

Putting a Price on Carbon: Hard Targets to Keep Singapore Going

Putting a price on carbon is so crucial to the fight against climate change that it has been dubbed by some as a “silver bullet” in the global push to decarbonisation.¹ Announced in 2017, Singapore’s carbon tax then was the first carbon pricing policy (CPP) in Southeast Asia, hailed as progressive insofar as the region is concerned.² Designed to apply to target large emitters of greenhouse gas (GHG) rather than individual users, it serves as a price signal for industries and the nation.

Commentators, however, have suggested that the initial price of S\$5 per tonne of GHG emissions (to be maintained from 2019 to 2023) is still too low to meet global emissions targets. A parliamentary debate on carbon taxes in January 2022 also brought into question whether proposed increases to S\$10-15 per tonne were too conservative given that the average tax rate is at US\$65 per tonne for major economies around the world.³ Some businesses and parliamentarians have also cautioned that this may impact Singapore’s competitiveness. What is the socially and economically optimal carbon price, given Singapore’s constraints and capabilities? This case study considers the issue of carbon taxes from the perspectives of various stakeholders—businesses, environmental groups, policymakers, and consumers—to identify points of agreement and trade-offs for the way forward.

Background

Singapore’s Carbon Pricing Act (CPA) was announced in 2017, the first within the Southeast Asia region. Then Finance Minister, Heng Swee Kiat, proposed the Act during Singapore’s annual budget that year in parliament as the “most economically efficient and fair way” to reduce GHG emissions among many of Singapore’s existing climate policies.⁴ Initially pitched at S\$10-15 per tonne of GHG emissions, the carbon tax was implemented in 2019 at a lowered price of S\$5 per tonne, for all industrial facilities that emit GHG emissions equal to or exceeding 25,000 tonnes of carbon dioxide equivalent emitted (tCO₂e) annually.⁵ The price of S\$5 per tonne from 2019 to 2023 was set by the government after a series of public and industry consultations and will be further reviewed in 2022. Months ahead of that review in October 2021, Finance Minister Lawrence Wong

¹ Rabe, Barry G. *Can We Price Carbon? American and Comparative Environmental Policy*. Cambridge, MA: MIT Press, 2018.

² Angel Peiró-Signes and María-del-Val Segarra-Oña, “Trends in ESG practices: Differences and similarities across major developed markets”, in *Sustainability appraisal: Quantitative methods and mathematical techniques for environmental performance evaluation* (Springer, 2013).

³ “State and Trends of Carbon Pricing 2020”, *World Bank*, May 27, 2020, <https://openknowledge.worldbank.org/handle/10986/33809>.

⁴ Lydia. Lam, “Singapore Budget 2017: Singapore to implement carbon tax from 2019; diesel taxes restructured”, *The Straits Times*, February 20, 2017, <https://www.straitstimes.com/singapore/environment/singapore-budget-2017-singapore-to-implement-carbon-tax-from-2019-2-vehicle>.

⁵ National Environment Agency, “Climate Change”, 2021, <https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/carbon-tax>.

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remarked that existing carbon prices are “too low”, adding that the government is prepared to make “bold moves” in tackling climate change and future-proofing Singapore’s way of life.⁶

Singapore’s carbon tax is implemented as part of Singapore’s regulatory arsenal to meet its obligations in the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). The carbon tax is one of two main carbon pricing instruments – the other being a GHG emissions trading system (ETS). With a tax, the government sets the tax rate and specifies the sources subject to the tax. The emission reduction achieved depends upon the response of the affected sources to the imposition of the tax. With an ETS the government sets a limit on GHG emissions by specified sources and distributes allowances approximately equal to the limit.⁷ A nascent policy among Singapore’s climate change initiatives, the carbon tax remains an evolving policy for the island-state in balancing among its myriad interests and stakeholders.

Global actors

The first carbon tax was implemented in 1990, with CPPs increasing in number and price over the years, to 64 initiatives in 2020.⁸ As Figure 1 shows, Finland, Poland, Sweden, Norway, Denmark, and the Netherlands first introduced carbon taxes in the early 1990s. Following adoptions in Slovenia and Estonia, adoptions slowed down from 2000 to 2008 during which only Latvia implemented the policy. However, since 2008, the adoption of a carbon tax gradually increased: from 2008 to 2019, 17 countries adopted a carbon tax, constituting a total of 25 countries.

As Figure 2 demonstrates, the introduction of an ETS is more recent – first implemented in 2002 by the United Kingdom. The policy saw a turning point in 2005 as the first major carbon market was launched – the European Union ETS.

