

Original Research Article

## The Comprehensive Environmental Management Model in Post-Covid19 Era

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### ABSTRACT

To restrict the adverse impact of Green House Gas there is a need of rapid action for transformation of the current situation to achieve the targets mentioned by the United Nations Programme. The coronavirus crisis generated additional challenges but also generated a provision for companies to develop a sustainable model in the recovery period by incorporating the non-financial aspect of green environment in their business model. In this paper, we identify some of the main problems of the existing projects related to Green House Gas control and propose the Dragon Value System with a potentiality of overcoming the drawbacks of the existing models. We find a comprehensive environmental management model that will be opportunity driven, based on certain financial assets associated with wide spectrum of stakeholders and applicable by company of any size. The findings of the paper will contribute to the academic literature related to environmental management and SDG 7. The proposed model will assist the investors to identify a comprehensive model to invest and could generate new public-private partnership to apply highly beneficial and comprehensive environmental management model.

### Introduction

In the tenth edition of the Emission Gap Report 2019, the United Nations Programme (UNEP) shows that countries around the world have failed to stop the growth of the Green House Gas (GHG) emissions. In addition, the report suggests that even many initiatives are taken at the country level, there is a need of rapid actions to bring transformational change to achieve the targets for 2030 setup by the United Nations (UN). After this serious report by UNEP, these countries start investing heavily on feasible and sustainable models. However, since December 2019, the world has started experiencing a crisis created by the novel Corona Virus (also known as Covid-19). Leading world organisations and researchers mention that one of the reasons of the Covid-19 pandemic could be a lack of awareness about the environment. For example, the Executive Director of the UNEP states that a severe pressure by humankind on the natural world can result in destructive outcomes such as an attack of viruses on human being (Carrington, 2020). Without a change in the human behaviour about their treatment on natural habitat can add to a risk of spilling of viruses from animals to humans (Hassan *et al.*, 2020). Such changes may not be possible without definite rules and regulations developed by the policy makers for companies by considering various models, scenarios and predictions of 'The Limits to Growth Revisited' (Bardi 2011) in an attempt to plan for the future of our society.

The European Corporate Governance Institute (ECGI) is urgently collecting thoughts and public opinion on how quickly and dynamically the society can recover once the crisis is over. Within the existing market regulations, we observe a discussion around banning short sale when the crisis related to Covid-19 has started evolving. But, as the pandemic crashes the world

market, it is now the time to reflect on what went wrong in the last decade to save the society for their people and what the companies could do to help in recovering from the crisis by developing a comprehensive sustainable model.

Being motivated by the above-mentioned arguments, in this paper, we identify few main problems associated with the failure of the companies in achieving the UN target and propose the Dragon Value System that can assist the companies to apply a comprehensive environment management model in the post Covid-19 crisis with an outcome very soon.

In the next section, we discuss the main reasons behind the problems associated with not reaching the UNEP target yet. In Section 3, we explain the Dragon Value system in detail and indicate the way the model can overcome the mentioned problems. In the final section, we conclude the paper by explaining the findings of the application of the model and the contribution of our study.

#### **Reasons for not reaching the targets of environmental management before Covid-19:**

In this section, we identify and discuss the possible reasons that can shed some lights on the failure of reaching the targets of environmental management before the crisis created by corona virus.

- (i) To reach the zero emission by 2050, the energy sector should play an important role. The transition in the system that companies can adopt has been a very slow in the past. Transition to a low-carbon system is associated with a 'collective good' and 'climate'. So, it remains a problem driven rather than an opportunity-driven puzzle by companies (Sovacool and Geels 2016). Thus, our first question is which sustainable business model can allow the companies to bring in a system-wide transformation that can convert the problem driven motive to opportunity driven?
- (ii) The requirement by the Sustainable Development Goal 7 (SDG 7) of the United Nation is to 'ensure access to affordable, reliable, sustainable and modern energy for all'. Many years have passed since the goal was set. Yet, around three billion people in the world still depend on traditional biomass fuels for their day to day life. Such act by people is affecting their economic livelihoods and the global environment (Batchelor et al. 2019). In other words, a lack of awareness by individuals and companies is contributing to the severe environmental problem. For example, burning of non-renewable biomass fuels can generate a giga ton of carbon dioxide (CO<sub>2</sub>) per year, which is almost two percent of global emission of CO<sub>2</sub> (Bailis et al. 2015). Thus, the absence of initiatives to develop a comprehensive business model for the local companies with the help of private-public partnership is one of the major reasons of the above problem. Accordingly, our second question is what type of collaboration between the stakeholders of the companies is required to develop a comprehensive environmental management model?
- (iii) David Rule, the Executive Director of Supervision at the Financial Reporting Council, argues that the Covid-19 pandemic creates difficulties to companies and associated auditors. He adds that the financial report presented by companies and approved by the auditors should be more comprehensive in stating how the companies are addressing the requests made by governments. In addition, it should assist the stakeholders to take well-informed decision by providing insightful information. Many countries have made it mandatory to consider non-financial items in the financial report for the companies. Prior studies show that transparent financial reports, including the non-financial aspects such as environment consciousness of companies can benefit the stakeholders in their decision-making. For example, a study on the USA, Nandy and Lodh (2012) show that the environment conscious companies are getting favourable loan contract term from banks. In the last decade, we find a limited number of studies on the relationship between reporting of companies and the carbon emission target. So, our third question is how does the reporting of certain relevant financial assets help the economy to achieve the UNEP target?
- (iv) The climate policies for achieving the 1.5-degree centigrade temperature target require upscale of supply side of investments in the energy system. McCollum et al. (2018) estimate that to reach this target, companies need to extract resources, generate power, arrange provisions for energy storage or produce pipelines, need to do fuel conversion etc. which needs US\$1.6–3.8 trillion per year on average from 2016-2050 around the world. The target is not for only one company. So, we believe that if the target-achieving activities are distributed among all companies, the country-level environment management model can allocate necessary resources to each unit in the market. However, to identify the capacity of the companies, it is important to consider the size of company (Dang et al., 2018). Larger companies are usually in a better position to invest more on environmental management compared to smaller companies because of the nature of their capital structure. Thus, it is important to determine the size of companies to understand how the decision makers

of the companies can influence the activities of the human being in the society. Consequently, it can assist the country to achieve the greenhouse gas (GHG) emission target. Kumar et al. (1999) document a comprehensive review to identify theories on technological, organizational, regulatory and financial development, which can assist us in determining the impact of firm size. So, following Kumar et al. (1999), we consider a large company is the one associated with utility sector, R&D and capital-intensive industries, industries where wages are higher compared to the peers and industries that are involved in environment management with less need of external financing. Additionally, the goodness of fit of a regression model for the environmental management model, measured by R-squared, also depends on the company size. In our best knowledge, there is no study discussing on the way small and large companies can work together towards the SDG7. Thus, our final question is to examine how a comprehensive environmental management model can consist of large and small companies.

