

A Plan for a Post-carbon Singapore

By Bertrand Seah

Abstract

This submission will detail a comprehensive set of suggestions and ideas for the National Climate Change Secretariat's (NCCS) public consultation on climate policy. Our current trajectory still seeks to increase emissions for the next 10 years, which is at odds with the climate science that demands emissions be halved in that same period, and calls for immediate action to be taken. The proposals herein will focus in particular on the heaviest emitters in Singapore, and also draw attention to the fact that Singapore is an open, globalised city-state that is deeply interconnected with the rest of the world, and must tackle policies with this in mind. This means that decarbonisation – which involves the weaning off of the pervasive influence that fossil fuels have on society – must be sought in all aspects of society. I propose here that in order to do so, the government needs to find the political will to take the lead. Furthermore, there needs to be significant reform to our approach to climate governance, as well as specific policy reforms pertaining to the carbon tax, finance, regional collaboration, and infrastructure. Lastly, it must be acknowledged that climate change is a deeply political issue, and climate action must be pursued in a just and equitable manner. From this, the following recommendations are provided:

Recommendation 1: That the government treats climate change as interconnected with other social issues, and for climate policy to be seen as an opportunity to solve climate change as well as these other social issues.

Recommendation 2: That climate policy is framed and formulated in a just and equitable manner, and directs the onus for action on the heaviest polluters.

Recommendation 3: That the government revises up its climate targets in line with the IPCC's findings that emissions must be halved by 2030 and reach net zero by 2050.

Recommendation 4: Reform MEWR and NCCS to give it a stronger mandate to enact climate change policies.

Recommendation 5: Institutionalise Environmental Impact Assessments and the precautionary principle for all major government and government-linked projects.

Recommendation 6: Commit a set amount of the annual budget to climate change and decarbonisation policies.

Recommendation 7: Publish detailed yearly reports on Singapore's environmental performance.

Recommendation 8: Expand the Centre for Climate Research Singapore to provide multi-disciplinary policy expertise for Singapore’s decarbonisation.

Recommendation 9: A strategic and carefully managed phasing out of the oil and gas industry from Singapore.

Recommendation 10: A governmental committee is set up for the greening of the Singapore economy, with a task force set up alongside to ensure the just transition of affected workers.

Recommendation 11: That the carbon tax rate be raised to a more appropriate level of at least \$40-80 per tonne.

Recommendation 12: That the current flat-rate, no-exemption approach to all large emitters be strictly retained even as the carbon tax rate is increased.

Recommendation 13: That the carbon tax be part of a suite of supporting decarbonisation policies, and not the main pillar of a mitigation strategy.

Recommendation 14: That revenues from the carbon tax redistributed back to citizens through a progressive carbon dividend, which is used to ensure a just transition to a green economy.

Recommendation 15: That the sovereign wealth funds take the lead in financing low carbon investment and infrastructure development.

Recommendation 16: Set standards for risk assessment that factors in long-term climate risks, and ensure that all institutional investors follow these standards.

Recommendation 17: Create a Green Investment Bank of Singapore to provide low-interest loans for green projects.

Recommendation 18: Revise monetary policy to dis-incentivise brown investments and incentivise green investments through adjustments in capital requirements.

Recommendation 19: Divest all public institutions from fossil fuel-related assets.

Recommendation 20: For Singapore to work more closely with ASEAN Partners to develop the ASEAN Power Grid

Recommendation 21: Enhance existing plans for a “car-lite” society to aim for a “post-car” society

Recommendation 22: Set a target to make public transit an affordable, more efficient and more pleasant form of transport than cars.

Recommendation 23: Redirect infrastructure development from roads and highways to further enhancing the MRT rail network.

Recommendation 24: Expand pathways and infrastructure for walking, cycling, and PMDs.

Recommendation 25: To closely monitor developments in New Zealand in moving away from GDP growth-based societal metrics, with a view to adopting and adapting it for Singapore's context

1. Preamble: Garnering the political will for ambitious climate action

I thank the National Climate Change Secretariat for opening up this channel for consultation with the public. Climate change is destined to be the most pressing, existential problem facing coming generations, and even poses a threat to the prospects for human civilisation. This will bring ramifications not just for Singapore's survival as a nation, but globally.

Such concerns are not lost on our political leaders. There is no need to reiterate the government's words to the government too much here, but the points raised are nonetheless important to remember. As Minister for the Environment Masagos Zulkifli said in a recent speech, "The warning is loud and unmistakable: We must act now or we may well face the ultimate threat to human survival ... the end of life as usual." It is also encouraging that climate change was made a key focus for this year's National Day Rally, and that the government has made clear that it is a long term issue that it will devote a large amount of government resources towards. Acknowledging the problem is thus not something that the government can be faulted for, and it is welcome that they accept the prognosis of the best available science regarding the climate crisis.

However, acknowledging the problem is only but one small step to solving it. The next, and more crucial step, is in finding the necessary solutions to deal with the issue at its roots. The government is entirely right that this is not an issue that Singapore can resolve on its own, and that it will be responsibility of the entire global community, but Singapore still needs to be doing more. In the bigger picture, efforts to curb the climate crisis have been a complete failure. This has come about in spite of much lauded achievements in international climate diplomacy, including the 1992 Rio Earth Summit and the 2015 Paris Agreement. In contrast with these triumphs in diplomacy, however, human actions have continued to escalate the climate crisis. For example, fossil fuel use has continued to grow since the Earth Summit, and approximately half of the cumulative historical use of fossil fuels have come since that landmark conference,¹ with 2018 representing the highest increase in fossil fuel use in seven years.² Likewise, global greenhouse gas emissions have also risen dramatically in that period, and is estimated to have reached record highs in 2018.³ The main takeaway from this,

therefore, is that global efforts have overwhelmingly failed to prevent the onset of climate crisis by reducing emissions.

Much of this can ultimately be reduced to the lack of political will to transform society and avert climate catastrophe. The need for domestic action in order to achieve this cannot be understated. This is codified in the Paris Agreement, which differs significantly from the earlier Kyoto Protocol. Because the latter set binding targets on its parties, many states were repelled from joining the agreement, and its coverage over the international community was meagre. The Paris Agreement, on the other hand, has been adopted almost completely by the international community, but was only able to do so because there are no binding targets set on each country. The mechanism used instead to meet the target is self-determination, as countries are given the freedom to set their own targets in line with what they see as realistic and feasible for them. Because of this mechanism of self-determination of climate targets, the prospects for keeping to the 1.5°C limit rests on each state garnering the domestic political will to pursue ambitious targets.

As of now, it is demonstrably clear that this political will has not been achieved, with combined pledges by countries still leading to a projected temperature rise going beyond 3°C.⁴ From this, it is evident that acknowledging the science is not enough, but that there needs to be an honest and frank assessment of the degree of transformation needed to avert climate disaster. And that this needs to come from each state acknowledging the widespread changes necessary to undertake, rather than deflecting responsibility to other actors.

In this regard, it might be worth noting what climate researcher Michael Hoexter refers to as the two forms of climate denial.⁵ The first, more well-known form is called hard denialism, as embodied most prominently by the Trump Administration and his Republican Party, which outrightly denies the validity of the science of climate change, and therefore opposes any measure to take action to avert a problem it refuses to see. The second, less well-known form is called “soft” denialism, which accepts the realities of the science of climate change, but denies the responsibility to confront it at the scale required. Even though this second form does not entail outright denial, it is the much more ubiquitous, as the vast majority of states and powerful actors have readily affirmed the severity of the climate crisis, but continue to refuse to take more substantive action. The idea that solutions to the crisis can be left to others, can be delayed to the future, is only waiting for the right type of technological solution or can be detached from issues of social justice are all forms of soft denial that should be condemned. All the countries that have not provided a concrete plan for keeping to the targets underlined by the Paris Agreement are guilty of this form of soft climate denial.

A look at developments in other countries shows very clearly what is at stake with the climate crisis, where protests have sprouted around the world demonstrating anger at the inaction of governments. The Fridays For the Future movement, started by Greta Thunberg, has now reached global proportions. What is notable about this movement is that it is made up predominantly of youths, many of whom have not yet reached the voting age in a democracy, and more generally are not a demographic one would associate with social protests. The fact

that these youths have taken action at a global scale is a clear indication that they are fighting for their own futures against present and past generations that have created this problem and failed to stop it. Other movements, such as Extinction Rebellion, have decided that only radical action is sufficient given the failure of political systems to respond to the crisis. While these tensions have not yet reached Singapore's shores, it would be short-sighted to think that these same concerns and frustrations are not felt by our youths, and that our political system can be resilient to these pressures in the absence of more ambitious policy.

Singapore's current approach to climate change is heavily focused on adaptation policies, but remains lacking in terms of reducing emissions. While the adaptation policies are commendable, I am deeply concerned that Singapore only intends to peak emissions in 2030, and will continue growing emissions until then. This seems especially difficult to justify given that the IPCC calls for emissions to be halved in that same period. A substantive climate policy needs to give as much attention to mitigation as much as it currently does to adaptation.

To put it in stark terms, the government's focus on adaptation without mitigation seems to suggest that it is already committed to a catastrophic future that can still be averted. This is a dangerous path to take given that no matter the foresight and long-term thinking that goes into adaptation measures, as Singapore is doing, the destruction posed by climate breakdown may well surpass the capacity of any society to protect itself from.