Table 1. The adoption of national carbon taxes.

	Carbon Tax	US\$/ton CO2 emission
Finland	1990	77
Poland	1990	<1
Sweden	1991	139
Norway	1991	64
Denmark	1992	29
The Netherlands	1992	17
Slovenia	1996	21
Estonia	2000	2
Latvia	2004	6
Switzerland	2008	101
Liechtenstein	2008	101
Iceland	2010	36
Ireland	2010	25
Ukraine	2011	<1
Japan	2012	3
Australia	2012-2014	23
The United Kingdom	2013	24
France	2014	55
Mexico	2014	3
Spain	2014	25
Portugal	2015	8
Chile	2017	5
Colombia	2017	6
Argentina	2019	N/A
South Africa	2019	N/A
Singapore	2019	N/A

Sources: the World Bank's *State and Trends of Carbon Pricing 2018* (World Bank 2018). See Tews et al. (2002) for information on the Netherlands' carbon tax.

Figure 1: The adoption of national carbon taxes; from Thisted & Thisted (806) Table 1

Table 2. The adoption of national Emission Trading Schemes (ETS).

	ETS
Britain	2002
EU (28 + Iceland, Lichtenstein, and Norway)	2005
Switzerland	2008
New Zealand	2008
Kazakhstan	2013
Australia	2015
Korea, Republic of	2015

Source: the World Bank's *State and Trends of Carbon Pricing 2018* (World Bank 2018).

Figure 2: The adoption of national Emission Trading Schemes (ETS); from Thisted & Thisted (806) Table 2

⁶ Jun Sen. Ng, "Revised carbon pricing to be announced in next Budget, as current level is 'too low': Lawrence Wong", *Today*, October 15, 2021, <https://www.todayonline.com/singapore/revised-carbon-pricing-be-announced-next-budget-current-level-too-low-lawrence-wong>.

⁷ Haites, Erik. "Carbon taxes and greenhouse gas emissions trading systems: what have we learned?." *Climate Policy* 18, no. 8 (2018): 955-966.

⁸ Ibid.

Besides this, the spread of ETS follows a similar pattern to that of carbon taxes since countries outside Europe first started implementing ETS in 2008 and onwards. In all, 36 countries have an ETS. Figure 3 depicts the diffusion of the two policies internationally from the 1990s to the present.⁹

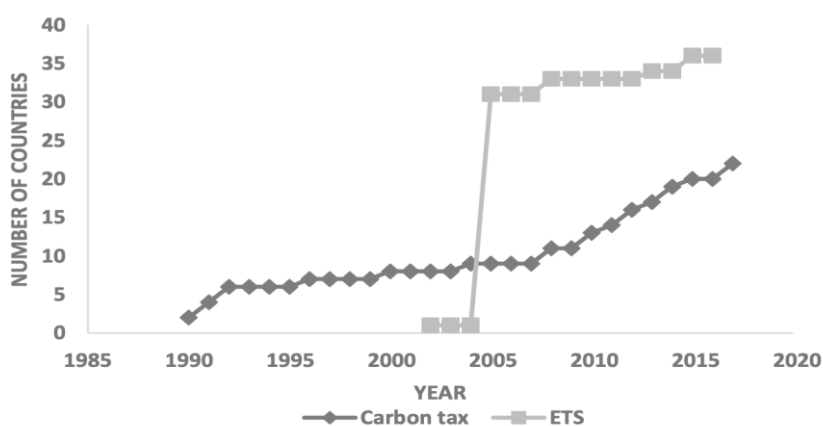


Figure 3: Number of countries that adopt carbon tax and Emission Trading Schemes (ETS) between 1985-2020; from Thisted and Thisted (807) Figure 1

Besides nation-states, international organisations, NGOs, and social movements have also worked as “norm entrepreneurs” in the push for policy action in global decarbonisation efforts. These global actors facilitate international agreements such as the Kyoto Protocol in 1997 and the Paris Agreement in 2015, in turn providing an impetus for states to reach specific climate targets.¹⁰ Under the Paris Agreement, Singapore pledged to peak its emissions at 65 million tonnes of CO₂-equivalent around 2030, and to halve emissions from its peak to 33 million tonnes by 2050.¹¹

General public

Domestically, discussions around upholding Singapore’s commitments to the Paris Climate Agreement revolved around a proposed carbon tax of S\$10 - S\$20 per tonne of GHG in early 2017.¹² Consultations with industry leaders had also begun in February, with National Climate Change Secretariat’s (NCCS) public consultation exercise occurring later in the year from March to May 2017.¹³ A second round of public consultations was then carried out from October to December 2017 to receive feedback on a draft carbon pricing bill, including provisions for its price (ballpark figures remained around S\$10 - S\$20), mechanism (e.g.,

⁹Thisted, Ebbe V., and Rune V. Thisted. "The diffusion of carbon taxes and emission trading schemes: the emerging norm of carbon pricing." *Environmental Politics* 29, no. 5 (2020): 804-824.