**Proposal for a comprehensive environmental management model in post Covid-19 period:**

**(A) The proposed model: The Dragon Value System (DVS)**

**Outline:**

The DVS is an ecosystem to support the necessary local and planetary emission of greenhouse gas reduction with the aim of maintaining global warming within 1.5 ° C in 2030, as indicated by the UN objectives. It is financed by anyone who wants to contribute publicly to the fight against climate change. Public- and private-sector companies, large industrial entities, small or family companies, government bodies or financial service providers and institutional investors can contribute in the proposed system. Dragons are tools created to transfer funds raised, to anyone in the world who has shown that they have reduced their greenhouse gas emissions. For example, if a small company installs a photovoltaic system and avoids emissions of fossil energy, they can be certified and give rise to a corresponding economic contribution in the form of Dragon Tokens equivalent to US dollars.

**The structure:**

The DVS bases its structure on two main pillars. Firstly, a blockchain technology which will be able to guarantee maximum transparency, speed and fairness of the system. Secondly, the banking system to ensure that the financial transactions are regulated and delivered according to the local standard regulation.

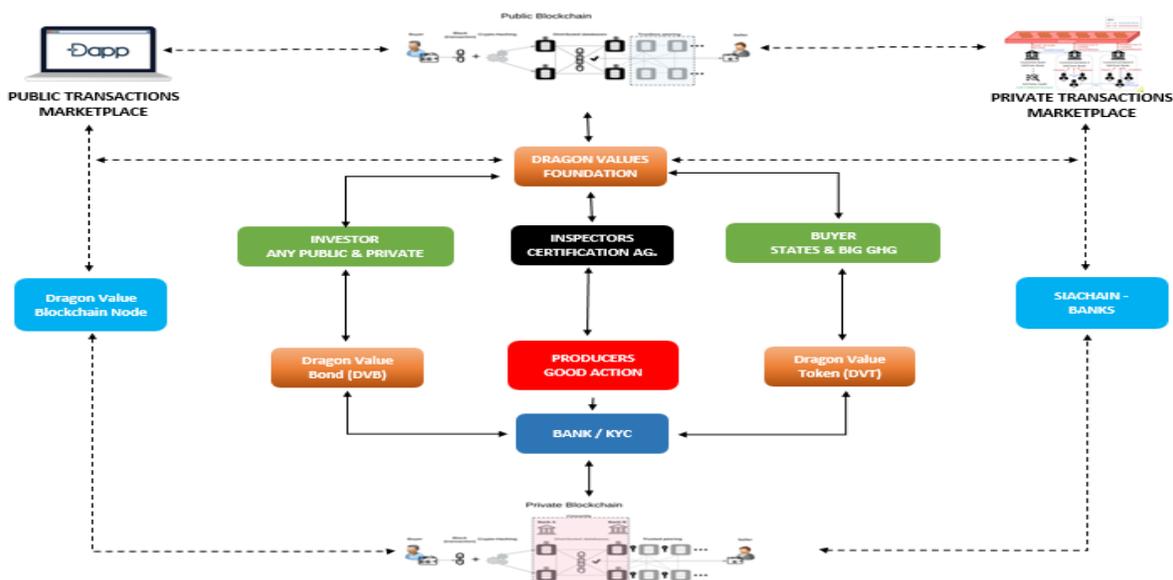
**The governance:**

The Dragon Values project is governed by a Foundation, composed of associations and non-profit organizations, which controls, guarantees and defends the environmental values and purposes.

**Components of DVS:**

In Figure 1, we explain the various components of our proposed system.

**Figure 1: Components of the Dragon Value System**



The components mentioned in the graph is explained as follows:

**DVS:** It is a platform that uses special financial instruments, such as Dragon Tokens and Bonds in order to promote and remunerate specific types of “green” certificates proving the effective reductions of greenhouse gas emissions -also known as Certified Emission Reductions (CERs). The reference unit of measurement is the ton of carbon dioxide equivalent (tCO<sub>2</sub>e) quoted in US dollars according to market demand and supply.

**CERs:** they are certificates issued by specific certification agencies, (called Inspectors) authorized by the Foundation with reference to the international procedures and protocols. The certificates are subjected to numerous checks before (and after) payments to grant maximum security.

**Dragon Value Bond and Token (DVB and DVT):** These are the financial means designed to ensure the maximum security and transparency of CERs purchase and sale transactions carried out through interbank service companies such as SIAchain, in the areas of their competence. They are issued in real time by the Foundation upon actual purchase by Investors and Buyers, avoiding any exchange risk. These parameters form the basis of the remuneration ecosystem supporting the CERs Producers attesting reduced quantity of emissions (tCO<sub>2</sub>e) and quality (type activity: plantation, renewable energy, capturing etc).

**The Foundation:** It is a non-governmental confederation of non-profit non-governmental associations, issuing DVT and DVB, in relation to market demand and the targets set by the United Nations.

**SIAchain:** is the SIA group's interbank service company that with its platforms, Blockchain permissioned and RTGS (Real Time Gross Settlement System), executes purchase and sale transactions of Dragons in an instant economic and safe way, with zero exchange risk into US dollar. The DVT (Token) and DVB (Bond) are in fact issued and transferred to buyers in real time at the same time of purchase. SIAchain collects the commissions due to the Foundation to ensure the due transparent and independent management of the ecosystem. Once the costs are covered, the Foundation will use the excess proceeds to finance and promote new certificates, as well as related services and social activities of public interest.

**Buyers:** They are the public and private entities, states and large greenhouse gas emitters. By purchasing CERs via DVT (Token = US dollars), they promote and finance the production of new certificates, reducing their environmental impact, till reaching the targets assigned to them.

**Investors:** They are mainly private entities such as families, pension funds. Apart from purchasing DVB (Bond = US dollars), they promote and finance the production of new certificates against which they receive periodic dividends always in DVB and always convertible in US dollars. Upon request, they can become shareholders without participating in the business risk, therefore with guaranteed capital. Through a Blockchain code and a simple mobile phone, they can trace their investment and the expected interest rate. In addition, the transaction security and data confidentiality are guaranteed first by the interbank service companies such as SIAchain and then by the local bank through which the transaction is managed.

**Producers:** They are the public and private entities and companies. The small and large businesses are able to certify their effective reduction of tCO<sub>2</sub>e emissions. They sell their certificates through their local bank and get paid in Dragons, credited to an appropriate current account (C/A) in US dollars, convertible anytime into any other currency.