During the National Day Rally 2019, the segment on climate change was focused mostly on adaptation measures to protect from rising sea levels, which pose an especially pressing threat given that Singapore is a small island state. However, PM Lee also identified several other possible impacts, including new diseases, more frequent pandemics, food shortages, forced migration of displaced populations, and wars. While these are all humanitarian issues in their own right, they also present grave threats to Singapore's survival and well-being as a nation. Furthermore, given the uncertainties of climate change, there can also be any number of unanticipated effects that will occur, as well as the increasing possibility that tipping points will be reached from which there will be irreversible damage to the climate.

Singapore is an open, globalised city state that is dependent on the rest of the world for most of its needs, ranging from its economy to its food, water, and energy. This means that Singapore has a large stake in the health of the planet – a successfully adapted Singapore would still struggle to survive if the rest of the world is suffering from climate breakdown. Singapore thus has very good reason to take a more proactive role in decarbonising its economy and leading other countries to do likewise.

The majority of this paper will focus on the possible measures the government could implement to mitigate emissions. This submission will be organised as follows: The next section will make brief comments about the public consultation document provided by the NCCS, and argue that climate policy needs to be significantly reframed if it is to engender the widespread political support it deserves. The following section will address the claim that

Singapore's national circumstances make it difficult for more to be done to mitigate emissions, and suggest instead that Singapore has both the reasons and the capability to undertake more substantive climate action. Thereafter, aspects of Singapore's climate governance will be assessed, and suggestions will be provided to better integrate climate concerns into Singapore's overall governance approach. From therein, the task of decarbonisation will be the focus of the next few sections, focusing on the fossil fuel-related industries, the carbon tax as mitigation measure, the financial system, regional collaboration, and transport. Finally, a shift away from GDP as a metric will be proposed as a way to achieve better environmental and social outcomes, before closing with concluding remarks.

2. Brief comments on the NCCS consultation document and the need to reframe climate policy

Before I begin elaborating on my suggestions, it is necessary first to make a few brief points about the consultation document provided by NCCS. While it is a detailed and comprehensive document that provides the public with important information and reference points for the public to provide feedback, I have some qualms with the framing of much of the document.

The key issue I have is that it frames the sphere of climate action too much on the actions of individuals and households. While it is undeniable that everyone has their part to play in making Singapore cleaner and more environmentally friendly, this must be concomitant with how much each actor contributes to our emissions profile, and how the burdens for climate mitigation must be spread in a just manner.

As the data provided from our GHG Emissions Profile reveals, emissions from households play only a miniscule role in Singapore's overall emissions, at 0.4% of primary emissions and 6% from secondary emissions in power generation. This shows that households play a far lesser role in our emissions compared to other sectors, in particular from industry, which takes up a combined 60%, and transport and buildings, which together take up slightly over 30%.

Despite this relatively small role, each section (A-E) of the NCCS document focuses its framing and questions considerably on the responsibility of individuals and households in climate mitigation. While it is true that individuals and households must play their part, we should be wary of framing climate policy in ways that imply excessive burdens and sacrifices on the part of individuals. The following examples from the consultation document illustrate this point:

- Section E [Encouraging Collective Climate Action]: Are you prepared to bear some additional costs/inconvenience to contribute to a low-carbon Singapore? For example, higher utility bills from switching to greener fuels or methods of generation, paying more for waste disposal, paying more for products that have been produced in a carbon neutral way etc?

- Section A [Improving Energy Efficiency across all Sectors]: Would you be willing to pay more for products or services from a business that is taking responsible climate action by reducing emissions and/or purchasing carbon credits to offset its carbon emissions?
- Section C [Reducing Emissions from Power Generation]: How many percent more would you as an individual or your company be willing to pay to purchase electricity generated from clean and renewable sources?

Framing climate policy too much as sacrifices brings many political ramifications that diminish public support for climate action. For this reason, climate policy has tended to be politically fraught in many places, as individuals increasingly find that climate policy hurts their livelihoods, and lets polluters off the hook. In some cases this has come in spite of widespread acceptance that climate change is an urgent issue.

In Australia, a landmark carbon tax was introduced in 2011 by the Labour and Green Parties on the back of a wave of climate demonstrations. These demonstrations mobilised as many as 100,000 Australians at the peak of the movement, while a 2006 poll showed that 68% of Australians viewed climate change as a “serious and pressing problem” requiring urgent action. However, the carbon tax policy quickly turned into a political failure, with free permits and unlimited offsets handed out to heavily polluting companies, while most of the costs for the tax were passed on to consumers. The political backlash ultimately proved fatal for the prospects of the carbon tax, which never managed to gain widespread support. The Labour government would go on to lose elections in 2013, and the carbon tax was quickly scrapped. As one commentator points out:

“The carbon tax painted climate action as linked to lower living standards. This meant the climate movement’s support for the tax cut it off from wider layers of workers. The movement became even more restricted to middle class supporters unconcerned by the prospect of rising prices.”⁶

Similarly, the Yellow Vest protests in France started when the imposition of a diesel tax triggered nation-wide protests against President Macron. While many interpreted the protests to be a revolt against climate policies, the protestors made clear that it was not the environment that they were protesting about, but that the costs for decarbonisation were being so onerously shifted towards the poor.⁷ This was so particularly because Macron had earlier removed a wealth tax, while the increased diesel tax had its biggest effects on a poorer suburban demographic who depended on their motor vehicles for transport, and were already living pay check to pay check. A study found that the most highly polluting companies in France were paying €21 per tonne of carbon emissions, with some receiving over-allotted emission quotas and thus paid nothing for their emissions.⁸ Meanwhile, households and less polluting industries paid €44 per tonne of carbon. The increased taxes thus pushed their costs of living beyond what they could sustain, and drove them to take action to oppose the policies.

More ominously, the biggest political opponent to Macron has come from the far-right Marine Le Pen, who manipulates environmental concern in support of racist, xenophobic and ultra-nationalist worldview.⁹ This is similarly the case in the United States, where a manifesto left behind by the perpetrator of the recent El Paso shooting revealed a worldview supported these same dangerous, genocidal tendencies of the far right as solutions to environmental collapse.¹⁰

In Singapore, there are some indications that support for climate policy differs along societal lines, particularly along generational lines. A fair amount of anecdotal observations have pointed out that climate action is supported far more strongly among a young demographic, and much less so among older people.¹¹ Given that many of the older generation are already likely to be facing pressures over issues such as healthcare, housing and retirement, it is unlikely that they will respond well to climate policies to impose further costs on their daily practices. In any case, many of the older generation are likely to be less consumptive than younger people, which means that measures aimed at individualised consumption behaviours are less likely to resonate with them in the first place.

On the flipside, the existing approach is also the source of frustration for more environmentally conscious people. I can speak here of my own personal experiences with environmentally conscious peers. Many of them are young, have very little hope that climate catastrophe will give them a bright future, and experience varying degrees of eco-anxiety.¹² Nonetheless, they do all they can to reduce their own personal waste and carbon footprint (as government rhetoric encourages them to), and advocate the same to their friends, family, and on social media. However, many of them are deeply frustrated that, in spite of these efforts, there remains so little change happening on a systemic and institutional level. Furthermore, a few of them see this as hypocritical on the government's part, particularly in view of the government's continued and steadfast support for dirty industries. In this regard, it is important also for the government's own legitimacy that climate policies are aligned to its stated commitments to undertake substantive climate action.

An ambitious climate policy should thus seek to be wide-ranging to the extent that actors across society – be it state-linked institutions, businesses, households and individuals – can all be transformed towards cleaner behaviours, norms and practices, and does so in a way that ensures that the onus for action is spread in a just and fair manner. The only actor that has the power to bring about such changes is the state, and in Singapore the state is widely acclaimed as one that has the foresight, competence and technical expertise to bring this about. The only reason that this cannot be achieved will ultimately come down to whether there is the political will to bring about the needed changes. The proposals provided herein will thus not solely be confined to the ways in which the original NCCS document has framed the types of solutions, but will go beyond that to provide suggestions for the kinds of far-reaching transformation needed in society.

Recommendation 1: That the government treats climate change as interconnected with other social issues, and for climate policy to be seen as an opportunity to solve climate change as well as these other social issues.

Recommendation 2: That climate policy is framed and formulated in a just and equitable manner, and directs the onus for action on the heaviest polluters.

3. Singapore's circumstances and national targets

Singapore's current pledges are far from sufficient in keeping to a 1.5°C warming target, as outlined in the Paris Agreement. This need not be deemed a failure yet, as escalating domestic political will and ramp-up mechanisms in the agreement give ample opportunity to revise and increase the ambition of policies and targets.

The key issue with existing targets is that, because emissions intensity is a measure of emissions pegged to GDP, there is still room to grow our emissions if there is economic growth. This is much different from a pledge that makes a firm commitment to an absolute reduction in emissions, and indeed it has been common even for knowledgeable individuals to reference reductions in carbon intensity as reductions in overall emissions. By contrast, as stated by the NCCS, Singapore is only working to peak emissions in 2030. This is directly at odds with the findings and recommendations of the IPCC, who call for a reduction in emissions by 47% in 2030, and to net zero by 2050. With this in mind, it is difficult to justify why Singapore has the right to continue increasing emissions, which is typically on the basis of poverty reduction.

Nonetheless, government rhetoric typically invokes Singapore's "National Circumstances" as reasons that mitigation cannot be achieved. These include Singapore being a low-lying, island city-state, geographical constraints, a lack of natural resources, and low suitability to alternative or renewable energy sources. Furthermore, it is commonly stated that because Singapore only represents 0.11% of global emissions, any mitigation measures will not have any effect in averting climate change on a global scale.