¹⁰ Ibid.

¹¹ "Speech on Private Member’s Motion To Accelerate And Deepen Efforts Against Climate Change", *Ministry of Sustainability and Environment*, February 1, 2021, <https://www.mse.gov.sg/resource-room/category/2021-02-01-private-members-motion-to-accelerate-and-deepen-efforts-against-climate-change/>.

¹² Andrea. Soh, "Big emitters face carbon tax from 2019", *Business Times*, February 21, 2017, <https://www.businesstimes.com.sg/government-economy/singapore-budget-2017/big-emitters-face-carbon-tax-from-2019>.

¹³ "Climate Change Strategy and Carbon Pricing Consultation Paper", *National Climate Change Secretariat*, March 20, 2017, <https://www.reach.gov.sg/participate/public-consultation/national-climate-change-secretariat/nccs/climate-change-strategy-and-carbon-pricing>.

the possibility of linking Singapore's carbon tax system to other international ETS), coverage (i.e., which facilities would be taxed), among other things.¹⁴

After concluding consultations with experts, businesses and the public, the final carbon tax scheme was announced in Budget 2018 with a tax rate of S\$5 per tonne - lower than the initially announced range. This rate would be maintained from 2019 to 2023, with plans to increase it by 2030.¹⁵ Since the implementation of the carbon tax, various environmental movements have also gained traction – Singapore's First Climate Rally was held in 2019 and PAP's youth wing, Young PAP, published a paper on the issue of climate change in March 2020. Two parliamentary motions on climate change and proposals on further tweaking the carbon tax have also since been filed by Members of the Government Parliamentary Committee (GPC) for Sustainability and the Environment in January 2021¹⁶ and 2022 respectively.¹⁷

Challenges

Whilst most do agree that a carbon tax is necessary to enforce an internalisation of cost by consumers and businesses, various challenges remain on its specificities. Chief amongst these is the question of the optimal price level which would help Singapore achieve its globally committed targets, reduce the domino effect on households, and ease the transition for firms and the Singapore economy. This section further describes these problems in detail, with respect to the various actors involved.

Global interests

Singapore's implementation of a carbon tax aligns with goals laid out in international agreements and global efforts towards decarbonisation. Singapore's involvement in global climate change efforts can be observed through its ratification of the United Nations Framework Convention on Climate Change (UNFCCC) in 1997, the Kyoto Protocol in 2006, and the Paris Agreement in 2015. Most recently, at COP26, Singapore, alongside Norway, pushed for a consensus to implement Article 6 of the Paris Agreement, which pertains to the regulation of carbon market system globally.¹⁸

The lack of consensus among the international community over Article 6 of the Paris Agreement has the potential to derail global decarbonisation efforts. At present, only about a quarter of countries have or had a

¹⁴ "Public Consultation Paper for Draft Carbon Pricing Bill", *Ministry of the Environment and Water Resources*, February 18, 2018, <https://www.reach.gov.sg/participate/public-consultation/ministry-of-the-environment-and-water-resources/energy-and-climate-division/public-consultation-paper-for-draft-carbon-pricing-bill>.

¹⁵ Audrey. Tan and Toh Wen Li, "Singapore Budget 2018: Carbon tax of \$5 per tonne of greenhouse gas emissions to be levied", *The Straits Times*, February 19, 2018, <https://www.straitstimes.com/singapore/singapore-budget-2018-carbon-tax-of-5-per-tonne-of-greenhouse-gas-emissions-to-be-levied>.

¹⁶ "PAP MPs file first parliamentary motion on climate change and its impact on Singapore", *Channel News Asia*, January 29, 2021, <https://www.channelnewsasia.com/singapore/pap-mps-file-first-parliamentary-motion-on-climate-change-1882951>.

¹⁷ See Kit. Tang, "PAP MPs file second parliamentary motion on climate change; proposals include tiered carbon tax", *Channel News Asia*, January 7, 2022, <https://www.channelnewsasia.com/singapore/climate-change-parliamentary-motion-carbon-tax-pap-mps-2421076>.