**Banks:** They are local banks operating directly on the territory granting the identity of buyers, investors and producers of C/A. They manage customer accounts in harmony with the Foundation's protocols and local laws. There are not anonymous C/A or portfolios. End users and intermediaries can open C/A in Dragon through their local bank undersigning the KYC (Know Your Customer) identification process.

**Inspectors:** They are the certification agencies and bodies responsible for issuing local certificates (CERs) in accordance with the registration procedures required by the Foundation and suitable for the registration into the public Blockchain.

**DV Blockchain Foundation Node:** It is the node of the Blockchain permission created exclusively by the Foundation in order to validate, with its consent, the data and documents registered by all the other nodes of the network. Once the DV node registers a block of data, all other nodes will have the same copy of information.

It is also important to understand how the proposed model is different from the existing green certificate. The added advantages of using DVS is explained in Appendix 1.

#### **(B) DVS addressing the questions raised in Section 2:**

##### **Convert the problem driven motive to opportunity driven:**

On the Earth Day 2020, the Secretary General Antonio Guterres mentions to the world that

“Greenhouse gases, just like viruses, do not respect national boundaries” (<https://www.un.org/sg/en>)

The positive aspects of the present critical situation due to the Coronavirus and the related slowdown of economy, is that now we have a better chance to review the rhythm and direction, toward Local and Global Circular Economy by rewarding specific “good actions”. The planet yearly reproducing capacity is well-known and from that the required investment planning to stay within the limits is also available to companies and their stakeholders. It is just a matter of financial tolls and algorithms, suitable to granting a sustainable future for the generations to come. The following challenges are big and many and tightly interconnected to each other (a) Climate Change, (b) Pollution, (c) Inequality (d) Pandemic, (e) Conflicts for resources (f) Loss of biodiversity (g) Economy and Politics etc. Mother Gaia is giving us clear signs about which direction we should take and can’t afford to lose time further; we must act now.

The global Covid-19 lockdown is our very last vital chance that the nature is giving us to find the right path. We can, therefore, take advantage of these crises to start a New Green Era for a better world. It is not simple nor easy, but we have no choice. The good news is that the best strategy to adopt is the donkey logic “carrot works better than stick”.

##### **Kind of collaboration among the stakeholders:**

The Oil, Gas and Coal Industry, the so-called Fossil Fuels, together with the Nuclear Industry, are playing an outstanding strategic role within the global energy, to support the economy and policy dominant fields, and they will continue to do so also for the urgent needed *renewable-energy transition*. All major financial lobbies are important partners investing in green projects with profitable returns for their present stakeholders even better than before. The fossil fuels industrial era gives humanity a chance to grow to the actual great level, which unfortunately, at the moment, is becoming more unsustainable every day. Thus, it is up to the fossil-fuel industry to take the lead for the required economic transition by reducing the emission worldwide and develop higher-level collaboration with the stakeholders of their business.

##### **Reporting of certain relevant financial assets:**

In order to stay within 1.2-degree centigrade, the World Bank has foreseen that countries will have to invest an increasing percentage of their GDP, starting immediately until reaching zero emissions within 2050 or expect to have many times the same value of damages from climate-change calamities. Therefore, emission reductions are the most profitable solid asset on which to invest for our future. According to the United Nation and World Bank the numbers are clear- within the year 2030 the reduced emission must be around 150 GtCO<sub>2e</sub>, with an average value of 100 US\$/GtCO<sub>2e</sub> which makes a turnover of around US\$15 trillion. Thus, companies need to report their emission reduction assets and motivate other companies to report on the most essential and as well profitable asset.

##### **Comprehensive environmental management model irrespective of size:**

Zero carbon environment will be beneficial for all. Instead of a group trying to achieve the target, there is a serious need for all in the society to come together to address this serious concern. Thus, industrial sectors, education, R&D, universities, policy makers must work hard and cooperate to follow the same path toward the common interest against the unnatural greediness of human being. As Mahatma Gandhi said “The world has enough for everyone's need, but not enough for everyone's greed.” A comprehensive model will not only able the companies to reach the designed target in a short period but will also be able to minimize their cost of operation if they adopt a feasible model. The implementation cost is high for companies when they try

to act in an isolate manner. For details see Appendix 2 where we include relevant graphs from the world bank report 2019 on State and Trends of Carbon Pricing. In Append 3 we mentioned how the DVS can be a sustainable comprehensive model.

## Conclusion

The main motivation of the study is to identify major limitations to the application of the existing greenhouse gas control models. We argue that even though coronavirus has created additional challenges to the stakeholders of the company but as most business is trying to revise their business plan to recover in the post Covid-19 period, this is the right time to consider carefully the environmental management system in the same model. In this paper, we identify that previously policy makers have failed to insist business to develop a comprehensive management system by considering many stakeholders. The regulatory framework cannot support companies to report sufficiently about the non-financial asset, as a result the climate-change issue remains as problem-driven rather than opportunity-driven. The proposed Dragon Value System possesses the capacity to overcome the problems mentioned before in different country setup. The system can allow to balance the financial and non-financial motives of the company in short run leading to a long-run benefit. The recommendation of the paper can enrich the academic literature related to environmental management and also guide the academics about how to reach the SDG7 targets. The proposed comprehensive model takes care of financial benefit of the investor and by differentiating from the advantages of the existing green certificate, the findings show that how the public and private partnership can allow the country to reach the UNEP targets by time. Thus, the paper provides a guideline to the investors, policy makers and other stakeholders of the company of any size. Similar to other studies in the similar area, our study also suffers from limitations. Consideration of other factors like change in trend in supply chain etc. can enrich the model which is our plan for the next project.