However, I am not convinced that these arguments fully bear out. Firstly, this 0.11% does not account for the amount of emissions Singapore imports. Given Singapore's affluence, its levels of consumption are high by global standards, and much of this consumption comes from emissions generated beyond our borders. Put simply, this means that on top of this 0.11% of emissions happening within our borders, there is also a proportion of emissions created outside our borders that goes towards our own consumption, and is thus for our benefit. Metrics that account for this – net imports of emissions and emissions embodied in consumption – rank Singapore as the third highest in per capita terms as Figure 1 indicates, and show our ecological footprint to be much higher than the 0.11% figure suggests.

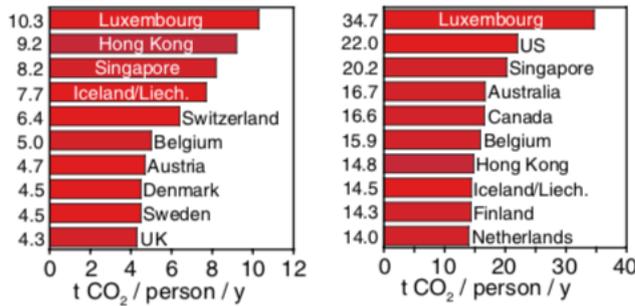


Figure 1: Top 10 net import of emissions per capita and emissions embodied in consumption per capita, respectively¹³

Secondly, the argument that Singapore’s emissions are too small a proportion of global emissions to be meaningful can be used by virtually any other country in the world. As Figure 2 below shows, the highest emitting countries in the world are China, which hovers at approximately 30%, and the US, which is around 15%. By contrast, the IPCC calls for approximately 50% of emissions to be cut by 2030. Going by such a target, it is conceivable for even China or the US to make the same claim, as even if either (or both) of them fully cut their emissions by 2030, we would still not achieve the required emission reductions. Indeed, this exact point is one also used in the US.¹⁴ That such an argument holds true even for the second highest polluting nation in the world turns it into a mere truism, making it an easy way to deflect responsibility while further entrenching the prisoner’s dilemma of international climate politics.

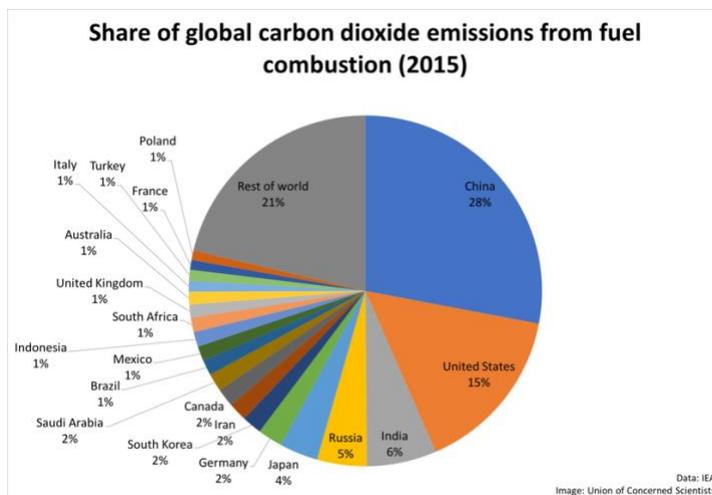


Figure 2: Breakdown of emissions by country. Source: Union of Concerned Scientists¹⁵

To be clear, I do not reference these figures to condemn Singapore’s environmental record, but to show that Singapore has every reason and capability to be pursuing a stronger climate policy. As it currently stands, it seems entirely incongruous for Singapore to be such a firm supporter of the Paris Agreement and the UNFCCC process, and yet be so opposed to setting targets that meet the goals set out in the agreement. Singapore should be setting much more ambitious targets in line with 1.5°C warming pathways, and these targets must come hand in hand with concrete measures for achieving them.

Recommendation 3: That the government revises up its climate targets in line with the IPCC’s findings that emissions must be halved by 2030 and reach net zero by 2050

4. Reforming the governmental approach to climate change

The government prides itself on its “whole-of-government” approach to tackling climate issues. In principle, this is important as policies should not be undermined by factionalism within government, or by conflicts between ministries with competing agendas and interests. Climate policies need to be approached with full commitment by all sectors of society, and every branch of government needs to play its part. Singapore’s current institutions show some of the positive attributes of a whole-of-government approach, as the NCCS and the Inter-Ministerial Committee on Climate Change allows for coordination on climate policies across the various ministries and agencies. As the experience of other countries have shown, this is not always a given, as the existence of powerful lobby groups or policy networks have often succeeded at inhibiting major changes in environmental policy.

However, environmental policy will only be pursued in such a structure if it vests power and influence in environmental actors. In other words, a cohesive institutional structure like this will only lead to ambitious policy if ambitious policy is first a priority on the governmental agenda. As political scientist James Connelly points out:

“Institutionalisation... has the advantage of providing a ready-made structure within which policy responses can be channelled. However, this seeming advantage can at the same time be a drawback. Problems tend to be defined in ways which admit of solutions within the prevailing political and administrative arrangements.”¹⁶

Here, it is my opinion that more can be done to give the various environmental agencies a stronger mandate and institutional powers within the government apparatus to pursue more ambitious environmental reforms. This is especially so given the suggestion by scholars that the environmental ministry in Singapore has traditionally had a “lowly position in the pecking order of ministries”, and by others that wherever the environmental ministry has taken increasingly pro-green stances vis-à-vis developmental imperatives, this has “caused tension with pro-development ministries.”¹⁷

The first step that can be done is a reform of the Ministry of Environment and Water Resources to better incorporate climate change issues. The current vision and mission statements of the ministry state, respectively, “A clean environment, water and safe food for all. Together, a liveable and sustainable Singapore”, and “To ensure a clean, sustainable environment, and supply of water and safe food for Singapore”. While there are references to sustainability, these seem to refer more towards the liveability of living spaces rather than an explicit focus on climate.

The mandate to formulate climate change plans falls more with the NCCS, which falls under the Strategy Group of the Prime Minister's Office. Because it is a strategy group rather than a ministry, I am concerned that this overly bureaucratizes the process of climate policymaking, vesting the authority policymakers without enough institutional measures that give citizens a say in such an existential issue.

Take for example this NCCS public consultation itself. Even though I and many of my peers are putting in the time and effort to provide a comprehensive set of ideas and proposals, I am not convinced that the NCCS even has the authority to make significant changes to the national agenda based on the feedback we provide. The current gov.sg website indicates a policy & planning division and a strategic issues division, each made up of teams of civil servants. Unlike Ministers, who are elected office-holders that are accountable to voters and other elected representatives in parliament, these civil servants are ultimately only accountable to the Prime Minister and the Ministers in the PMO, and will only be receptive to public feedback that follows the policy agenda set by political leaders. Reforms of our climate governance need to be made to place climate action at the front and centre of MEWR's objectives, to make the formulation and implementation of policies for mitigation and adaptation its key responsibilities, and to be accountable to the people in achieving our aims of becoming a carbon-neutral nation. Such accountability can only come about through democratic processes, and not through a bureaucratic process that is shielded from public opinion.

A second step would be to introduce sustainability divisions across all government ministries and agencies, in particular the development-focused institutions. While it is difficult for even an expanded environmental ministry to institute clean environmental change across all government operations, having mandate that each institution keeps to strict sustainability standards, in both its operations and in the policies it formulates, would help to entrench sustainable principles across the entire public service.

Another possible measure would be to institutionalise sustainability measures in policymaking across all government departments. Such measures include Environmental Impact Assessments and the precautionary principle. EIAs are already commissioned for many projects, however it would be a positive step if this can be mandated for all major developmental projects, as well as projects that step into the boundaries of nature areas. These EIAs should also be made publicly accessible to the furthest extent possible.

The precautionary principle states, in conditions of uncertainty, decision makers should prevent potentially serious or irreversible environmental harm.¹⁸ This involves two "triggers", as Raffensberger and Tickner suggest: "If there is a potential for harm from an activity and if there is uncertainty about the magnitude of impacts or causality, then anticipatory action should be taken to avoid harm."¹⁹ The benefit that would result from this is that the burden of proof is re-assigned, as it is now the onus of the actor (for example, the business) to show that a particular project is environmentally friendly rather than on the environmentalist or conservationist to prove that there will be environmental harms.²⁰ Like EIAs, this should be

codified into governance, and applied especially to developmental projects that the government involves itself in domestically and abroad. Taken together, EIAs and the precautionary principle will form a two-step process in ensuring that environmentally damaging activities will not be undertaken.

The government can also make a firm commitment in terms of its fiscal spending to commit a proportion of its GDP annually to decarbonising measures.²¹ Economist Robert Pollin, looking at a global scale, suggests that decarbonisation would be feasible, and indeed highly desirable, if each country can make a commitment of 1.5-2% of its GDP to the necessary transitional policies.²² Given that Singapore's GDP per capita is extraordinarily high compared to most other countries, such a commitment would certainly give Singapore much of the resources needed in order to pursue and achieve decarbonisation.

Lastly, more could be done in terms of research and publicly available information on climate change. For example, the latest Biennial Update Report published by the government for the UNFCCC in 2018 only includes emissions data up to 2014. The government should commission an annual environmental report, and should provide more detailed information on Singapore's emissions profile, broken down by sector and firm, and should include updates on Singapore's progress towards a low-carbon future.

