efficient and/or circular economy adapted products, production technologies and processes
(X) green buildings which meet regional, national or internationally recognized standards or certifications.

Source: *The Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds*, ICMA, June 2018

based on the consulting companies. Therefore, optimal portfolio allocations would be distorted by the different definitions of consulting companies. A detailed mathematical explanation can be seen in “COVID-19 and Optimal Portfolio Selection for Investment in Sustainable Development Goals” (*Finance Research Letters*, 2020, by Naoyuki Yoshino, Farhad Taghizadeh-Hesary and Miyu Otsuka, <https://doi.org/10.1016/j.fr.2020.101695>).

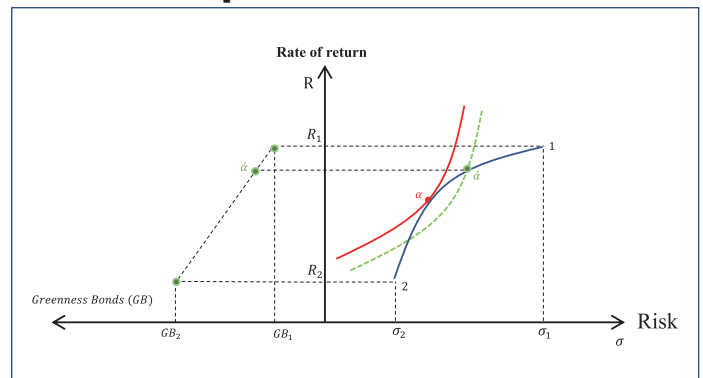
**Green Bond**

A similar argument can be applied to Green bond investment. *Table 2* shows the Green bond principles defined by the International Capital Market Association (ICMA). In Japan, the Development Bank of Japan (DBJ) has issued Green bonds for the construction of commercial buildings that reduce CO2 and are environment friendly, and the Japan Housing Finance Agency has issued Green bonds for the construction of environment friendly housing. Both of these bonds satisfy the criteria defined by the ICMA. However, they do not accurately reflect by how much CO2, NOx and other polluting gases can be reduced. It can be said that some Green bonds are 80% green and 20% gray, and others 90% green and 10% gray. But as long as the criteria defined by the ICMA are met, a Green bond can be issued.

*Chart 3* shows the greenness index in the second quadrant. As in the case of SDG investment, investors are now taking greenness into account in addition to the rate of return and risks associated with investments. Since a Green bond is not necessarily 100% green, portfolio allocations can be distorted by current definitions of such bonds.

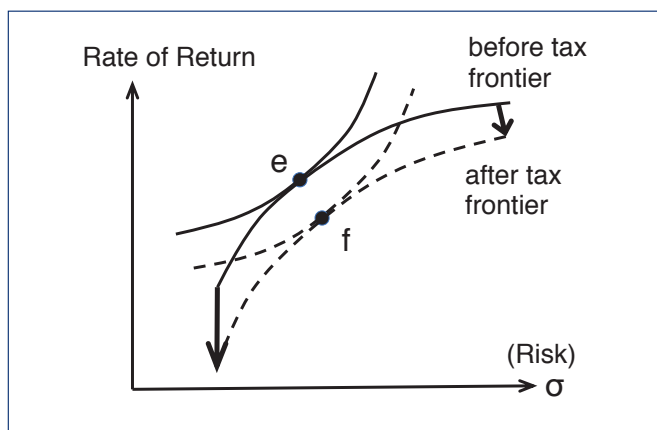
CHART 3

**Green bond portfolio**



Source: *Compiled by the authors*

CHART 4  
After-tax frontier



Source: Covid-19 and Optimal Portfolio for Investment in Sustainable Development Goals  
<https://doi.org/10.1016/j.frl.2020.101695>

### GHG Taxation & Accurate Credit Rating of Greenness

A standard global greenhouse gas (GHG) tax on CO<sub>2</sub> and NO<sub>x</sub> will give us a new rate of return on assets A and B, presented in this subsection. Tax rates can be adjusted based on the progress of pollution reduction. If pollution reduction is slow compared to the target, the global

$$R_A = R_A - (\text{GHG Tax}_A)$$

$$R_B = R_B - (\text{GHG Tax}_B)$$

As shown in *Chart 4*, the frontier curve of asset A and asset B will go down based on the emission of GHG. The after-tax rate of return is adjusted by the amount of tax charged to company A and company B. Investors can only look at the after-tax rate of return and the risks associated with it without taking the SDG component into account. The SDG component is automatically adjusted by taxation on GHG. If these GHG taxes are allocated to Green investments such as solar and wind power, their rate of return will rise, which will accelerate more investment into Green projects.

Another way is to make the credit rating of a company based on its greenness, which is comparable to measuring its GHG exposure. If company A is exposed to zero GHG, it is rated AAA, but one whose exposure is large would be rated as BB, etc. An accurate measuring of GHG will provide an accurate credit rating for each company that

TABLE 3  
Green credit rating

Credit Rating	Greenness (%)	CO <sub>2</sub>	NO <sub>x</sub>	Plastic	N <sub>2</sub> O etc
AAA	100 ~ 90	AAA	AAA	AAA	.....
AA	90 ~ 80	AA	AA	AA	.....
A	80 ~ 70	A	A	A	.....
BBB	70 ~ 60	BBB	BBB	BBB	.....
BB	60 ~ 50	BB	BB	BB	.....
B	50 ~ 40	B	B	B	.....
CCC	40 ~ 30	CCC	CCC	CCC	.....
CC	30 ~ 20	CC	CC	CC	.....
C	20 ~ 10	C	C	C	.....

Source: Compiled by the authors

investors can follow. *Table 3* shows an example of Green credit rating based on emissions of CO<sub>2</sub>, NO<sub>x</sub>, and plastics. These ratings will make it easier for investors to decide on investing in Green projects.

### Conclusion & Policy Implications

SDGs are an important target we have to achieve. Green investments are important too. But as each consulting company has its own criteria for measuring SDGs, investors' portfolio allocations can become distorted due to the lack of global standardized criteria for such measurement. To achieve clean energy and environment-related SDGs, we recommend the adoption of international GHG and plastic taxation systems, and that the credit rating of companies be based on GHG emissions for investors to take into account.

Finally, although adopting an international taxation system for GHG and plastics is desirable, it might be difficult for developing countries. So we recommended starting such a system in regions where economic cooperation and economic integration exist, like the European Union or the Association of Southeast Asian Nations. **JS**

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