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## Appendix

## 1. Difference between Dragon Value system and existing Green Certificate:

**COMPARISON  
DRAGON VALUES vs. GREEN CERTIFICATES**

Features	Dragon Certificate	Green Certificate
1) Encourage environmental sustainability and the development of renewable energy sources limited to large organizations	✗	✓
2) Support initiatives aimed at reducing greenhouse gas emissions limited to large organizations	✗	✓
3) Central role of the banking system with a "traditional" management opposed to the crypto currencies	✓	✓
4) Support the US economic system (USD) to allow large polluters, who live in the dominant macro economic system, to invest in renewable energy	✓	✗
5) System open to all, large and small emitters, secure, certified, transparent, decentralized and incorruptible, certificate traceability and transaction history through the Public Blockchain network; (NO Green washing)	✓	✗
6) Adding a competitive advantage for companies that generates a virtuous circle that can be spread to stakeholders	✓	✗
7) New energy services market for rewarding small and medium "prosumers" (producer – consumer)	✓	✗

2. : State and Trends of Carbon pricing 2019, World Bank & UNFCCC

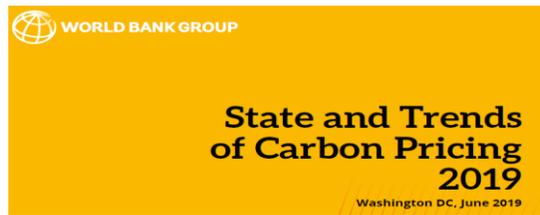
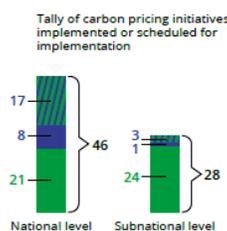
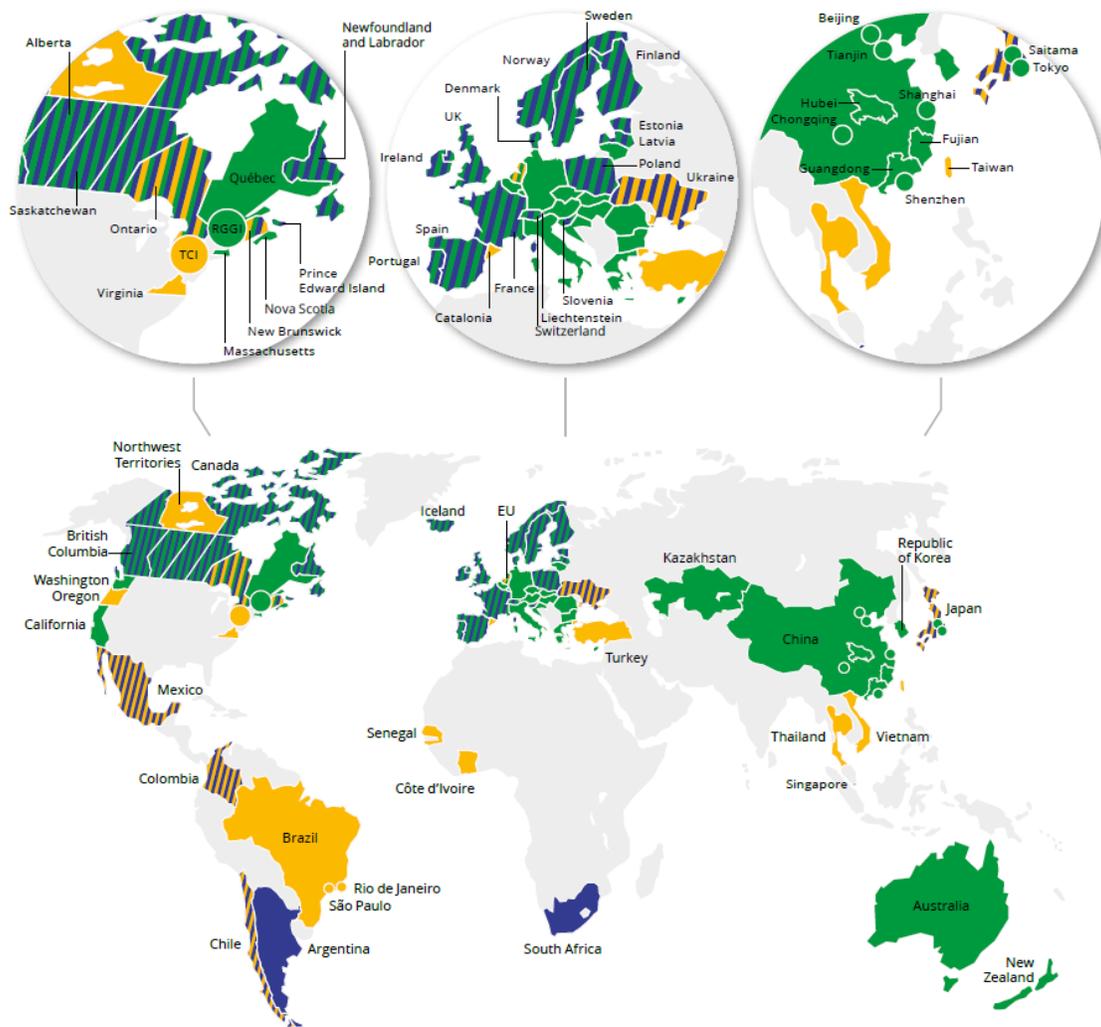


Figure 1 / Summary map of regional, national and subnational carbon pricing initiatives implemented, scheduled for implementation and under consideration (ETS and carbon tax)