The recently announced Centre for Climate Research Singapore is a step in the right direction. However, it should focus on more than just the science of the impacts of climate change on Singapore. The seriousness of climate change demands an entire network of research institutions that connects the many issues pertaining to climate in a multi-disciplinary manner. This should include, in particular, climate policy think tanks focused on formulating policy for decarbonisation based on rigorous research. While this network should liaise closely with the government to set pathways for a decarbonised future, it should also be independent and autonomous so as to empower it with the institutional leverage to advocate ambitious measures.

Recommendation 4: Reform MEWR and NCCS to give it a stronger mandate to enact climate change policies, and more accountability to the public.

Recommendation 5: Institutionalise Environmental Impact Assessments and the precautionary principle for all major government and government-linked projects.

Recommendation 6: Commit a set amount of the annual budget to climate change and decarbonisation policies.

Recommendation 7: Publish detailed yearly reports on Singapore's environmental performance.

Recommendation 8: Expand the Centre for Climate Research Singapore to provide multi-disciplinary policy expertise for Singapore's decarbonisation.

5. The fossil fuel industry

The fossil fuel industry plays a big part in Singapore's economy, and is also a key contributor to Singapore's emissions. Any climate policy must start by first looking at the environmental effects of this industry, and what can be done given its sheer presence in our economy. The following two graphs from Su et al. show the disproportionate amount of emissions coming from this industry.²³

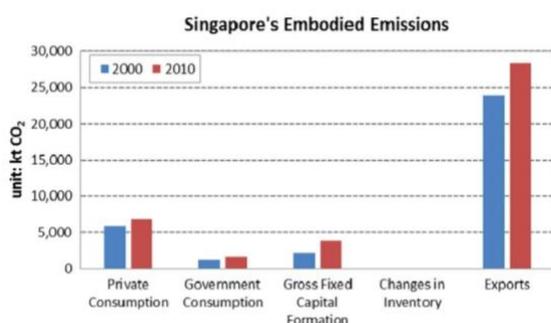


Figure 3: Singapore embodied emissions by final demand category, 2000 and 2010. Source: Su et al.

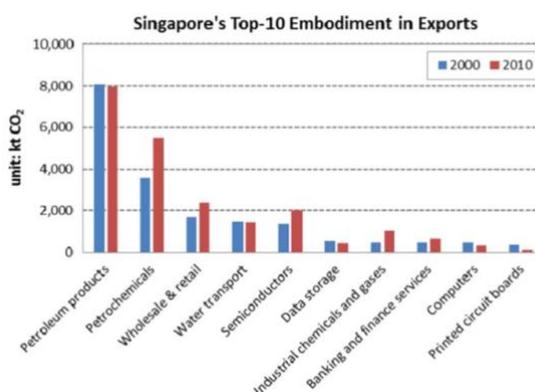


Figure 4: Embodied emissions in exports by sector, 2000 and 2010. Source: Su et al.

From Figures 3 and 4, it can be seen that the vast majority of emissions coming from economic and productive activities in Singapore comes from the export sector, and that from these exports, a significant share comes from either petroleum products or petrochemicals. An substantive emission mitigation policy would thus need to focus significantly on the oil and gas industry where these emissions come from.²⁴

The long-standing ties of the fossil fuel industry should also be acknowledged, with the presence of the biggest firms like Shell and ExxonMobil in Singapore tracing back to the 1890s. Oil companies also played a big role in the industrialisation and rapid economic development from the 1960s onwards. Singapore's pioneering generation expended considerable efforts attracting the oil industry, which by 1974 succeeded bringing in over S\$900 million in investments and building five oil refineries, turning Singapore into one of

the largest and most modern oil refining centres in the world.²⁵ The benefits to Singapore's economy from this were further fuelled by the succession of wars around Asia and the Middle East, which increased the fuel demand for Singapore to supply to the US military.

Today the close ties between Singapore and these fossil fuel firms have been regularly affirmed in speeches and through national awards. Executives from these firms are also integrated into the governing committees of various economically-pivotal government-linked entities. The chairman of ExxonMobil Asia-Pacific, for one, sits on the board of EDB, while the previous chairman of Shell was a main committee member of the Committee on the Future Economy (CFE), the government-initiated body tasked with planning for the economic restructuring of Singapore in view of future challenges.

In spite of these close relations, however, it is time that the government seriously reconsiders how welcoming it should be to the oil and gas industry going forward. This is in view of the increasingly clear role that the industry plays both in terms of direct greenhouse gas emissions, as shown earlier in this paper both in the global and local contexts. On top of that, the fossil fuel industry has also played a pivotal role in subverting international and domestic efforts to reduce emissions to a level that would have averted the current climate crisis. This includes the notorious, well-documented efforts made by the industry to cultivate climate denial in the United States,²⁶ and also their involvement in international climate conferences to weaken obligations placed on states to reduce emissions.²⁷

While Singapore's current policy seeks to work with these fossil fuel giants to reduce their emissions by increasing energy efficiency, statements and reports from these companies have made it clear that they will not pursue complete decarbonisation. ExxonMobil, in a 2018 climate risk report that was published after years of shareholder lobbying, stated that it expects that nearly all of its 91 billion barrels of oil reserves (20 billion proven and 71 billion unproven) can be extracted and sold based on its market and operational assumptions.²⁸ Shell has been more forefront in envisioning a 2°C-compatible future with their Sky Scenarios report, but still insists that oil and gas demand still remains at approximately today's levels until at least 2040, and fossil fuels will continue to be used even in 2100.²⁹

Activists, researchers and journalists around the world have thus advocated that action to be taken to disavow the fossil fuel industry not just for its environmental impact, but on ethical and social justice grounds. Here, however, I will suggest that taking steps to move away from the fossil fuel industry is also the sensible decision for Singapore going forward. There are three main reasons for this.

Firstly, the fossil fuel industry is in decline, and Singapore should not be hedging its bets on sunset industries. In 1980, seven out of the top 10 companies in the Standard and Poor's 500 Index were oil and gas companies, and energy stocks commanded 28% of the Index. Today, that proportion has dropped to 5%, with the energy sector rated as the worst performing sector in the index. ExxonMobil, in particular, has for many years been among the top five publicly traded companies in the world in terms of market capitalisation, but has now

dropped out of the top ten list of the S&P 500 Index, and revealed in its latest quarterly earnings that it had to borrow money just to pay its dividends to shareholders.³⁰ Its petrochemical business, which is where Singapore has invested heavily into, is also expected to see soft results over the next year owing to a surplus of global capacity.³¹

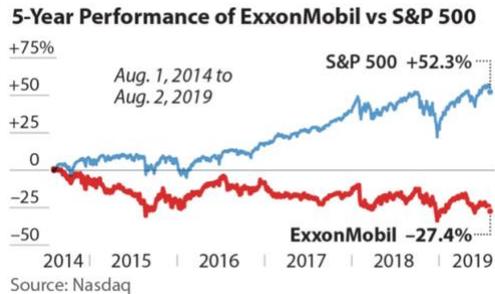


Figure 5: Declining performance of ExxonMobil³²

For this reason, some of the biggest fund managers in the world have started to move their investments away from the fossil fuel industry. Legal & General Investment Management (LGIM), which manages US\$1.3 trillion in assets and was one of ExxonMobil’s top 20 shareholders, announced in June that it was dumping \$300 million worth of shares that it held in the company, while BNP Paribas Asset Management announced that it would divest approximately US\$1 billion in coal stocks as early as next year.³³ Meanwhile, a report by the Institute for Energy Economics and Financial Analysis (IEEFA) estimates the BlackRock, the world’s largest investor, has eroded the value of its US\$6.5 trillion funds by approximately \$90 billion because of its investments in declining oil companies. The underperformance and declining prospects of the fossil fuel industry also brings risks of a “carbon bubble” and the possibility of a financial crisis triggered by the fossil fuel industry, which will be elaborated on in the later section on the financial industry.

Secondly, the petrochemical industry has been for a volatile industry for Singapore itself. As Ng Weng Hoong documents, the petrochemical sector has suffered its share of shocks and setbacks over the years, as shown in following table.

Year	Firm	Timeline
1971-1987	Sumitomo Chemical (Japan)	<p>1974: Sumitomo Chemical and EDB form an equal joint-venture, which is almost immediately cancelled and put on hold for three years because of the first oil shock</p> <p>1979: The project is delayed again because of the second oil shock</p> <p>1982-4: The petrochemical complex is completed in late 1982, but is not brought onstream until 1984 because of the stagflation and recession brought about by the oil shocks</p> <p>1984-7: The complex suffers losses for three years, and is branded a “white elephant”</p>
1997-1998	Mobil	<p>1998: Collapse of oil prices and the Asian Financial Crisis leads to the consolidation and merger of two oil majors – Exxon and Mobil into ExxonMobil, each of whom had a petrochemical complex on Jurong Island in the pipeline. The merger leads to the Mobil complex being shelved, leading to projected losses from delayed, downsized or cancelled projects totalling “several billion dollars”.</p>
2003-2004	Sumitomo Chemical	<p>2003: Shell Chemicals Limited and Sumitomo Chemical announce they would look into a new ethylene plant on Bukom Island, with a view to starting construction in 2004 and becoming operational in 2007.</p> <p>2004: Sumitomo Chemical announces it is dropping out of the project, deciding instead to team up with Saudi Aramco to build a US\$9.8 billion petrochemical complex in Rabigh city in Saudi Arabia</p>
2009	JTC	<p>A tender to appoint an operator for a proposed underground oil and petrochemicals storage cavern is called off due to the poor economic environment, having already been delayed twice since 2007.</p>
Year	Firm (2009 project cost in S\$million)	Plant (estimated delay as of 2011)
2008 onwards (as a result of the 2008)	Jurong Aromatics Corp (2400)	Aromatics plant (3 years)
	Tuas Power ((1400)	Clean coal plant (1 year)
	SLNG Corp (1000)	LNG terminal (1 year)
	Lanxess (700)	Butyl rubber plant (2 years)

financial crisis)	Mitsui Chemical (200)	Phenol plant (na)
	Stolt Nielsen (250)	Chemical storage terminal (one year)
	ExxonMobil (5000)	Petrochemical complex (at least one year)

Table 1: Setbacks in the petrochemical industry. Source: Ng Weng Hoong, 2012

While the industry has managed to ride out these many setbacks to become a lucrative sector of the economy, it should not be expected that there will be no further setbacks in the future. In fact, given the current context of geopolitical uncertainties and escalating climate breakdown, it is a reasonable expectation that the industry will continue to face much volatility going forward.