¹⁸ "Singapore: COP26 and Creating a Center for Carbon Trading", *Akin Gump*, November 10, 2021, <https://www.akingump.com/en/experience/practices/climate-change/speaking-sustainability/singapore-cop26-and-creating-a-center-for-carbon-trading.html>.

CPP, covering only around one-fifth of global GHG.¹⁹ Among jurisdictions with a CPP, carbon prices range from as high as US\$119 per tonne CO₂ equivalent (tCO₂e) in Sweden, to as low as US\$0.3/tCO₂e in Mexico (ibid.). The global average carbon price of US\$2/tCO₂ in 2020 remains well below the estimated prices needed to meet the 2°C temperature goal of the Paris Agreement.²⁰ While Singapore pushes for the implementation of Article 6 in a display of its commitment to global decarbonisation efforts, its carbon price remains well below the estimated price needed to hit global targets. Global interests in establishing Singapore as a carbon trading hub and a country that prioritises “green growth” has to be considered alongside potential public and industry interests from a more highly priced carbon tax.

Diverse public interests - consumption vs jobs

The carbon tax could also have negative and positive effects on different groups of the public. Consumption-wise, a higher carbon tax could be passed on to consumers in the form of higher prices for products which are carbon-intensive. This is illustrated by the economic concepts of tax incidence and elasticity for a given product, as shown in Figure 4.²¹ In the left graph, consumers have high inelastic demand²² for the product affected by the carbon tax and thus bear a greater share of the tax burden compared to producers. The converse is true for the right graph - producers bear a greater share of the tax burden due to their relatively higher inelasticity of supply. The key factor which determines the size of the consumers’ tax burden is their elasticity of demand relative to producers’ elasticity of supply - the one with a greater inelastic demand or supply is less able to ‘escape’ the tax burden and thus bears a greater share of it.

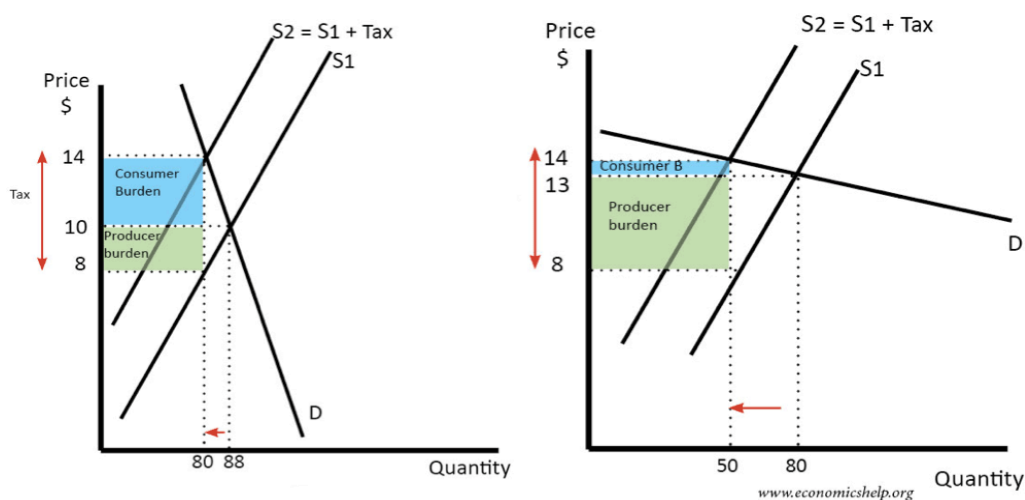


Figure 4: Tax incidence graphs; from Pettinger.

¹⁹Steinebach, Yves, Xavier Fernández-i-Marín, and Christian Aschenbrenner. "Who puts a price on carbon, why and how? A global empirical analysis of carbon pricing policies." *Climate Policy* 21, no. 3 (2021): 277-289.

²⁰"State and Trends of Carbon Pricing 2020", *World Bank*, May 27, 2020, <https://openknowledge.worldbank.org/handle/10986/33809>.

²¹ Tejvan Pettinger et al., "Tax Incidence," *Economics Help*, December 24, 2019, <https://www.economicshelp.org/concepts/tax-incidence/>.

²² Having high inelastic demand means that consumers are unable to find good substitutes for that product and/or are unable to reduce their consumption of that good because it is a necessity.