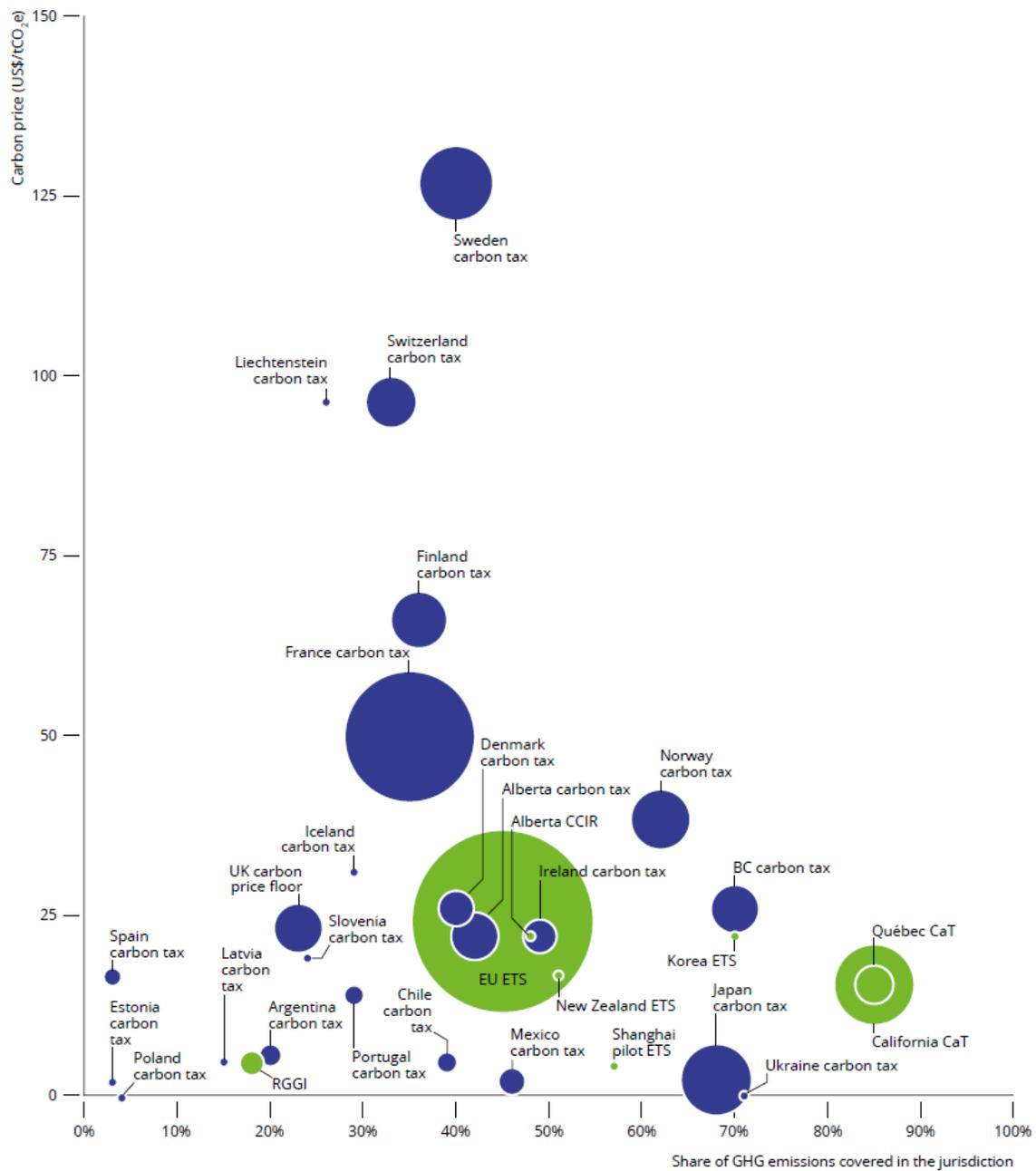


- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS or carbon tax under consideration
- ETS and carbon tax implemented or scheduled
- Carbon tax implemented or scheduled, ETS under consideration
- ETS implemented or scheduled, carbon tax under consideration
- ETS and carbon tax implemented or scheduled, ETS or carbon tax under consideration

The large circles represent cooperation initiatives on carbon pricing between subnational jurisdictions. The small circles represent carbon pricing initiatives in cities.

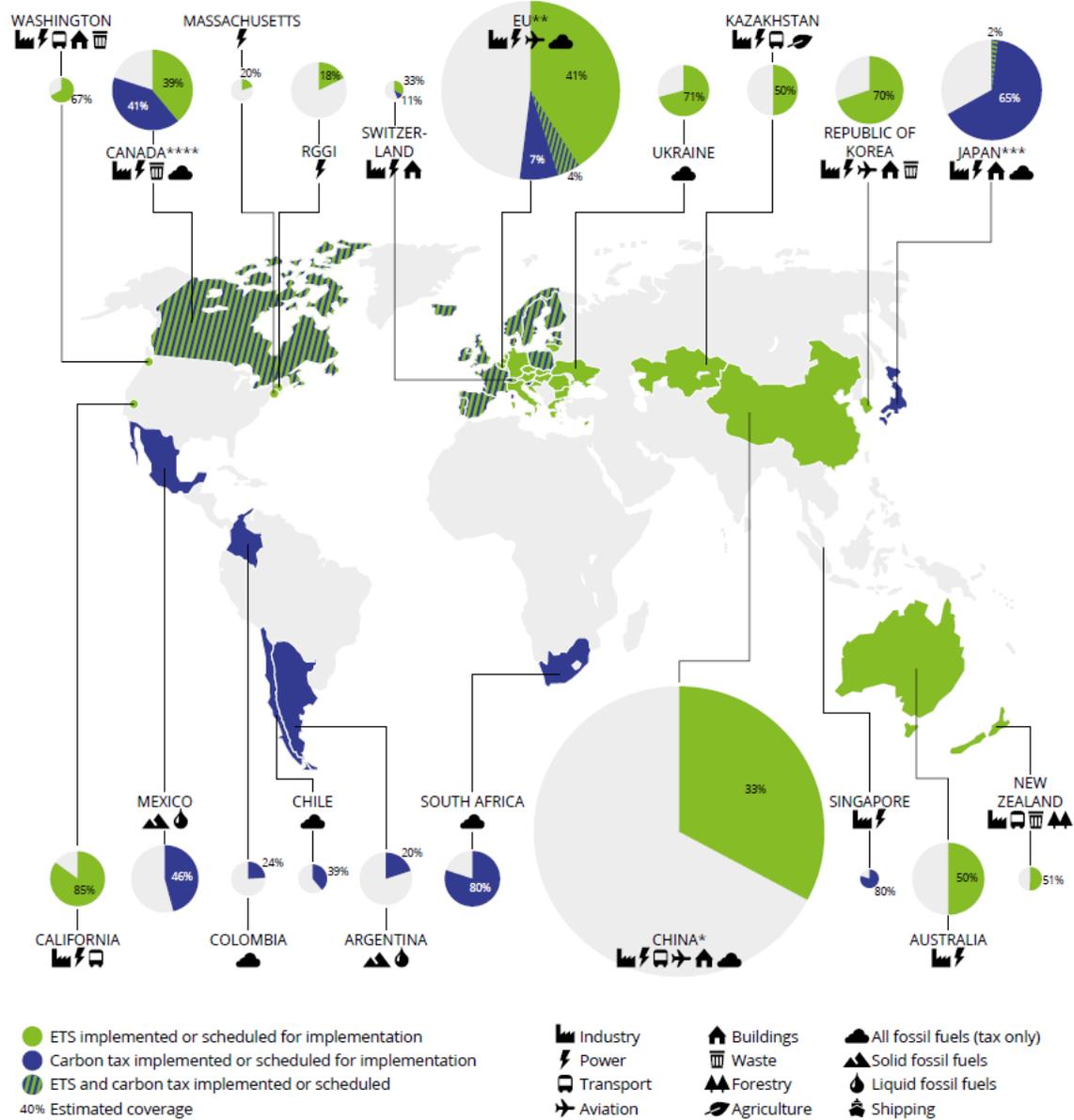
Note: Carbon pricing initiatives are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered "under consideration" if the government has announced its intention to work towards the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS not only refers to cap-and-trade systems, but also baseline-and-credit systems as seen in British Columbia and baseline-and-offset systems as seen in Australia. The authors recognize that other classifications are possible.

