

Carbon Pricing and Trading Systems Worldwide and Their Applicability to the Power Sector in Sri Lanka

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Introduction

A carbon price is a system introduced and quantified the cost applied to carbon pollution, while encouraging the polluters to reduce the amount of greenhouse gases that they emit into the atmosphere. Economists worldwide agreed that introducing a system in a form of carbon price is the single most effective way for countries to pursue reduction of their emissions.

It is obvious that climate change is the greatest global challenge of our time. It threatens to roll back decades of development and put lives, livelihoods, and economic growth at risk. Scientists warn of dangerous impacts on agriculture, water resources, ecosystems, and human health, if countries do not take appropriate action. If the world warms by just 2°C (3.6°F), which may be reached in 20 to 30 years, it predicted to see widespread food shortages, unprecedented heat waves, and more intense storms. Already, studies suggest that about 1.5°C of warming has been reached.

What is Carbon Pricing?

Carbon pricing is an approach to reduce carbon emissions, by adopting mechanisms to pass the cost of emitting of CO₂, on to emitters. Primary goal is to discourage the use of carbon dioxide emitting fossil fuels, to protect the environment, address the causes of climate change, and meet national and international climate agreements.

A price on carbon helps shift the burden for the damage back to those who are responsible for it, and who can reduce it. Instead of dictating who should reduce emissions where and how, a carbon price gives an economic signal and polluters decide for themselves whether to discontinue their polluting activity, reduce emissions, or continue polluting and

pay for it. In this way, the overall environmental goal is achieved in the most flexible and least-cost way to society. The carbon price also stimulates clean technology and market innovation, fuelling new, low-carbon drivers of economic growth.

Approaches established for carbon pricing [1]

Emissions Trading Systems (ETS)

ETS, sometimes referred to as a cap-and-trade system – caps the total level of greenhouse gas emissions and allows those industries with low emissions to sell their extra allowances to larger emitters. By creating supply and demand for emissions allowances, an ETS establishes a market price for greenhouse gas emissions. The cap helps ensure that the required emission reductions will take place to keep the emitters (in aggregate) within their pre-allocated carbon budget.

Carbon Taxes

A carbon tax directly sets a price on carbon by defining a tax rate on greenhouse gas emissions or more commonly, on the carbon content of fossil fuels. It is different from an ETS in that the emission reduction outcome of a carbon tax is not pre-defined, but the carbon price is.

The choice of selecting suitable type of carbon pricing methodology will be depend on many factors such as, country status, economy, energy sector, industries, transportation, buildings, aviation industry, life pattern, climate/geological location, etc.

To understand the global scenario, top 20 of world largest CO₂ emitting countries have been tabulated in terms of per capita emission and respective share portion in world context. Further, Sri Lanka stand at the rank 89 as per 2016 world bank data (latest available up to now).

Table 1: World's Largest Countries in Terms of CO₂ Emissions: Global Share in 2016 [2]

