Disclosing Climate Risk

The earth is waiting for people's response to climate change. According to Intergovernmental Panel on Climate Change [IPCC] (2018), "Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate" (p. 6). Even though people have taken action, current situation is still worrying. What else can people do? Governments should force companies to disclose climate risk. Climate risk is considerable, but companies hide and ignore it. If companies care about climate risk, they will take action against climate change. People will invest in climate-friendly projects if they know companies' climate risk. Governments can facilitate international cooperation on the climate issue if they force companies to disclose climate risk.

Climate risk is noticeable. World Economic Forum (2019) lists the top ten risks in *The Global Risk Report 2019*. "Extreme weather events" ranks first in terms of "likelihood" and third in terms of "impact" (p. 5). Extreme weather events are more frequent than before. According to an article in *The Economist*, "In 2017 Houston experienced its third '500-year flood' in less than four decades, California suffered five of its 20 worst wildfires ever and parts of the Indian subcontinent were underwater for days following epic monsoon downpours" ("Hot, Unbothered", 2019, p. 15). Extreme weather damages supply chains. For example, abnormal climate disrupted commercial traffic along the Rhine in 2018, because rains could not replenish the sources of this worldwide busiest waterway ("Hot, Unbothered", 2019, p. 15). Multiple "chokepoints" in the food system failed simultaneously. People shut down one

of the Gulf Coast ports in the US during a hurricane in 2018. At the same time, heavy rains swamped key roads in Brazil (World Economic Forum, 2019, p. 79). Companies relying on supply chains suffer losses from climate change.

Other companies are not safe either. According to Stefan Schaltegger, Dimitar Zvezdov, Edeltraud Günther, Maria Csutora, and Igor Alvarez (2015),

> When nations and whole industries are confronted with a phenomenon of un-sustainability it is not astonishing that many industries, markets and companies are affected by climate change induced problems of water scarcity, soil erosion, devastatingly large fires, decreasing fish populations, floods, etc. Given the interconnectedness of industries and global trade, an impact of climate change to global social and economic systems is also likely to have an impact on those who are not directly affected. (p. 2)

Climate change decreases sales and increases costs for most companies. For example, personnel expenditures increase because the productivity of employees decreases. Material costs increase because companies spend more on maintaining existing resources and purchasing new resources. Operational costs such as energy and water costs for snowmaking machines increase. Transportation costs increase because companies adapt the type of transportation for the changing climate. Insurance costs and financial penalties also increase under the changing climate (Stechemesser, Bergmann, and Guenther, 2015, pp. 222-223). Climate change brings potential losses. “One study last year found that accounting for physical risks to corporate assets would shave 2-3% off the total market value of over 11,000 globally listed firms” (“Hot, Unbothered”, 2019, p. 15).

Companies have considerable climate risk, but governments haven't forced them to disclose such risk. Because companies can hide those potential losses, they ignore climate risk. Only when companies must disclose climate risk will they consider how to deal with climate change.

Companies are not unaware of climate change, but they take few actions. According to Carbon Disclosure Project [CDP] (2012), "Many companies report that they have started to consider climate change in their business strategy. However, only a small share of companies mentions a specific and systematic adaptation strategy" (as cited in Schaltegger et al., 2015, p. 4). Companies worry that climate change will influence their long-term development, but they care more about their current profitability. They make strategies for profits rather than climate change. For example, the global energy industry is planning multi-trillion-dollar investments to satisfy the rising demand for oil and gas. Oil majors, like ExxonMobil, are investing in upstream projects from Texan shale to high-tech deep-water wells. Oil companies lobby against measures that would limit emissions. However, according to an assessment by the IPCC, oil and gas production should fall by about 20% by 2030 and by about 55% by 2050 ("Crude Awakening", 2019, p. 9).

Companies will fight against climate change when they pay sustained attention to their climate risk. Companies should maximize shareholders' wealth. They should also react to climate change for sustainable development. Although these two requirements are not contradictory, companies may lose some profits if they stick to climate-friendly strategies. Companies ignore the climate issue because they prefer making profits to protecting climate. However, if companies must disclose climate risk, they will connect climate change with

shareholders' wealth. They must reduce climate risk to guarantee shareholders' wealth.

If companies care about climate risk, they will strategize on protecting climate. Companies' climate change strategies include mitigation and adaptation. For mitigation, according to Schaltegger et al (2015),

> At the core of the mitigation mechanism are efforts to avoid greenhouse gas (GHG) emissions. Furthermore, the removal of these gases from the atmosphere by means of carbon sinks (e.g. by carbon capture and sequestering) can be subsumed to mitigation. …Corporate planning involves the identification and assessment of climate change impacts, the setting of targets, and the formulation of measures. Implementation and operation focuses on the related organizational structure and process organization. Checking and corrective action aims at continuously monitoring and improving climate change mitigation. Finally, management reviews support top management to evaluate mitigation efforts. (p. 5)

Adaptation strategies include "climate knowledge absorption, climate related operational flexibility, and strategic climate integration" (Schaltegger et al., 2015, p. 4). Companies should improve both mitigation and adaptation strategies. Current mitigation strategies lack research and management control. Most companies do not have specific and systematic adaptation strategies (Schaltegger et al., 2015, pp. 4-5). When companies disclose climate risk, they must measure their impacts on climate change. Companies can gain direction for improving strategies from these impacts. For example, companies can assess how effective their mitigation measures are and identify their mitigation potential (Schaltegger et al., 2015, p. 8). Companies will plan and implement more effective climate change strategies than

existing ones.