**Figure 4 / Carbon price, share of emissions covered and carbon pricing revenues of implemented carbon pricing initiatives**



Note: The size of the circles is proportional to the amount of government revenues except for initiatives with government revenues below US\$100 million in 2018; the circles of these initiatives have an equal size. For illustrative purposes only, the nominal prices on April 1, 2019 and the coverages in 2019 are shown. The carbon tax rate applied in Argentina, Finland, Mexico and Norway varies with the fossil fuel type and use. The carbon tax rate applied in Denmark varies with the GHG type. The graph shows the average carbon tax rate weighted by the amount of emissions covered at the different tax rates in those jurisdictions. The middle point of each circle corresponds to the price and coverage of that initiative.

Figure 5 / Sectoral coverage and GHG emissions covered by carbon pricing initiatives implemented or scheduled for implementation, with sectoral coverage and GHG emissions covered



Note: The size of the circles reflects the volume of GHG emissions in each jurisdiction. Symbols show the sectors and/or fuels covered under the respective carbon pricing initiatives. The largest circle (China) is equivalent to 12.4 GtCO<sub>2</sub>e and the smallest circle (Switzerland) to 0.05 GtCO<sub>2</sub>e. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS does not only refer to cap-and-trade systems, but also baseline-and-credit systems such as British Columbia and baseline-and-offset systems such as in Australia. Carbon pricing has evolved over the years and they do not necessarily follow the two categories in a strict sense. The authors recognize that other classifications are possible.

\* The coverage includes the China national ETS and eight ETS pilots. The coverage represents early unofficial estimates based on the announcement of China's National Development and Reform Commission on the launch of the national ETS of December 2017 and takes into account the GHG emissions that will be covered under the national ETS and are already covered under the ETS pilots. The sector symbol refers to the covered sectors in the national ETS or (one of the) ETS pilots. The national ETS will initially cover the power sector only. The covered sectors vary per ETS pilot.

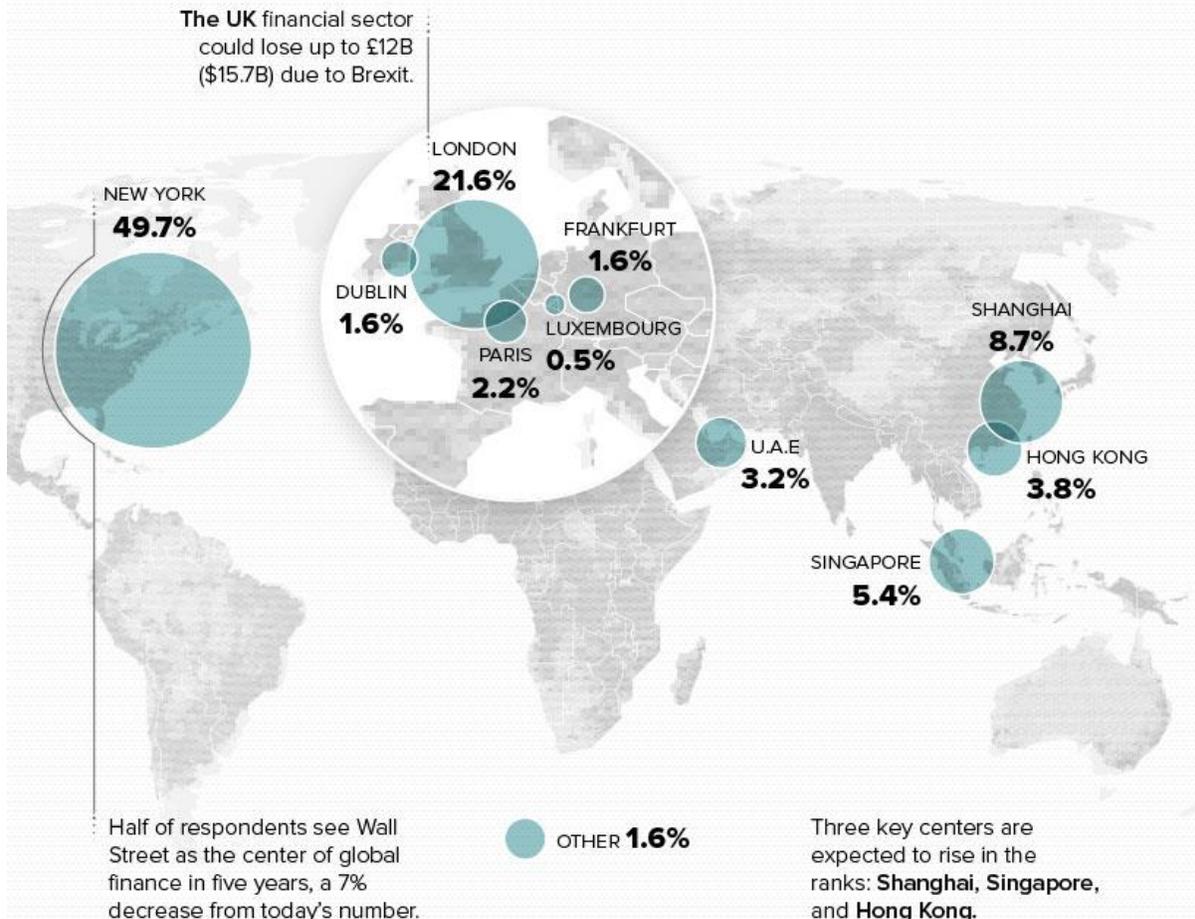
\*\* Also includes Norway, Iceland and Liechtenstein. Carbon tax emissions are the emissions covered under various national carbon taxes; the scope varies per tax.

\*\*\* ETS emissions are the emissions covered under the Tokyo CaT and Saitama ETS.

\*\*\*\* The coverage includes both components of the Canada federal backstop system and the subnational carbon pricing initiatives.