Lastly, the Singapore government should take steps to move away from the fossil fuel industry in anticipation of global efforts to decarbonise. As just mentioned, major global institutions have already announced that they will play a stronger role in addressing the fossil fuel industry through their investments. On top of that, powerful states might also follow suit in their climate policies. The most important is from the United States, one of Singapore’s most important political and economic partners, where climate policies have become a national priority on the political agenda. In the current Democratic Party primaries for the 2020 Presidential Elections, numerous candidates have revealed ambitious plans that aim to tackle the fossil fuel industry. The most ambitious is Bernie Sanders’ US\$16 trillion plan, which intends on “making the fossil fuel industry pay for their pollution, through litigation, fees, and taxes, and eliminating federal fossil fuel subsidies”, but other candidates such as Elizabeth Warren and Andrew Yang have also unveiled plans to end support for the fossil fuel industry.³⁴ Such plans, if carried out, would present a further knell to the profitability that Singapore currently expects out of the industry, and furthermore, risks Singapore’s international standing in the future if it decides to remain a fervent supporter of a potentially discredited, fallen industry.

Given these reasons, I would argue that it is in Singapore’s best interests to start a planned phasing out of the oil and gas industry over the next 10 years. Presently, the industry contributes approximately 5% of Singapore’s GDP and employs 25,000 workers, which is a significant but not insurmountable proportion for a carefully-managed phase out to be undertaken over a ten year period. Such a move must ensure that the transition be carried out in a just manner for affected workers, involving reskilling, the creation of new jobs for these workers, as well as social welfare provisions to ensure that their livelihood can be protected and secured regardless of the transition away from the oil and gas industry.

As it is, Singapore is already well-placed to undertake such a large transition given the presence of the SkillsFuture program, which can be expanded and utilised for jobs affected by the transition. Much of the job creation and reskilling can come from greening the economy itself. A report from the International Labour Organisation (ILO) estimates that as

much as 24 million green jobs could be created globally until 2030 involving sustainable practices such as increasing energy efficiency, transforming energy and transport infrastructures, and retrofitting old buildings. A government committee should thus be set up for the decarbonising of the Singapore economy, with an additional task force for the just transition of workers. Additional reforms in support of this goal of decarbonisation will be elaborated in the following sections, dealing with the carbon tax, financial reform, regional collaboration, and transport.

Recommendation 9: A strategic phasing out of the oil and gas industry from Singapore.

Recommendation 10: A governmental committee is set up for the greening of the Singapore economy, with a task force set up alongside to ensure the just transition of affected workers.

6. The carbon tax

Singapore's \$5 per tonne carbon tax is commonly regarded as a key mitigation measure. In general, putting a price on carbon has been a heavily politicised issue in many countries, and as a result has taken different forms owing to the different social and political dynamics in each country. Here, I will make four main points: Firstly, that there is no "optimal price" of carbon as such, and that this price will always be based on a set of political trade-offs and normative assumptions. Secondly, that nonetheless, Singapore's carbon price falls way below most guidelines of an acceptable carbon price requisite with the environmental costs of carbon. Thirdly, that while having a substantial, wide-ranging price on carbon is important and necessary, its mitigating potential should not be overstated, and that a carbon tax needs to be part of a broader policy framework that is aimed at decarbonisation. Lastly, that the process for the formulation and implementation of carbon tax policy is transparent and follows principles of fairness and distributive justice. This is particularly so in determining where the bulk of tax revenue comes from, and how the revenue from the tax will be spent.

Numerous figures have been proposed as guidelines for an "optimal" carbon price. A report by the High-Level Commission on Carbon Prices, chaired by Joseph Stiglitz and Lord Nicholas Stern, recommends that a tax of at least US\$40-80 per tonne by 2020, rising to US\$50-100 in 2030 is necessary in order to meet the targets of the Paris Agreement.³⁵ Pioneering environmental economist William Nordhaus, in an analysis of 13 models on carbon prices, found an average carbon price of approximately US\$30 per tonne in 2020 rising to US\$55 in 2030 in order to keep to a 2.5°C target.³⁶ His own economic modelling of the social costs of climate change, suggests an "optimal" scenario of 3.5°C of warming in 2100, where the 2015 social cost of carbon is US\$30 per tonne, rising to US\$42 in 2025. Adjusting the model to a 2.5°C warming projection, by contrast, brings this social cost of carbon upwards of US\$200 per tonne from 2020 onwards.³⁷ Others suggest that the carbon price should be pitched at a level that incentivises utilising negative emission technologies, which optimistic estimates say are possible at approximately US\$100 per tonne.

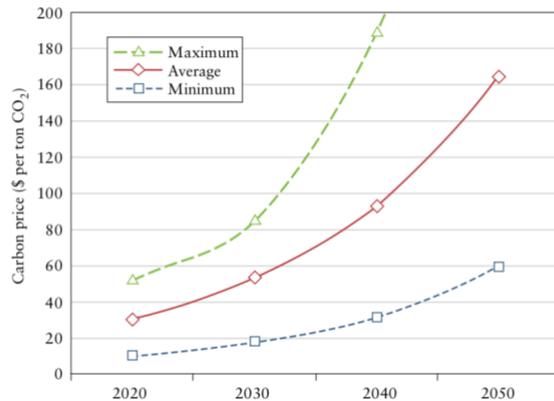


Figure 6: Average carbon prices from 13 models, according to Nordhaus.³⁸ Note: these are models for a 2.5°C target

From these figures, it is clear that Singapore’s carbon price is set at too low a level, even if the price is increased to \$10-15 per tonne in the coming years as planned. Nonetheless, it is praiseworthy that Singapore’s policy applies to all large emitters without exception. On the other hand, it is set at a level where it is uncertain if it will lead to substantive mitigation measures. The carbon tax thus has benefits and weaknesses compared to other countries, and it is in these trade-offs that we should focus our attention.

At a basic level, a much higher price will always be much better at dis-incentivising carbon emissions than a lower price, but will accordingly be less amenable to businesses, producers, or consumers for whom costs will rise. In the Singapore case, it has been outlined in parliamentary debates that the price is starting at this low \$5 level because of a need to maintain Singapore’s competitiveness and attractiveness to business.³⁹ However, such a low level might even be counter-productive in generating broad-based support for the carbon tax. A study of the behavioural impacts of a carbon tax suggests that the “nudge” approach, promising lesser benefits but starting at a lower price to “nudge” individuals towards such policies, could ultimately diminish support for more substantive policies, as they help to cultivate the false hope that a quick fix can be implemented without imposing any considerable costs on society.⁴⁰

In other countries, however, different kinds of compromises have been made. The most common compromises has been in the implementation of differential tax rates to different industries, and the use of tax relief for affected sectors. These forms of tax exemptions on the carbon tax have curbed the mitigating potential of carbon taxes, particularly in places that have implemented a relatively high tax rate, because in practice they have tended to be used for carbon-intensive sectors.

A study of five early implementers of the carbon tax from – Denmark, Finland, Netherlands, Norway and Sweden – from 1997 to 2008 found that only Finland was shown to have succeeded in achieving emissions mitigation to a significant level through its carbon tax policy, in spite of a lower carbon price than the other countries.⁴¹ The reason that the carbon

tax policies in these four other countries were not as effective in mitigating emissions came precisely down to measures to cushion dirty industries from the tax. In Denmark, businesses were reimbursed 50% of the standard rate, with further reductions in the rate the higher the carbon intensity of the firm. In the Netherlands, the energy intensive industries were given tax relief for large scale consumption of natural gas and certain types of residual fuels. In Norway, the mitigating potential of the carbon tax was negated by the push to grow its oil and gas export sector.

The last case of Sweden is particularly noteworthy as Sweden has seen the dramatic rise of its carbon tax to about US\$139 per tonne today, the highest in the world. However, exemptions and differential rates have also reduced its mitigating impacts. In the early years of implementation, a lowered rate was kept for industry, while later years saw about two-thirds these industries become exempt from the Swedish tax in lieu of the EU-based European Trading System, which has maintained a far lower carbon price than Sweden's. Over the period of 1991-2014, total emissions dropped by almost 24%, but emissions from iron and steel, two of the dirtiest industries, rose about 10%.