While such economic analysis on inelasticity has not been conducted on Singapore's carbon tax system yet, the trend of remote working arrangements suggests that consumer demand might be more inelastic than the producers'. As more people are working from home, consumers (i.e., the typical household) face greater inelastic demand for electricity. The circuit breaker period saw household electricity consumption increase by 22%²³, and household electricity consumption has continued to rise by 7% in 2020 compared to 2019.²⁴ The possibility of a greater consumer tax burden is also not homogenous between households. A uniformly-applied carbon tax adversely impacts lower-income households more than higher-income households when the former spends a greater proportion of their income on electricity. This corroborates with the current situation in Singapore where it was reported that those in the lowest income bracket spent the highest proportion of their income on housing and utilities.²⁵ However, current government transfers like GST vouchers and U-save rebates do help to mitigate such potential regressivity from the carbon tax.²⁶

On the other hand, a carbon tax could benefit certain groups of individuals through the creation of green jobs. As carbon gets more expensive, investments in less-carbon intensive energy like renewables and new technologies such as carbon capture, utilisation, and storage (CCUS) could create new jobs in the energy and chemicals industry. Carbon services such as carbon trading and green finance could also create a significant number of jobs in Singapore. Recent parliamentary debates were centred around this discussion as Members of Parliament (MPs) Poh Li San, Hany Soh and ²⁷ The recent announcement of a new global carbon exchange, Climate Impact X, being set up in Singapore also shows how the Singapore economy is pivoting its trajectory towards more green jobs.²⁸ However, as noted by MP Dennis Tan, such pivoting also leaves workers within carbon-intensive industries vulnerable.²⁹

Industry interests

The effects of a carbon tax on firms can be illustrated with the economic concept of marginal abatement costs. Firms that pollute can be modelled with Figure 5, where the marginal abatement cost (MAC) curve refers to the amount of cost each firm incurs for a unit of pollutant abated (i.e., costs incurred from developing green technologies or processes which reduce the amount polluted). Moreover, assuming that the firm currently pollutes 50,000 tonnes, a \$5/tonne carbon tax incentivises the firm to only abate up to the point where the abatement cost is equal to the amount it would pay in tax. In the figure, this is the quantity of 25,000 tonnes and following which, the firm finds it less expensive to pay tax and continue polluting than abating. This

²³ Vanessa Liu, "Household electricity consumption increased by 22% during circuit breaker period: EMA, SP Group", *The Straits Times*, June 16, 2020, <https://www.straitstimes.com/singapore/household-electricity-consumption-increased-by-22-during-circuit-breaker-period-ema-sp>.

²⁴ Ibid.

²⁵ Adeline Tan, "Lowest income groups least impacted by rising prices in second half of 2021", *The Straits Times*, January 24, 2022, <https://www.straitstimes.com/business/economy/lowest-income-groups-least-impacted-by-rising-prices-in-second-half-of-2021>.

²⁶ "Carbon Tax", *National Climate Change Secretariat*, <https://www.nccs.gov.sg/faqs/carbon-tax/>.

²⁷ Cheryl Lin and Tang See Kit, "Growing green talent, green finance and combatting greenwashing among MPs' suggestions for climate action", *Channel News Asia*, January 12, 2022, <https://www.channelnewsasia.com/singapore/growing-green-talent-green-finance-fighting-greenwashing-mp-climate-change-suggestions-2431451>.

²⁸ Melissa Low and Eric Bea, "Maximising Singapore's Readiness as a Carbon Services Hub", *Energy Studies Institute*, October 22, 2021, <https://esi.nus.edu.sg/docs/default-source/esi-policy-briefs/maximising-singapore-s-readiness-as-a-carbon-service-hub.pdf>.

²⁹ Ibid.

illustrates a key point about how the price level of a carbon tax has to be carefully calibrated and ambitious enough such that firms would be incentivised to change their processes rather than merely paying tax.