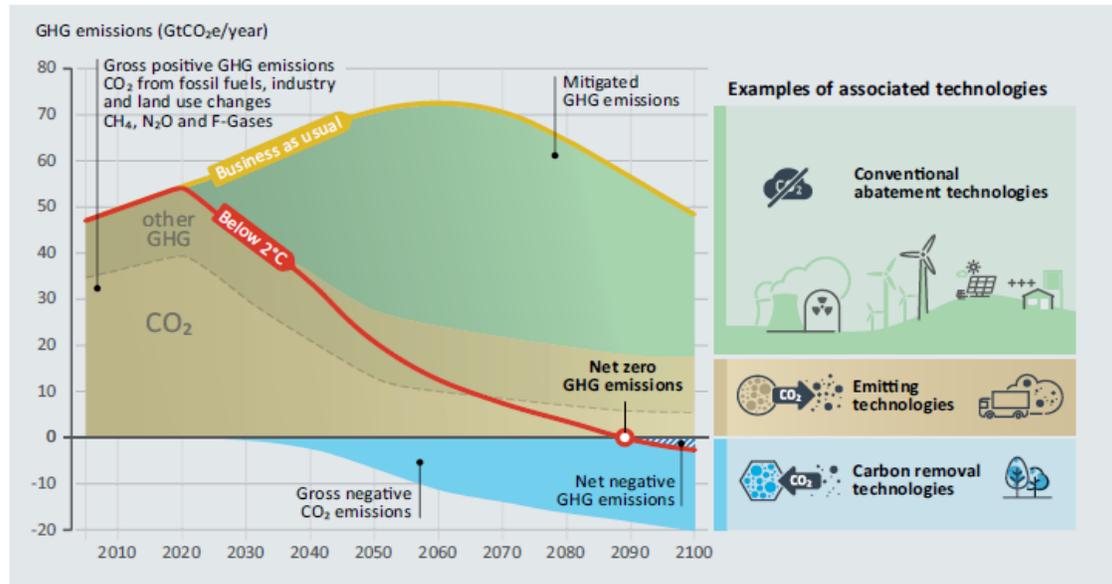
# Q Which city will be the world's top financial center in 5 years?

% of survey respondents



Source: Duff & Phelps, "Global Regulatory Outlook 2020", PWC, New York Fed, "Business Leaders Survey January 2020"

Figure 7.2: The role of carbon dioxide removal in climate change mitigation.



Note: This figure shows emission reductions from conventional mitigation technologies combined with carbon dioxide removal. This exemplary scenario is consistent with an at least 66 percent chance of keeping warming below 2°C relative to pre-industrial levels. Emission reductions are shown against a business-as-usual scenario without any additional climate policies. Global net emissions levels turn to net negative towards the very end of the century, but carbon dioxide removal is already being deployed much earlier. Some residual greenhouse gas emissions remain at the end of the century, as they are too difficult to mitigate in the scenario. Note that the scenario used is different from the scenarios used in Chapter 3, which leads to small variations in emission levels and timing of negative emissions. Source: Jérôme Hilaire (Mercator Research Institute on Global Commons and Climate)

Figure 3.1: Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and 10<sup>th</sup> to 90<sup>th</sup> percentile range).

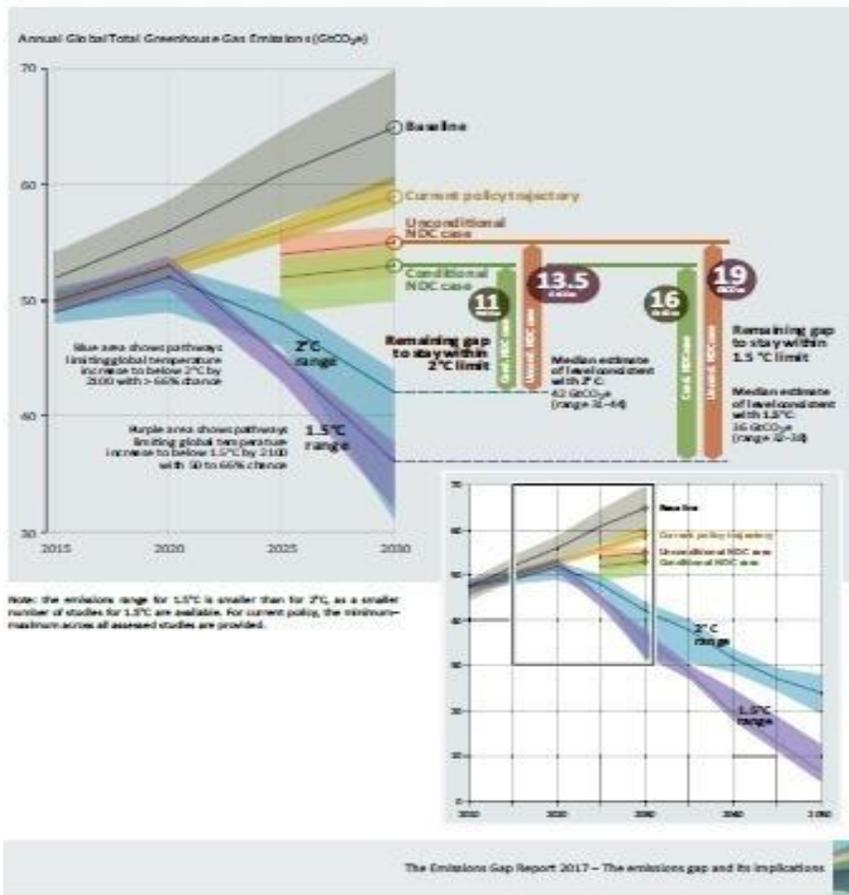


Table 3.1 Emissions targets submitted to the UNFCCC by different countries/regions  
(UNFCCC 2015b)

India	Base year 2005: a) 33 to 35% reduction in carbon intensity by 2030; b)40% cumulative installed electric power capacity from non-fossil fuel based energy sources by 2030
Australia	Base year 2000: 25% reduction by 2020
New Zealand	Base year 2005: 30% reduction by 2030
Canada	Base year 2005: 17% reduction by 2020; 30% by 2030.
China	Base year 2005: 60 to 65% reduction in carbon intensity by 2030
European Free Trade Association	Base year 1990: 30% reduction by 2020; 35-40% by 2025; 50% by 2030
EU-27	Base year 1990: 20% reduction by 2020; 40% by 2030; 80% by 2050
Japan	Base year 1990: 25% reduction by 2020.
Mexico	Base year 2000: 50% by 2050
Russia	Base year 1990: 15-25% by 2020 ; 70-75% by 2030
South Korea	Base year Business As Usual: 37% by 2030
USA	Base year 2005: 17% reduction by 2020; 42% by 2030; and 83% by 2050

Figure 4.1: Total emission reduction basic potentials compared to the current policy scenario in 2030.