With effective strategies, companies will put more funds in climate-friendly investments. For example, companies will invest in low-emission technologies. According to the IPCC (2018), "Technology development and transfer is recognized as an enabler of both mitigation and adaptation in Article 10 in the Paris Agreement (UNFCCC, 2016) as well as in Article 4.5 of the original text of the UNFCCC (UNFCCC, 1992)" (p. 371). General purpose technologies (GPTs) can reduce greenhouse gases (GHG) emission. Such technologies include artificial intelligence (AI), the internet of things (IoT), nanotechnologies, biotechnologies, and robotics (the IPCC, 2018, p. 369).

Companies are reluctant to invest in these technologies. The research and development (R&D) costs are high. Low-emission options will increase the energy costs. Higher energy costs will amplify overall production costs. The prices of non-energy goods will increase, which could reduce consumer purchasing power and demand (the IPCC, 2018, pp. 374-375). However, if companies incur climate risk from carbon-intensive assets, they will consider the low-emission technologies as a "free option on carbon" (Andersson et al., 2016, as cited in the IPCC, 2018, p. 378). Companies do not risk profits for the climate-friendly transition. But if they can reduce climate risk with climate-friendly investment, they will give up short-term profits and protect shareholders' wealth. Companies will reassess their investment regarding climate risk.

Investors other than companies will also reassess their investment after companies disclose climate risk. These investors will care about the climate issue as companies do. Governments can share the burden with diverse investors in climate governance. According to

the IPCC (2018), "the average estimate by seven models of annual investment needs in the energy system is around 2.38 trillion USD2010 (1.38 to 3.25) between 2016 and 2035. This represents between 2.53% (1.6–4%) of the world GDP in market exchange rates (MER) and 1.7% of the world GDP in purchasing power parity (PPP)" (p. 372).

The energy investment is only one sector. Governments face increasing investment in overall infrastructure, because they should improve infrastructure to coordinate with low-emission transition. For example, governments should adapt transport infrastructure to manage increasing shares of electric vehicles. Governments should improve the digital infrastructure so that they can deploy sensor-based technologies across all kinds of networks and grids. Governments should also invest more in "green infrastructure" which will reduce energy demand, lower urban temperatures and improve water management (World Economic Forum, 2019, p. 83). If governments force companies to disclose climate risk, governments can direct people's savings to these projects. People will measure climate risk and value the risk-reduction role of these projects. Governments can raise more funds for climate-friendly investments.

Investors also have other climate-friendly options. For example, the European Investment Bank (EIB) issued the first green bond called "climate awareness bond" in 2007. The issuers now include banks, non-bank financial organizations, and corporations (Tang and Zhang, 2018, p. 3). The market for green bonds is growing. "According to UN Environment, issuance of 'green bonds' jumped from US$11 billion in 2013 to US$155 billion in 2017" (World Economic Forum, 2019, p. 83).

But the future of this market is vague. Green bonds are an instrument that "promotes

climate-friendly investments by limiting the use of proceeds, and involves strict monitoring and reporting requirements-while having no immediate financial benefits over and above an ordinary corporate bond" ("International Financial Law Review; London", 2015). Investors feel uncertain for green bonds, because issuers do not disclose enough information and provide standards to assess greenness. Critics say such uncertainty will slow the future growth of this market (Tang and Zhang, 2018, p. 4). If governments force companies to disclose climate risk, both the issuers and investors of green bonds will increase. More companies will issue green bonds to attract investors with low climate risk. Investors can assess companies' situations under climate change and measure benefits from green bonds. The market of this climate-friendly instrument will grow.

Governments can facilitate international cooperation on the climate issue if they force companies to disclose climate risk. Countries altogether deal with this global issue. People agreed on the Kyoto Protocol in 1997. They set the objective in the Convention to achieve "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (*The United Nations Framework Convention on Climate Change*, 2015, as cited in Pickl, 2008, p. 146). This Convention contains an economic tool, Joint-Implementation, to strengthen international cooperation between enterprises on reducing CO2-emissions (Pickl, 2008, p. 147). The Kyoto Protocol requires the European Union reduce greenhouse gas emissions by 8% from 1990 levels by 2012. The EU implements the European Union Emission Trading Scheme (EU-ETS) since 2005 to meet this requirement (Slate, 2012, p. 61).