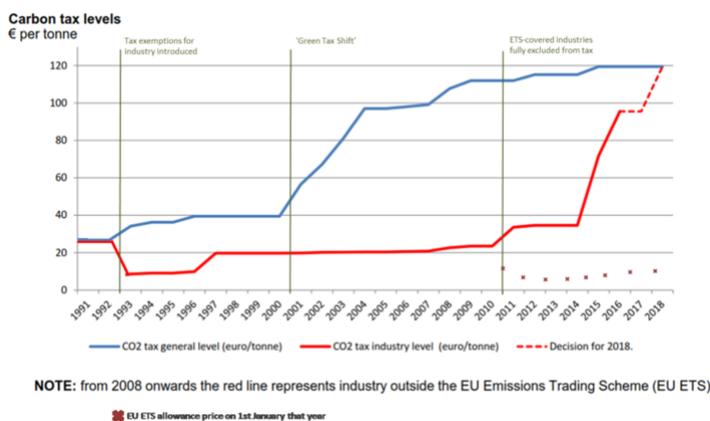


Figure 7: Sweden's general and industry carbon tax rates over time. The dramatic increase to Sweden's carbon tax for industries came only after the 2011 move to exempt two-thirds of industry from Sweden's tax in lieu of the lower priced EU ETS.⁴²

From this, it can be deduced that the carbon tax does not by default lead to increased emission mitigation. In most cases, exemptions and differential rates have severely negated impacts on dirty industries.

On top of market mechanisms such as the carbon tax, additional policies also need to be implemented to direct firms to decarbonise. Even in cases where there is a high carbon tax, if the costs for decarbonisation still exceed this high tax rate, dirty emitters will still find it preferable to absorb the costs of the increased tax rather than move to low-carbon options. In such cases, the supply becomes price inelastic, and the tax serves more as a way of extracting rent from a profitable industry than to decrease emission-heavy activities. A recent study on the incidence of a carbon tax on global CO₂ emissions shows this in rather stark terms: a

carbon price even as high as US\$200 per tonne would only reduce cumulative emissions from oil by 4%, and a carbon price of US\$600 would be needed to reduce cumulative emissions by 60%.⁴³ The implication from this is that reducing emissions cannot just be reduced to market-based measures, but that there has to be a comprehensive plan for decarbonising society in order to achieve widespread emissions mitigation.

Given the ubiquity of exemptions for carbon-intensive industries, it is indeed praiseworthy that Singapore's carbon tax has from the start kept a flat rate for all, and it must be emphasised the importance of keeping to this no-exemption approach even as the carbon tax is raised. Even then, however, the carbon tax would still not be a sufficient measure. Ideally, it should be pitched at a higher level of at least \$40-80 per tonne, but it should not be the main pillar of the emissions reduction strategy. Rather, it must come as part of a suite of measures that takes comprehensive steps towards decarbonisation.

Lastly, it should not be forgotten that a carbon tax is also ultimately a fiscal measure, and how the revenue is earned and spent needs to be determined in a just and transparent manner. As underscored by the aforementioned examples of the four countries mentioned above, as well as the earlier examples of Australia and France, the carbon tax should be aimed at penalising most severely the dirtiest actors, and not redirecting the tax revenues back towards them. There are two possible ways in which this can be done – a decarbonisation fund and a carbon dividend.

A decarbonisation fund would mean that the revenues gained from the tax are committed firmly towards decarbonisation and low-carbon innovation. This would exist as part the Singapore budget and be jointly administered by the finance and environmental ministries. Such a fund would then act as the medium where all revenues from the carbon tax goes, and where strict guidelines are set on the permissible use of the funds.

The carbon dividend would entail the redistribution of tax revenues straight back to citizens, meaning that measures for decarbonisation would be funded fully through conventional revenue sources. This is potentially be the preferable option for a number of reasons. Firstly, taxes have tended to be a politically fraught issue, as we have seen from the Yellow Vests protests, and more generally the intense opposition to taxes of all forms demonstrated in sections of American society. Secondly, if there is to be a serious intent to decarbonise fully, the carbon tax would only be a short-to-medium term solution, as the amount of revenue generated by the policy would gradually decline as emissions are reduced. The large amounts of investments required to green the economy should be funded by more consistent forms of revenue, and not by a policy whose revenue would decrease the more successful it is in achieving its objective. Thirdly, a carbon dividend can be tailored and distributed in progressive ways, and be channelled more towards poorer and lower-income households. It can also be directed more towards workers affected by the phasing out of carbon-intensive industries, ensuring that there is a just transition to a green economy.

Lastly, a carbon dividend would potentially generate more political support. A redistribution of this carbon dividend back to citizens would help to defray the potential added costs on consumers for the carbon tax, and give them a stake in supporting an ambitious carbon tax policy while maintaining the onus on producers to reduce emissions. A large study of participants from five different countries (albeit each with much different contexts from Singapore) showed more consistent public support for a substantial carbon tax across these countries if the revenue from the tax was directed straight back to citizens, as shown in Figure 8.

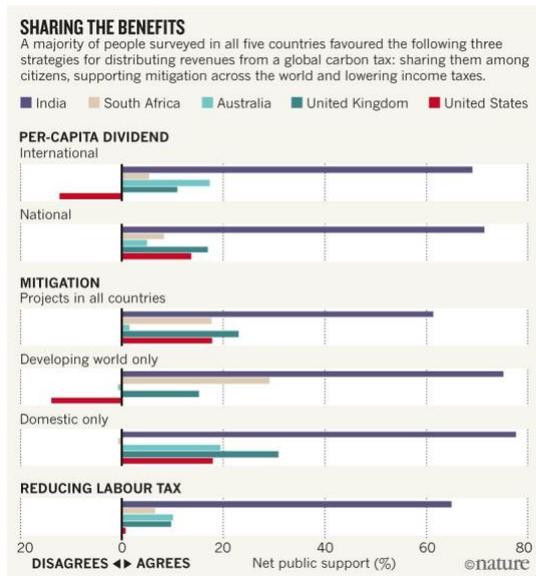


Figure 8: Support for a Carbon Tax across five countries. Source: S. Carattini, S. Kallbekken & A. Orlov⁴⁴

Recommendation 11: That the carbon tax rate be raised to a more appropriate level of at least \$40-80 per tonne.

Recommendation 12: That the current flat-rate, no-exemption approach to all large emitters be strictly retained even as the carbon tax rate is increased.

Recommendation 13: That the carbon tax be part of a suite of supporting decarbonisation policies, and not the main pillar of a mitigation strategy.

Recommendation 14: That revenues from the carbon tax redistributed back to citizens through a progressive carbon dividend, which is used to ensure a just transition to a green economy.

7. Financial risk and financial transformation

Singapore is widely acknowledged as a financial hub within the region. Given this privileged status, there needs to be a greater scrutiny on the ways in financial markets help or inhibit

decarbonisation, the risks that climate change brings to financial market, and how the financial industry can be reformed to be a driver of decarbonisation.

The importance of financial markets in view of the climate crisis cannot be understated. Numerous studies have pointed out how financial markets today fail to adequately account for climate risks. Frequently cited is that the analysis horizons of market actors are far too short to take note of longer term climate. Mark Carney, Governor of the Bank of England and Chair of the Financial Stability Board, suggests that this brings forth a “Tragedy of the Horizon”, whereby “the horizon for monetary policy extends out to two to three years. For financial stability it is typically a bit longer, but typically only to the outer boundaries of the credit cycle - about a decade. In other words, once climate change becomes a defining issue for financial stability, it may already be too late.”⁴⁵

The risks of climate-induced financial shocks include market risks, insurance risks, and liability risks. Market risks involve mainly the possibility that fossil fuel assets become stranded.⁴⁶ A key reason for this is that market valuations of fossil fuel companies are based on their proven fossil fuel reserves, which presumes that those reserves will be tapped on and extracted in the future. At the same time, it is projected that approximately 80% of this fossil fuel stock must be kept in the ground in order to keep to the targets of the Paris Agreement.⁴⁷ Put simply, fossil fuel companies are aiming to extract fossil fuels at a level about five times the permissible amount to avert climate catastrophe, meaning that these fossil fuel assets are likely to be overvalued. As a study by the 2°C Investing Initiative has found, compared with a pathway that would limit warming to a 2°C level, global market capitalisation under-weights renewable power generation by 19-36%, electric car production by 66-96%, and over-weights coal-fired power generation by 7-16%, oil and gas production by 12-14%, and coal production by 0-31%.⁴⁸

This means there is a substantial risk that these assets will ultimately become stranded, subjected to premature write-downs, or subjected to massive climate-induced shocks. It could certainly be the case that what we are seeing is a carbon bubble that could lead to a financial collapse in the future.

Today, it is estimated that approximately one-third of equity and fixed-income assets globally belong to sectors related to natural resources, extraction, carbon-intensive power utilities, chemicals, construction, and industrial goods, meaning that the risks of stranded assets amount to US\$1-4 trillion, rising to \$20 trillion in the broader industrial sector. By comparison, this far dwarfs the financial crisis of 2008, where the subprime mortgage crisis worth about US\$1 trillion ran into losses worth several hundred billion dollars.

Furthermore, if climate catastrophe is to lead to widespread damages in society, it might well overwhelm the ability of the insurance industry to act as a shock absorber for society, both in terms of physical damages as well as losses to assets. For example, average annual losses from wildfires have drastically risen in recent years, from below US\$5 billion since the turn of the millennium to over US\$20 billion in 2017 and 2018, which might lead to insurance

premiums rising beyond what many people can afford.⁴⁹ As a result, executives from insurance giants such as AXA and IAG have suggested that a four degree world almost certainly be uninsurable.⁵⁰

Finally, fossil fuel assets run liability risks. These are the risks that enormous costs are imposed on fossil fuel companies who are judged to be legally responsible for climate damages and losses, and are forced to financially compensate other parties. While most of these lawsuits have originated in the US, lawsuits aimed at reducing greenhouse gas emissions have arisen in an increasing number of jurisdictions, including Australia, the EU, the United Kingdom, New Zealand, Canada, Spain, Pakistan, India, Indonesia, South Africa, Colombia and Brazil.⁵¹ Even though these are not directly happening in Singapore, it is still important to note that many of the fossil fuel corporations that Singapore is heavily invested in are common targets of such climate-related lawsuits.