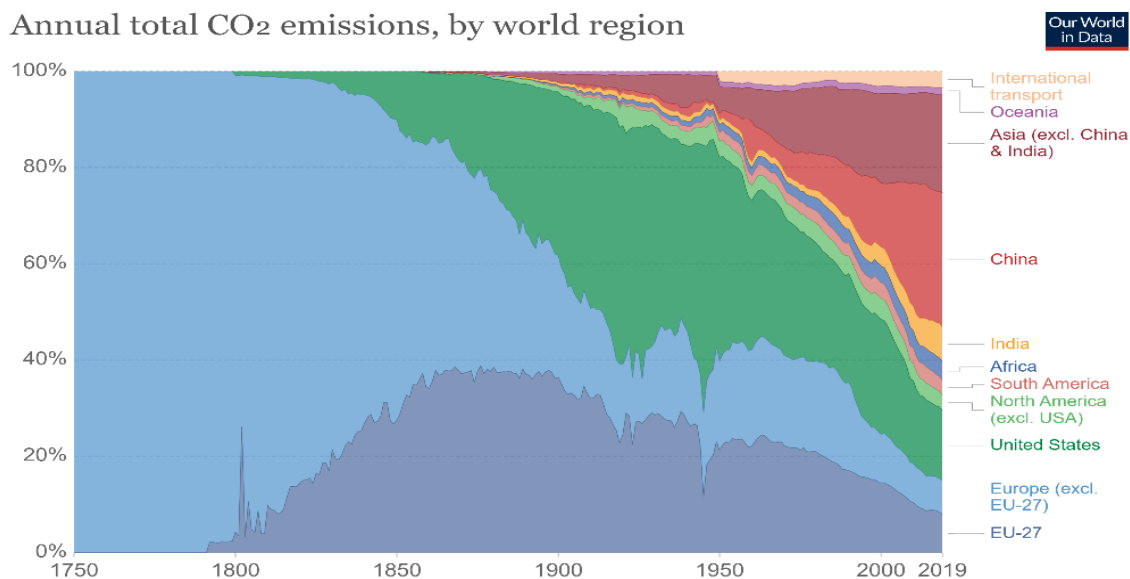
World Rank	Country	CO ₂ Emissions (ton, 2016)	Share of World	Population (2016)	CO ₂ Emission (tCO ₂ per person)
1	China	10,432,751,400	29.18%	1,414,049,351	7.38
2	United States	5,011,686,600	14.02%	323,015,995	15.52
3	India	2,533,638,100	7.09%	1,324,517,249	1.91
4	Russia	1,661,899,300	4.65%	145,275,383	11.44
5	Japan	1,239,592,060	3.47%	127,763,265	9.70
6	Germany	775,752,190	2.17%	82,193,768	9.44
7	Canada	675,918,610	1.89%	36,382,944	18.58
8	Iran	642,560,030	1.80%	79,563,989	8.08
9	South Korea	604,043,830	1.69%	50,983,457	11.85
10	Indonesia	530,035,650	1.48%	261,556,381	2.03
11	Saudi Arabia	517,079,407	1.45%	32,443,447	15.94
12	Brazil	462,994,920	1.29%	206,163,053	2.25
13	Mexico	441,412,750	1.23%	123,333,376	3.58
14	Australia	414,988,700	1.16%	24,262,712	17.10
15	South Africa	390,557,850	1.09%	56,207,646	6.95
16	Turkey	368,122,740	1.03%	79,827,871	4.61
17	United Kingdom	367,860,350	1.03%	66,297,944	5.55
18	Italy	358,139,550	1.00%	60,663,060	5.90
19	France	331,533,320	0.93%	64,667,596	5.13
17	United Kingdom	367,860,350	1.03%	66,297,944	5.55
20	Poland	296,659,670	0.83%	37,989,220	7.81
89	Sri Lanka	18,454,691	0.05%	21,021,171	0.88

Further, annual total CO₂ emissions, by world region compared since 1750, is shown in Figure 1. Countries in Europe and United States were the major emitters up to late

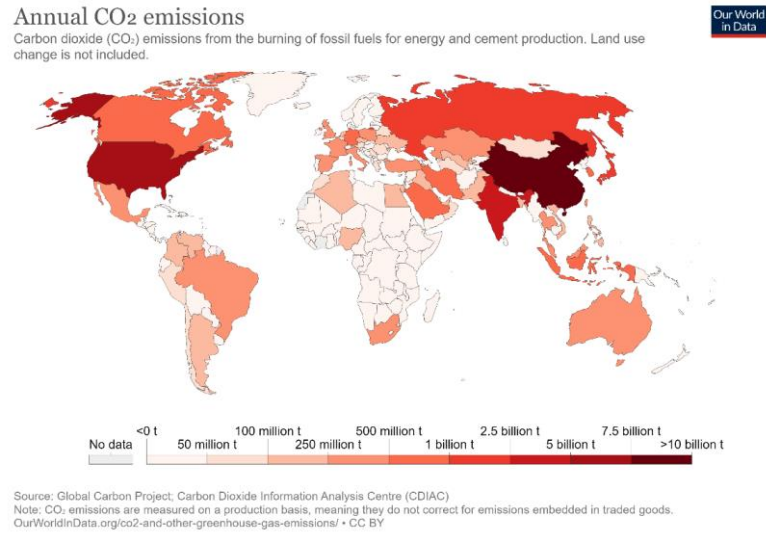
nineties. Presently, Asian countries emit a considerable share of global emissions along with EU and USA.

Figure 1 – Global Carbon Dioxide (CO₂) Emission Contribution in Regional Context Since 1750 [3]

Annual total CO₂ emissions, by world region



Source: Our World in Data based on the Global Carbon Project
 Note: This measures CO₂ emissions from fossil fuels and cement production only – land use change is not included. 'Statistical differences' (included in the GCP dataset) are not included here.