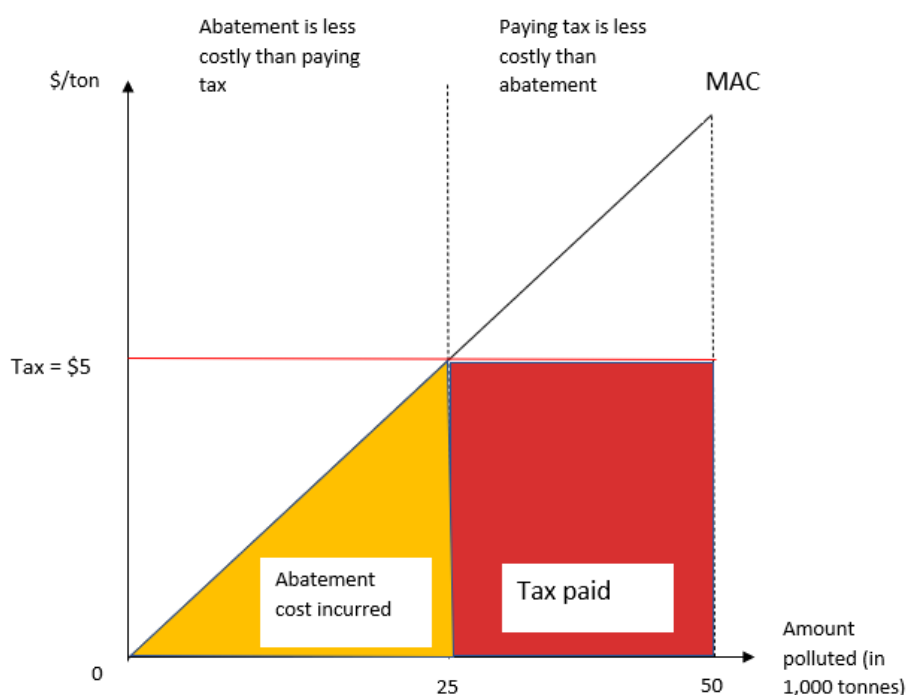


Figure 5: Firms' abatement cost curves; Authors' own figure.

Understood in this way, firms could have an interest in lobbying for a carbon tax rate lower than the cost it incurs for each tonne of carbon it tries to abate. Moreover, small and medium enterprises (SMEs) potentially face much higher MAC than other firms. These concerns with abatement costs were strongly reflected in the general responses gathered from industry in NCCS's public consultation exercise in February 2020. Main feedback included the costs of implementing improvement projects such as high upfront capital cost, low returns-on-investment, a long payback period and the challenges of ensuring reliability and precision control.³⁰

Ideological differences

Besides Singapore's reputational and economic interests that are shaped by how it implements its carbon tax, another important consideration is the ideological resistance and progress surrounding the policy itself. When the United States first attempted to introduce a carbon tax, it was met with such backlash that it was termed a "good policy with bad politics".³¹ Similarly, in Australia, the Gillard government's proposals for an ETS involving a fixed carbon price in 2011 backfired and were quickly repealed after the 2013 Australian federal election.³² Carbon tax remains a political thorny policy due to its potential effects on the public and industry

³⁰ "Response To Feedback On Singapore's Long-Term Low-Emissions Development Strategy", *National Climate Change Secretariat*, February 7, 2020, <https://www.nccs.gov.sg/public-consultation/response-to-feedback-on-singapore's-long-term-low-emissions-development-strategy/>.

³¹ Rabe, Barry G., and Christopher P. Borick, "Carbon taxation and policy labeling: Experience from American states and Canadian provinces", *Review of Policy Research* 29, no. 3 (2012): 358-382.

³² Bailey, Ian, Iain MacGill, Rob Passey, and Hugh Compston, "The fall (and rise) of carbon pricing in Australia: a political strategy analysis of the carbon pollution reduction scheme", *Environmental Politics* 21, no. 5 (2012): 691-711.

alike. This thus necessitates careful consultation to ensure that the citizenry, industries, and government are ideologically on the same page not just in the adoption of a carbon pricing policy, but on roughly how it should be priced. This was perhaps why the Singapore government took care to conduct multiple public and industry consultations before setting the carbon price, even revising the price downwards from initial announcements following these consultations.

On the other hand, Singapore's low carbon tax makes it an "outlier" globally³³ and deemed insufficient by environmental groups locally.³⁴ From the managing director of the Monetary Authority of Singapore, Ravi Menon, to opposition parties, to youth-led climate groups, a growing segment of the population is calling on the government to "boldly accelerate" climate action, which includes a higher carbon tax.³⁵ These ideological differences – between proponents for a higher and accelerated carbon tax and defenders of a more gradual approach – need to be well considered in order to make the carbon tax a collective rather than divisive policy for Singapore's future.

Policy Options

Option 1: Raise the price

While raising the carbon price is a clear goal of the Singapore government, the question of what the price should still remain. The government could come up with the price level in three ways: (1) with estimations using the social discount rate (SDR); (2) by benchmarking against global standards; (3) through price bargaining and consultations with industry and the public.