Given that the climate catastrophe is already likely to lead to widespread dislocations and social ruptures, the possibility that collapses in the financial or insurance industries might happen simultaneously is unconscionable and must be averted. In view of this, economists at the Bank of England have suggested two possible scenarios: either 1) the existing status quo in financial systems is preserved, fossil fuel industries continue to receive widespread subsidies from state actors around the globe, and investment in renewable alternatives remains insufficient to displace fossil fuels, leading not just to widespread environmental collapse, but enormous shocks to the financial system, or 2) governments commit to full-scale decarbonisation, and produce comprehensive plans that allow financial markets to clearly identify fossil fuel losses and efficiently phase them out with minimised shocks to the system.

The choice facing policymakers here is stark. As François Villeroy de Galhau, governor of the Banque de France, puts it: “it is delusional to think that when risks become perceptible, everyone will be able to cut their exposures at the same time and in an orderly fashion.”⁵²

This would require substantive reform to the financial industry, and a redefining of fiduciary duties that incorporates longer term accounting of climate risks and commits financial actors to environmental objectives.

One measure currently in place to promote green finance has been green bonds, which are earmarked for projects that have positive environmental benefits. These green bonds thus help to channel financial capital towards projects and innovation that achieve green objectives. Because sustainability-minded investors will have a higher demand for green bonds, the cost of capital for green projects will be lowered, driving further adoption and innovation.

However, in the absence of a more rigorous supporting policy environment, its positive effects are still limited. This is because of a lack of enforceable standards on what constitutes green projects – most issuers use ICMA Green Bond Principles, which define broad eligible

categories but not in any strict technical detail. As a result, certain questionable projects have been financed by green bonds. Chinese banks, for example, have included “clean coal” projects under their green bond use of proceeds.⁵³ More pertinently, there are little concrete financial incentives for these green bonds relative to conventional bonds, and no means of dis-incentivising dirtier assets, which means that in many cases green bonds do not directly replace investments in fossil fuel assets.

Indeed, global renewable energy investment has been on the decline in recent years,⁵⁴ while investments into oil and gas rebounded in 2018, rising for the first time since 2015.⁵⁵ As the International Energy Agency notes, “there are few signs of the substantial reallocation of capital towards energy efficiency and cleaner supply sources that is needed to bring investments in line with the Paris Agreement and other sustainable development goals.” More broadly, the IMF estimates that global fossil fuel subsidies totals US\$5.2 trillion, or approximately \$10 million a minute.⁵⁶ The proliferation of such subsidies constitute major barriers to the development and adoption of renewable energy technologies.

As a result, many of such green projects, particularly those pertaining to new technologies, do not have favourable risk/return profiles, which means that the development of such technologies should not be left to financial markets alone.

Singapore, as an important financial hub for the region, has the means for using this power to take the lead in transitioning to a low carbon future. This can be done through Singapore’s sovereign wealth funds, and through the role of central banks and monetary policy.

While the ostensive aim is to ensure that healthy returns on investments can be generated, they have also been involved in building up infrastructure in developing areas around the region. The flipside of this is that the accounts of various institutional actors reveal exposure to many dirty and carbon-intensive assets. Most notably, the major banks have been involved in major coal financing projects around the region, which has received major scrutiny from civil society groups.⁵⁷ As Market Forces has revealed, this includes 13 deals for coal-fired power stations worth US\$1,409 million, five coal port deals worth \$630 million, and four focused on coal mining worth \$372 million.⁵⁸ While public pressure has forced these banks to announce a stop to financing new coal plants, this has not been extended to projects it is already financing, including the Vung Ang 2 and Van Phong 1 power stations in Vietnam, and Java 9 and 10 in Indonesia. This is extremely problematic given that coal is by far the dirtiest fossil fuel in terms of emissions, and Southeast Asia is still increasing its coal demand at a time when the rest of the world has already made moves to curb, if not eliminate the use of coal to serve energy demands.⁵⁹ The continued financing of these coal plants around Southeast Asia abets climate catastrophe in one of the most vulnerable regions in the world, where 450 million of its 650 million inhabitants living in low-lying coastal areas.⁶⁰ Similarly, public universities here have come under increasing pressure to divest their endowment funds from fossil fuel assets.⁶¹ While public pressure has played a key role in pressuring banks and other institutions to move away from coal financing, the most effective way of bringing about

change should definitely start from state policy, which can then shape the investment decisions of banks and other institutional actors.

Financial reform that places decarbonisation on its agenda should start from the sovereign wealth funds. An article by Robinson and Fabian in the Straits Times suggests four steps in which this can be done: 1) the funds themselves become world leaders in financing low-carbon infrastructure, capturing the incentives that governments are directing towards a green economy, 2) the aforementioned longer term risk assessments are incorporated into investment decisions, 3) the funds use their institutional might to lobby the boards of companies to identify, report and manage the transition to a low-carbon economy, and 4) the funds collaborate closely with policymakers to factor in the real costs of carbon-intensive assets, and drive the change locally and regionally towards low-carbon infrastructure.⁶²

MAS can also play a crucial role by making reforms to its monetary policy. This is important as financial markets play a key role in determining investment costs and serve as a reference point for investment decisions. This can be done through the development of appropriate environmental risk measures, and the integration of such measures into asset purchase strategies and collateral frameworks. One promising proposal would be to increase capital requirements for carbon-intensive lending.⁶³ For such loans that are heavily reliant on fossil fuels, or carry a higher carbon risk, an increased capital requirement would help to reflect the actual, growing systemic risk that comes with investing in carbon intensive activities. This would bring two main benefits: carbon-intensive investments would be dis-incentivised relative to low-carbon investments, and the increased capital requirements would add a greater buffer to increase resilience against the losses that are expected from a carbon bubble.

On top of that, a possible measure would be the creation of an entirely new development bank that is explicitly focused on providing low interest loans for green projects. A Green Investment Bank of Singapore would have the institutional mandate to take the lead in financing green innovation in Singapore and around the region. A recent report by the WWF suggests that banks around the Southeast Asia are still lagging behind in addressing the risks posed by climate change, with only 9% having no-deforestation policies, while 91% continue to finance coal plants.⁶⁴ The report indicates that Singaporean banks are by no means the worst in the region, but as a financial hub, Singapore could certainly be playing a more proactive role in filling the massive need for sustainable infrastructural development in the region. Another report jointly conducted by the United Nations Environment Programme and DSB estimates that the amount of additional investment needed in Southeast Asia until 2030 totalling US\$3 trillion, including \$1.8 trillion in infrastructure, and \$400 billion each in energy efficiency, renewable energy and food, agricultural and land use.⁶⁵

Recommendation 15: That the sovereign wealth funds take the lead in financing low carbon investment and infrastructure development.

Recommendation 16: Set standards for risk assessment that factors in long-term climate risks, and ensure that all institutional investors follow these standards.

Recommendation 17: Create a Green Investment Bank of Singapore to provide low-interest loans for green projects.

Recommendation 18: Revise monetary policy to dis-incentivise brown investments and incentivise green investments through adjustments in capital requirements.

Recommendation 19: Divest all public institutions from fossil fuel-related assets.

8. Increasing regional collaboration to meet energy needs

The previous sections have already touched on some of the important circumstances Singapore faces in formulating its climate policy – Singapore does not have the resources to support its current level of development or energy demands, while our larger but poorer neighbours are pursuing development in ways that bring increased climate risks. Meanwhile, as PM Lee stated at the National Day Rally, there is still a need for more global action to be taken in order for emissions to be reduced.

If the solution is to come from international agreement, Singapore's climate policy must then also focus on how we can play a more proactive role on the international stage. The most effective way that Singapore can do this is to focus on the region, where Singapore enjoys a relatively powerful and wealthy status, and can thus utilise that towards environmental outcomes. The previous section has already elaborated on what Singapore can do in greening the financial system around the region, and here I will focus on how Singapore can be a major protagonist in greening the regional energy grid.

Singapore's energy mix is currently still heavily fossil fuel dependent. As of 2015, renewable energy still takes up a small proportion of Singapore's electricity generation at less than 1%, and is only projected to reach 20% by 2050. However, the breakdown of this entire energy landscape warrants some investigation given that it is commonly reiterated that it is simply not technically possible for Singapore to have a higher proportion of clean renewable energy. As shown in Figure 9, however, the vast majority of Singapore's energy demand comes from the industrial-related activities.