Figure 2: Global Carbon Dioxide (CO₂) Emission, by Countries [3]

Sri Lanka contributes approximately 0.06% to the Global CO₂ emissions (2019 status). Approximately 35% ~ 40% of these emissions are from the electricity sector. Presently, 70 jurisdictions (46 national and 24 sub-national) have either implemented, or are scheduled to

implement carbon pricing initiatives. These carbon pricing initiatives cover around 20 percent of global GHGs, up from 15 percent in 2017. There are 61 implemented or scheduled carbon pricing initiatives around the world, of which 31 are emission trading systems and 30 are carbon tax programs.

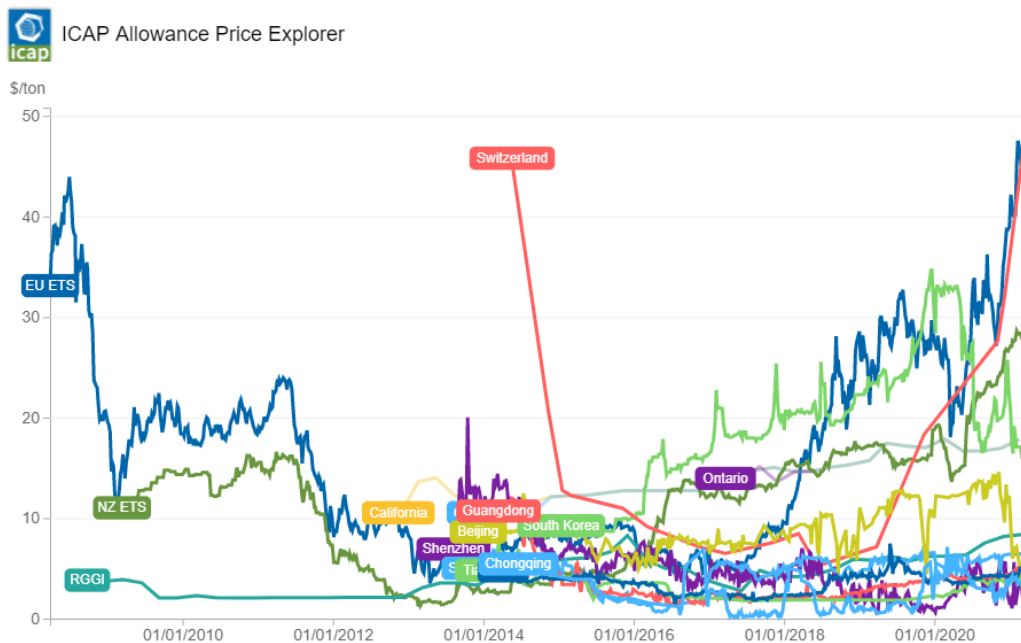
Table 2: Carbon Pricing in 2020 by World Bank

#	Emissions Trading Systems		#	Carbon Taxes	
	Country	US \$/tCO ₂ e		Country	US \$/tCO ₂ e
1	European Union	25	8	Canada	21
2	Latvia	10	9	South African	7
3	Sweden	119	10	Norway	49
4	Switzerland	19	11	Argentina	1
5	Korea	33	12	Japan	3
6	China	1 ~ 5	13	Ukraine	<1
7	Canada	21	14	UK	22

Carbon Pricing Initiatives

According to the published report by World Bank's "State and Trends of Carbon Pricing 2020", carbon prices range from less than 1 USD/tCO₂e to 119 USD/tCO₂e, with almost half of the carbon pricing initiatives covered emissions priced at less than US\$ 10/t CO₂e [4]. Further, global average carbon price is only 2 USD/tCO₂e as per the International Monetary Fund (IMF) calculations [5].

However, despite promising progress, 80 percent of emissions are still not covered by carbon pricing. Half of current emissions covered by carbon pricing initiatives are priced at less than 10 USD/ton CO₂e. Further, Figure 3 shows price variations 2010-2020 in different carbon pricing programs around the world, published by International Carbon Action Partnership (ICAP).

Figure 3: Fluctuations of Carbon Pricing in Recent Years Published by ICAP [6]

Applicability to Sri Lanka and the Power Sector

Power generation gives rise to a range of costs due to local air pollution as well as global climate change impacts from GHG emissions. Such external social and environmental costs, which are known as externalities, are unaccounted costs arising from impacts on climate, human health, crops, structures, and biodiversity. These costs are associated with all types of electricity generating technologies such as thermal, hydro, wind, solar, and biomass. Hence, externality costs including carbon pricing will be applicable to all types of power generation and need to be considered if the true cost of generation is to be estimated.