First, the carbon price can be set using estimations of the SDR, a concept commonly used in policy cost-benefit analysis to put a present value on costs and benefits that will occur at a later date. In the context of climate change, this means estimating the value of consumption people would be willing to sacrifice today in order to prevent a sacrifice in consumption by people in the future.³⁶ A positive SDR would give less weight to future benefits relative to the present costs of climate change mitigation (e.g., an SDR of 3% could yield a carbon tax of \$17/tonne) whereas a near-zero SDR would give relatively equal weight to present costs and future benefits (e.g., an SDR of 0.1% could yield an optimal carbon tax of \$159/tonne today).³⁷ A recent study estimated the SDR using Singaporeans' valuations of housing and found that a decline of 0.5-1.5% per year, which implies a greater valuation of public investments which can provide greater returns to society in the future.³⁸

Second, the government could also consider setting a carbon price that is on par with global standards or agreements. The current average tax rate of OECD countries is \$65/tonne whereas the International Monetary

³³ Selina. Xu, "Singapore Must Raise Carbon Tax Faster, Central Bank Chief Says," Bloomberg, July 14, 2021, <https://www.bloomberg.com/news/articles/2021-07-14/singapore-carbon-tax-needs-to-be-raised-at-faster-pace-mas-says>.

³⁴ Vanessa. Lim, "Singapore youths call on country's leaders to 'boldly accelerate' climate action," November 5, 2021, <https://www.channelnewsasia.com/singapore/climate-change-youth-activists-policy-recommendations-singapore-emissions-2292666>.

³⁵ Ibid.

³⁶ Laurence Seidman, *Public finance* (McGraw-Hill/Irwin, 2008).

³⁷ Ibid.

³⁸ Eric Fesselmeyer, Haoming Liu, and Alberto Salvo, "Declining discount rates in Singapore's market for privately developed apartments," *Journal of Applied Econometrics* n/a, no. n/a, <https://doi.org/https://doi.org/10.1002/jae.2867>, <https://onlinelibrary.wiley.com/doi/abs/10.1002/jae.2867>.

Fund recommended a global average carbon price of \$100/tonne to reach the target of halving emissions by 2030 and net zero emissions by 2050.³⁹ However, Singapore's current target is to have carbon emissions peak at 2030 before they decline.⁴⁰

Third, and most aligned with the current situation, is setting the price level after consultations with the public. As mentioned previously, the current carbon pricing system was put in place after two rounds of consultation with the public, industry and subject experts from March to December 2017. The final carbon price was set at \$5/tonne after the consultations, lower than the initial ballpark range of \$10-\$15.

Option 2: Policy design

Besides the price itself, other policy design considerations are also crucial to the implementation and trajectory of Singapore's carbon tax. First, the carbon tax can be expanded in coverage to include more firms. This was echoed in a motion on climate change moved by PAP MPs in January 2022, with calls to expand the number of facilities taxable under the carbon tax. At present, the threshold of 25,000 tonnes or more a year covers only around 50 large emitters in Singapore, even though smaller emitters with at least 2,000 tonnes are already considered "reportable facilities" and must monitor and measure their emissions under the CPA.⁴¹ As MP Louis Ng, who initiated the climate motion in parliament this year, said: "Emitters, small and large, have a role to play". Expanding the coverage of firms under the CPA will allow Singapore's CPP to be more encompassing with little marginal cost to "medium emitters" that are already subject to reporting obligations.

Second, while the price of Singapore's carbon tax is expected to gradually increase, the way price increases are conducted can influence public support and shape industry adaption to the CPP. An empirical study on CPPs in France, Germany, the United Kingdom, and the United States showed that for a given level of average costs, increasing cost paths receive little support whereas constant cost schedules are backed by majorities in all countries. In other words, constant cost paths (\$5 in 2021, \$10 in 2023, \$15 in 2025, \$20 in 2027 for example) significantly reduced opposition to climate action relative to increasing cost paths (\$5 in 2021, \$10 in 2023, \$20 in 2025, \$40 in 2027 for example).⁴² The cost path of Singapore's carbon tax should not only work towards international goals, but also strive towards constancy in the way through which such goals are achieved, for public, industry, and international interests alike.

Option 3: Rechannelling the carbon tax revenue

Carbon tax revenue could also be channelled to temporarily cushion increases in costs for businesses and consumers. For businesses, the carbon tax revenue could be used to fund grants and subsidies for firms that embark on green development projects or are in the process of becoming more efficient. The Singapore government has embarked on various initiatives in this regard with schemes such as the National Environment Agency (NEA)'s Energy Efficiency Fund, the Economic Development Board (EDB)'s Resource Efficiency Grant

³⁹ Prerana. Bhat, "Carbon needs to cost at least \$100/tonne now to reach net zero by 2050: Reuters poll", *Reuters* 2021, <https://www.reuters.com/business/cop/carbon-needs-cost-least-100tonne-now-reach-net-zero-by-2050-2021-10-25/>.