According to Slate (2012),

> Emission trading is a mechanism that allocates allowances to companies in order to stop greenhouse gas emissions according to each country's environmental target. The "quotas", "permits" or "caps", as the allowances are called in the Green Paper from March 2000, are allocated to companies included in the scheme. The method of allocation is based on auctioning and allocation free of charge…The mechanism agrees that the companies can emit more than their permits if they can find another company that emits less than its permits that have been allocated in the national plan and that is ready to sell permits to the company in need. (p. 62)

The EU set this trading scheme so that companies could enhance their profits and invest in new technologies and innovation programs (Slate, 2012, p. 62). This trading scheme works. EU-27 has reduced greenhouse gas emissions by 17.3% from 1990 levels by 2009. The EU plans to reduce the emissions with at least 20% below 1990 levels by 2020 (Slate, 2012, pp. 67-69).

However, when the third phase of EU-ETU started in 2013, the EU hasn't overcome obstacles they encountered in the first (2005-2008) and second (2009-2012) phases. The EU allocates the total number of gas emission permits among Member States according to historical data and risk prognoses. The EU cannot set accurate allocation plans. It overestimates some companies' reduction power but sets loose targets for some other companies. Companies without enough permits do not reduce pollution rates. They buy allowances from companies facing undemanding caps (Slate, 2012, pp. 63-71). Some states and sectors with high rates of emissions do not participate in the scheme (Pickl, 2008, p. 151). Some companies fear the direct costs from purchasing allowances and the indirect costs from

reducing positions in the value chain. They feel uncertain for EU-ETU and take a "wait-and-see" strategy (Hoffmann and Trautmann, 2008, pp. 112-113).

If governments force companies to disclose climate risk, the EU can set more effective allocation plans. According to Pickl (2008), "A key to effective emission analysis is the accurate and standardized reporting of emissions" (p. 147). Companies should measure their climate risk and report accurate greenhouse gas emissions. For example, Pickl (2008) says the Technology-Emissions-Means (TEM) model might be a useful mathematical tool to support the analysis within a "cap and trade" system. The TEM model enumerates risks related to climate change impacts. It shows the amount of emissions a company can reduce with certain technologies and financial means. If companies apply models like this to specify the amount of emissions under their climate risk, the EU can define each state's proper volume of greenhouse gas emission permits. Emitters with high costs of reducing emissions can buy permits from other emitters with lower costs of reducing emissions. Companies can reduce gas emissions in a cost-effective way (Pickl, 2008, pp.147-150).

If governments force companies to disclose climate risk, more companies will participate in the trading scheme. Some people say "an incentive-based approach in environmental policy has a higher probability of inducing cost-effective technology innovation and diffusion than command and control approaches" (Jaffe et al, 2004, as cited in Hoffmann and Trautmann, 2008, p. 112). But companies want reliable returns from their plans. EU-ETU is "incentive-based" but some companies choose "wait-and-see" because they feel uncertain for their returns (Hoffmann and Trautmann, 2008, pp. 112-113). If governments command companies to disclose climate risk, companies will take proactive environmental

strategies to reduce climate risk. Companies cannot avoid the costs of reducing greenhouse gas emissions. They will consider how to minimize the costs through the trading scheme. According to Pickl (2008), companies' investment strategies should be at the center of interests. The climate-risk analysis works because companies know the emission trading matches their interests (p. 151).

Some people argue that if investors pour into the green market for fear of climate risk, the green finance will expand sharply. The rapid expansion will cause "asset bubbles and the temptation to lower capital requirements to encourage sustainable investment" (World Economic Forum, 2019, p. 83). However, the green market will grow healthily rather than sharply if governments force companies to disclose climate risk.

If governments oblige companies to disclose climate risk, governments should first settle the problems about analyzing climate risk in current green market—"The problem of the weak regulatory system, together with the problem of insufficient unified codes and standards in place that can be used as a guide to measure emissions accounting or auditing to ensure consistent quality" (Buckstein, 2009, as cited in Haque and Islam, 2015, p. 253). The climate-risk report relates to a broad range of different stakeholders. But companies have no standard for selecting relevant information. Companies include incomplete and biased climate information in their reports (Schaltegger et al., 2015, pp. 15-16). For example, when some companies assess their greenhouse gas emissions, they measure only certain variables, collect selective data, and adopt certain assumptions in the calculations (Haque and Islam, 2015, p. 250). If governments set standards for companies' climate risk disclosure, companies will improve the completeness, transparency, and accuracy of climate change accounting

(Schaltegger et al., 2015, pp. 15-18). The green market can grow healthier under the risk-disclosure command.

Governments should force companies to disclose climate risk. Companies should not hide and ignore this considerable risk. If governments force companies to disclose climate risk, companies will take action against climate change. People will invest more funds in climate-friendly projects. Governments will facilitate international cooperation on the climate issue. Under the climate-risk-disclosure command, people can altogether cope with climate change. People may give the earth a tolerable response to the climate issue.

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