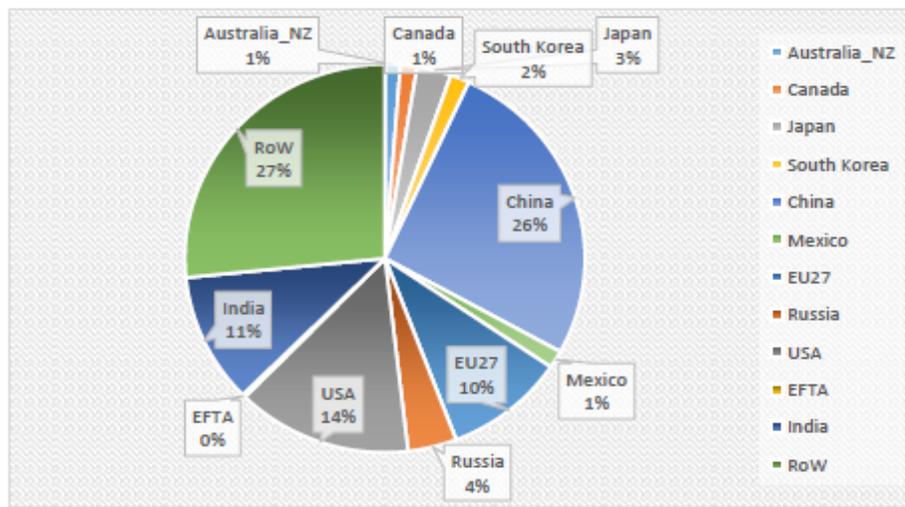
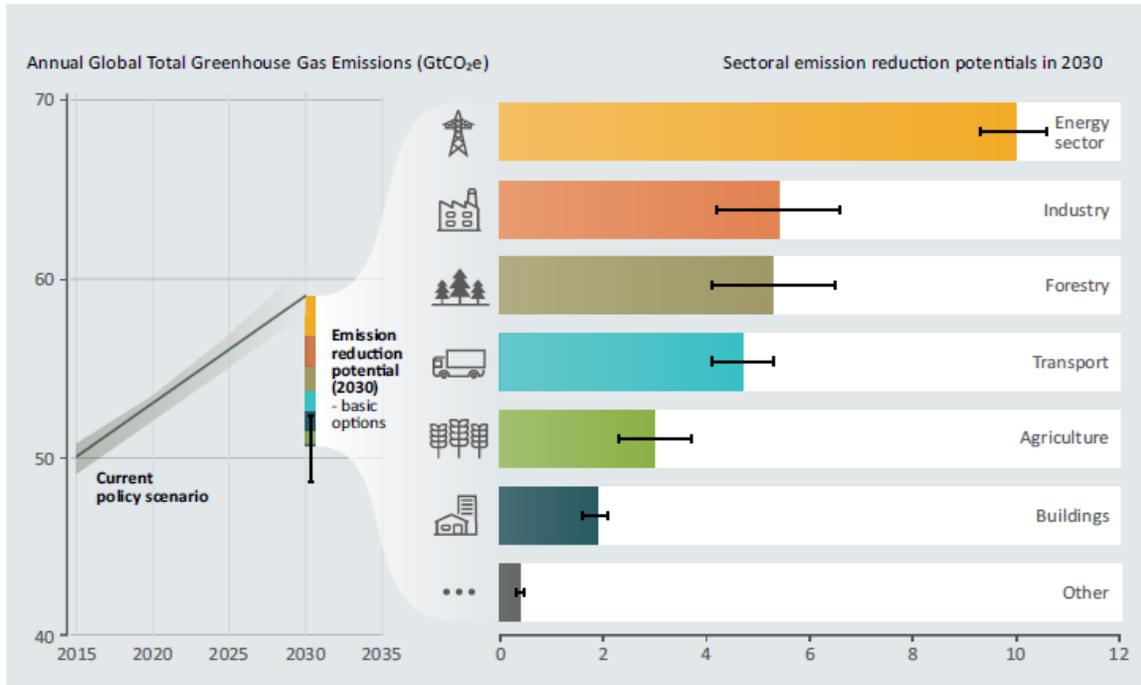
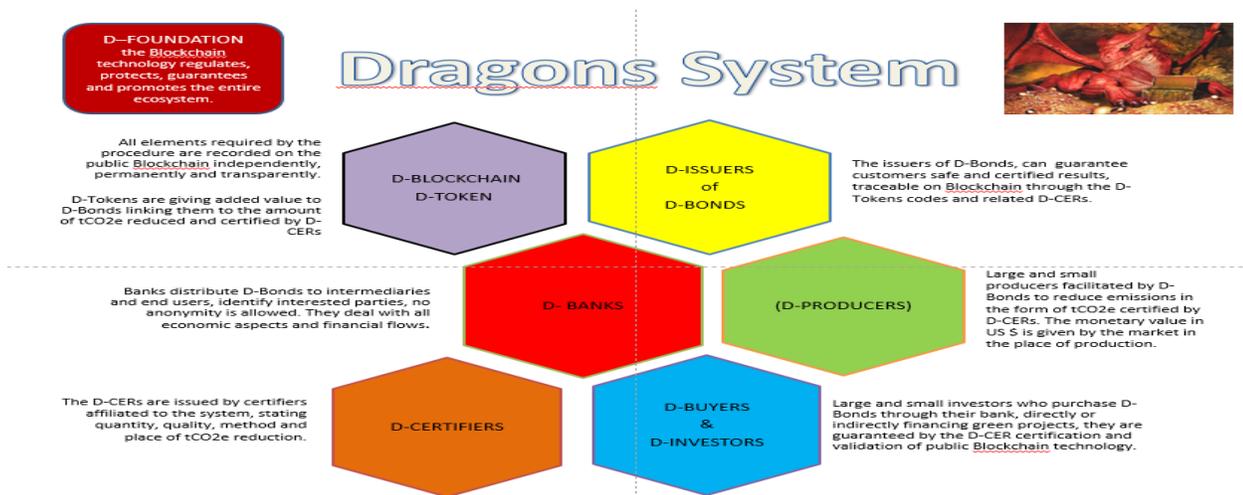


Figure 4.1 Cumulative emissions share of different countries from 2015 to 2050 in SSP2 Reference Scenario

GLOBAL TURNOVER - ASSET US\$ Co2 MINING - CAPTURE - REDUCTION				
REDUCED EMISSIONS	GtCO2e Reduction coef. 1/0.8/yr	LIMIT 450 = - 1,5 C°	Gt/CO2e YEARLY TARGET Gt/CO2e	BILLIONS US\$ (t = 100\$) Media/10 YRS TURN OVER
Year	Gt/CO2e	Gt/CO2e	GtCO2e/year	US\$
2030	9,313225746	30,000	22,000	22.000,000
2029	7,450580597	33,526	20,750	20.750,000
2028	5,960464478	38,221	20,438	20.437,500
2027	4,768371582	40,977	18,797	18.796,875
2026	3,814697266	44,181	17,996	17.996,094
2025	3,051757813	45,745	15,745	15.745,117
2024	2,44140625	47,996	14,181	14.181,396
2023	1,953125	48,797	10,977	10.976,746
2022	1,5625	50,438	8,221	8.220,932
2021	1,25	50,750	3,526	3.526,165
2020	1	52,000	-	-
TOTAL		452,631	152,631	152.630,825

Appendix 3: Comprehensive Sustainable Model-DVS



Source: Authors' calculation