⁴⁰ Audrey. Tan, "Singapore firms will get time to adapt to higher carbon tax", *The Straits Times* 2022, <https://www.straitstimes.com/singapore/politics/higher-carbon-tax-can-spur-green-transition-but-must-be-calibrated-to-help-spore-firms-stay-competitive>.

⁴¹ Ibid.

⁴² Michael M. Bechtel, Kenneth F. Scheve, and Elisabeth van Lieshout, "Constant carbon pricing increases support for climate action compared to ramping up costs over time", *Nature Climate Change* 10, no. 11 (2020/11/01 2020), <https://doi.org/10.1038/s41558-020-00914-6>, <https://doi.org/10.1038/s41558-020-00914-6>.

for Energy and Energy Market Authority (EMA)'s Genco Energy Efficiency Grant. Additionally, the government has also distributed GST and U-Save vouchers to lower-income households to mitigate the additional costs incurred by a carbon tax.

Option 4: Overarching decarbonisation goals

Lastly, Singapore should work towards overarching decarbonisation goals that complement and concretise the ambitions of the carbon tax. First, this can entail disclosure of Singapore's "Scope 3" emissions and work towards reducing these emissions. These results result from activities not directly owned or controlled by an entity but occur within the value chain of its activities. Despite Singapore's emission-intensive economic activities in the shipping and aviation sectors, emissions in these sectors are not counted under Singapore's NDCs and thereby do not fall under the existing carbon tax.

Second, to take decarbonisation a step further, a medium to long-term goal could be to implement a ubiquitous carbon tax that extends beyond specific industries. One important domain of doing so, in a manner that positively reinforces future climate action, would be to implement a carbon tax within schools and other educational institutes. For example, Yale University introduced a carbon fee on emissions from its buildings that is neutral to the revenue raised by the activities in the building.⁴³ Similarly, professors from the University of Washington have called for universities to "pay a carbon tax on their faculty's air travel", a call that widens the ambit of carbon taxation policies that are currently in place.⁴⁴ These expansions within the educational domain have an added benefit of positively reinforcing climate awareness and activism. In Singapore, the current domain of the carbon tax remains limited to a mere 50 or so industries; until and unless the ambit and ambition of the carbon tax extend into the general populace and beyond, the island-state would fall short of the "hard targets" necessary to achieve overarching decarbonisation goals.

Resolution

Singapore, as a low-lying island state, remains vulnerable to the effects of climate change. The implementation of its carbon tax, though a bold and commendable first move in the region, remains a single step in a journey of a thousand miles in the fight against climate change. Notably, the current price of Singapore's carbon tax stands as one of the lowest in the world, with no indication of how effective it has been in reducing carbon emissions thus far. While this price is expected to increase considerably in the coming years, the extent, and the manner through which this is done is of utmost importance – to align environmental goals with domestic constraints and capabilities. The price, design, revenue, and accompanying policies of the carbon tax will no doubt have a profound impact on global actors, the public, and industries in the years to come. In balancing the interests and ideations among these actors, it is crucial to recognise sustainability not as a trade-off among actors or vis-à-vis the economy, but as "second nature" within the island-state's Anthropocene. Only then can Singapore bite the "silver bullet", to realise the hard targets to keep the nation going.

⁴³ Nicole van Maanen., Carl-Friedrich Schleussner., and Andrzej Ancygier, "Carbon tax in schools: a laboratory for change", *Climate Analytics*, July 16, 2019, <https://climateanalytics.org/blog/2019/carbon-tax-in-schools-a-laboratory-for-change/>.

⁴⁴ Nives Dolsak and Aseem. Prakash, "The Climate Change Hypocrisy Of Jet-Setting Academics", *Huffpost*, March 31, 2018, https://www.huffpost.com/entry/opinion-dolsak-prakash-carbon-tax_n_5abe746ae4b055e50acd5c80.

Discussion Questions

1. Who are the key actors involved in and affected by the implementation of Singapore's carbon tax?
2. What are the interests of each of these groups and how do these interests shape the trajectory of Singapore's carbon tax moving forward?
3. Are there tensions and/or incompatibilities among these interests, as well as vis-and-vis environmental goals?
4. How can policy options be finetuned to address or speak to these stakeholders and their interests, while maintaining its environmental goals?
5. Are there necessarily trade-offs of interests in the implementation of a carbon tax?