There are many factors to be considered to determine the price of carbon emissions, which may differ from country to country, depend on lifestyle, per capita consumption, economy, industrial sector, energy sector, transportation, etc. Existing emission trading systems around the world, sectors such as power, industry, buildings, transportation, aviation, waste, and forestry were identified as sectors to be credited in the carbon trading system. Carbon trading system implemented in New Zealand has attributed all the above sectors, while system in Tokyo (Japan) considered industry & building sectors, and china considered the power sector only.

Commitment by Sri Lanka

As a member of United Nations Framework Convention on Climate Change (UNFCCC), Sri Lanka has submitted its Nationally Determined Contributions (NDCs) to the 21st session of the Conference of Parties to the UNFCCC [7]. Further, NDCs submitted to the UNFCCC will support achieving the set objectives of the Paris Agreement.

In response to challenges posed by climate change, Sri Lanka has taken several positive steps by introducing national policies, strategies and actions to address climate change. In the power sector, the Long-Term Electricity Generation Expansion Plan prepared by Ceylon Electricity Board [8] has been further developed and enhanced to calculate emissions and to analyse scenarios with emission constraints. The following factors require assessment to define carbon prices in Sri Lanka;

- Sri Lanka contributes only about 0.06% to global CO₂ emissions. Out of Sri Lanka's CO₂ emissions, only 35~40% is from electricity sector.
- When assessing environment impacts, global & local criteria cannot be mixed and evaluated. What portion of total emissions could be attributed to the local impacts alone has to be separated out for local

impact analysis. Hence, related studies and analyses needs to be addressed before analysis local environment impacts and evaluation.

- If this is to be quantitatively analysed, every activity resulting out of human existence should be assessed on the same terms, which would be a highly complex exercise. Instead, a qualitative assessment would be more meaningful.
- Sri Lanka has even increased our target to achieve 25% emission reduction by 2030 as NDC commitments (through Paris Agreement COP 21). Accordingly, CEB has incorporated the emission reduction as a commitment to be implemented in the current generation planning process. To ensure the commitment and determination of achieving the targets, CEB has planned to introduce large amounts of renewable energy to the system in future, in response to the expected demand growth, so that the CO₂ emission levels are kept well below.
- The Carbon Partnership Facility (CPF) initiated in Sri Lanka in collaboration with the World Bank a few years back was aiming a Carbon Trading mechanism. The price range for trading CO₂ was around 4-10 USD/tCO₂e, which is significantly lower than the figure proposed in the CBA in EIAR. However, this program did not materialize.
- In the global status of per capita CO₂ emission, Sri Lanka is in the 89th position with 0.88 tCO₂/person, while countries in EU emit 10 times higher. Whether it is justifiable to consider carbon price in EU, to be applicable to Sri Lanka, is a question.
- Determining carbon pricing for a particular country or a state, will consider major CO₂ emitting sectors such as power, industry, buildings, aviation, waste and forestry. In comparison with implemented carbon pricing mechanisms worldwide, applicable sectors were different from one another. For instance, Mexican pricing covers power and industry sectors, while Germany covers transport and building sectors. Hence, the pricing will be different to each other. In these circumstances, how is it applicable to consider carbon pricing of another country in Sri Lankan context?

- According to the World Bank statistics 2020, average carbon pricing implemented or scheduled globally, less than **2 USD/tCO₂e**.

Conclusion

Considering the above factors, it is unrealistic to adopt foreign carbon pricing policies and price levels in Sri Lanka without further examination. In consideration of available guidelines, the strategies formulated, and targets given by Ministry of Mahaweli Development and Environment in 2016 for NDCs could be the best available credible study done. It has clearly stated the actions taken and to be taken in future. If the projects are already included in those plans, there is a question that externalities need to be evaluated in determining the implementation stage i.e. extended cost benefit analysis (ECBA), in project implementation.

If is essential and justifiable to use carbon pricing, needs to be done with collaboration of experts under the supervision of government authorities. Carbon pricing cannot be established through ad-hoc studies done by different interest groups.

References

- [1] Source: <https://www.worldbank.org/en/programs/pricing-carbon>
- [2] Source: <https://www.worldometers.info/co2-emissions/>
- [3] Source: <https://ourworldindata.org/co2-emissions>
- [4] State and Trends of Carbon Pricing 2020, by World Bank Group
- [5] Putting a Price on Pollution, Finance & Development 56(4), December, 2019 by International Monetary Fund (IMF).
- [6] Source: <https://icapcarbonaction.com/en/ets-prices>
- [7] Nationally Determined Contributions (NDCs) by Ministry of Mahaweli Development and Environment 2016.
- [8] Long Term Electricity Generation Expansion Plan prepared by Ceylon Electricity Board, 2018