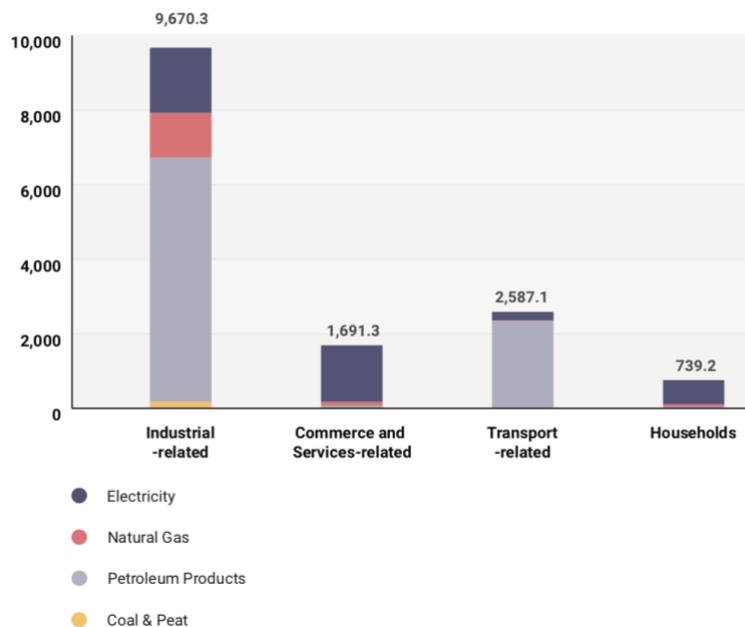


Figure 9: Singapore’s total energy consumption by sector and energy product in 2016.
 Source: Singapore Energy Statistics 2018⁶⁶

A phasing out of the heaviest industries, as proposed earlier, would thus help to reduce the enormous energy demand from petroleum products, and go a long way to reducing emissions. In the remaining sectors, households and commerce and service-related sectors are already predominantly electricity based, while the transport sector will be as electrification of vehicles are carried out. From there, reaching a net-zero target would then turn to the question of moving electricity generation to renewable resources.

It is widely noted that Singapore is not well-endowed in terms of renewable energy resources, lacking the means to deploy hydropower, wind, biofuel or geothermal energy. Its main renewable resource is solar, where Singapore receives about 50% more solar radiation than more temperate regions, but is still relatively limited its small land size. Nonetheless, it is estimated that, on its own, rooftop solar panels will be able to provide energy for 30% of public housing and 50% of private condominiums.⁶⁷ The government should thus take the lead in maximising the installation of solar panels on HDB rooftops, and expanding solar leasing programs nationwide for private property owners. Going beyond this, Singapore could play a more proactive role in greening the Southeast Asian economy.

In contrast with Singapore, Southeast Asia remains a largely developing nation, but is also quite well-endowed in terms of the renewable energy resources. Climate policy thus needs to look at how greater collaboration can be pursued with our regional partners, specifically in ASEAN. In spite of the large potential for renewables around the region, this has largely been untapped. The primary reason for this is that burning fossil fuels, particularly coal, is still the cheapest way to acquire energy. In addition to this, the high capital costs involved with renewable generation, as well as the lack of connection and network transmission infrastructure for remotely located renewable generators have been identified as barriers to

the further deployment of renewable energy in poorer countries.⁶⁸ The ASEAN Power Grid (APG) is the primary regional mechanism for integration of the energy grid. In order to serve energy needs here and around the region, Singapore should work towards accelerating and expanding development of the APG. A proposed model for optimising long term investments in sustainable development suggests that more collaboration in ASEAN is needed to achieve a low-emission scenario.⁶⁹ For Singapore, this would mean more collaboration to create a connection line transporting biomass and geothermal electricity from Sumatra to the Malay Peninsula and Singapore.

Recommendation 20: For Singapore to work more closely with ASEAN Partners to develop the ASEAN Power Grid

9. Transport

Under Singapore's latest BUR, transport takes up a combined 16% of primary and secondary emissions from Singapore's 2014 greenhouse gas emissions profile. Compared to other urbanised cities, Singapore's approach to transport deserves credit for its general effectiveness at alleviating the traditional issues with personal motorised transport. By severely restricting the supply of cars through the VQS/COE policy, Singapore suffers far less from the dual issues of pollution and traffic congestion that have plagued many cities. It is also commendable that the government has announced that its fleet of public transport vehicles will progressively be shifted towards electric vehicles, a change that will bring further benefits the more quickly the electricity grid can be shifted towards renewable sources.

However, there is still scope for further reducing this 16% of emissions from the transport sector, while also helping to create a more equitable society. A main pillar of transport policy is the move towards a "car-lite" society. This move away from cars is commendable given the numerous studies that show the many disadvantages of cars compared to alternative forms of transport, including health, fatalities, land use, as well as emissions.⁷⁰ A further stretch goal for this car-lite ambition would be a post-car future, which should aim to make the public transport network a faster and more efficient form of transport than the personal automobile. This brings the potential for significant reductions in emissions.

The existing LTA Master Plan for 2040 is aiming for a 20 minute town, 45 minute city vision. The is planned around the Walk-Cycle-Ride modes of transport, indicating strong existing efforts at working towards such a vision of interconnected, efficient and accessible public transport that is free of dependence on the personal motorcar. Given that the first two are generally used for shorter distances, the accomplishment of this vision will depend to a significant extent on the Ride component, defined in the plan as public transport such as buses and trains and point-to-point transport defined as taxis, private hire cars and shared cars. How much this vision can lead to a reduction in emissions will likely come down to how transport infrastructure be developed to favour cleaner types of public transport. As

already stated, the public transport network should aim to make trains a faster, more efficient and desirable means of commuting than cars – be it personal cars, private hire cars, and taxis – in the majority of travelling contexts.

This can be illustrated by an approximate ranking of the estimated emissions per person that might come from each type of transport, which should follow roughly, in descending order: personal cars => private hire cars/taxis => buses => MRT trains => PMDs => walking

To put simply, the aim of the transport plan should be to shift commuting practices to the right of this axis as much as possible, but centred around the MRT network as the predominant mode of transport across the city. This is important because the propagation of ostensibly greener forms of transport might ultimately lead to even more energy consumption.

As an example of this, the rise in private hire ride-sharing firms such as Grab and Go-Jek are often seen as cleaner forms of transport, primarily because their fleet of vehicles contain a much higher proportion of hybrid or electric vehicles than the car population. As such, they would lead to lower petrol consumption if motorists decide to use such services rather than buying and driving their own personal automobiles. Conversely, if public transport modes cannot be competitive enough, based on cost and travel time, with private hire options and taxis, enough people might move away from travelling by bus or train that emissions will be increased.

Anecdotally, this is a rather common occurrence for people in my age group and within my social circles. Because many people my age do not own our own cars, the typical options available to us are either buses, trains, or private hire cars/taxis. For many of us, travelling by Grab or taxis is simply the faster and more convenient form of transport, and is often worth the higher prices, especially during periods when such fares have discounts and promotions. This trend could be seen at a wider societal level around 2016-2017. In spite of the trend of decreases in car population (approximately 2% from 2013-2017) and decreases in the average mileage per motorist (16,700km, a fall of 21% from 2006), petrol consumption still rose approximately 3% to a record 6,453,600 barrels of petrol in 2017.⁷¹ Notably, this was the period in which there was intense competition between Uber and Grab, leading to a proliferation of discounts which dramatically lowered prices for commuters. What seems to have happened here is thus a typical example of the phenomenon known as the Jevons paradox, where increased efficiencies or lower prices drive increased consumption, negative efficiency increases and surpassing the original consumption levels.⁷²

To be clear, this is not to say that lowering the costs for transport is necessarily a bad thing, but that ramifications on emissions should always be taken into consideration. Promoting ride hailing services is desirable if it replaces more polluting private car ownership, but not if it shifts commuter choice away from cleaner forms of public transport. In view of this, the development of MRT rail networks should be strongly prioritised over the building of more

roads and highways in Singapore's urban planning, and policies should also aim to keep public transport affordable by freezing fare increases.

Furthermore, there should be greater efforts to expand the infrastructure for walking, cycling, and PMDs. This can include repurposing smaller streets into pedestrian areas, and increasing the space accorded for cycling lanes on roads. Furthermore, there should be greater installation of infrastructure for parking of bicycles and PMDs, as well as adapting public transport to better accommodate such users.

In addition to making public transport more viable relative to cars, there are other reasons why this would be desirable. Firstly, expanding road networks brings questionable benefits, as studies have shown that increasing the road space typically leads to more car traffic to fill that increased space – another example of the Jevons paradox.⁷³ Secondly, because the car population, by virtue of the high price of COEs, is made up of a relatively higher income demographic, using government funds to expand the road network would be a more regressive measure. Using government funds to expand the MRT rail network, on the other hand, would lead to benefits that can be enjoyed by a much larger cross-section of the Singapore population. Lastly, it would be a much more efficient use of land in terms of the number of commuters it can ferry within a given space.

Recommendation 21: Enhance existing plans for a “car-lite” society to aim for a “post-car” society

Recommendation 22: Set a target to make public transit an affordable, more efficient and more pleasant form of transport than cars.

Recommendation 23: Redirect infrastructure development from roads and highways to further enhancing the MRT rail network.

Recommendation 24: Expand pathways and infrastructure for walking, cycling, and PMDs.

10. Shifting away from GDP growth as a national priority

This final section suggests a broader, longer term and more all-encompassing shift that works towards making Singapore more environmentally sustainable, while also looking to rethink how we as a society conceive of our overarching societal objectives. For over five decades, Singapore's progress as a nation has been defined predominantly by the pursuit of economic growth in the form of GDP. This single-minded drive towards GDP growth has brought Singapore towards its current status as a developed and wealthy nation, but latest trends increasingly show that GDP is an incomplete, if not problematic indicator for societal well-being. There are several interconnected reasons for this.

Firstly, and most importantly, it has been widely shown that GDP is still largely correlated to emissions, and accordingly the pursuit of GDP is likely to drive the growth in emissions. Singapore's pledge makes targets based around emissions intensity, which aims to reduce this correlation by reducing the emissions for each dollar of GDP. This is known as relative decoupling, where there remains a positive correlation between GDP and emission, but policy, technological advancement and efficiency improvements lead to reductions in the correlation.

By contrast, absolute decoupling refers to the elimination of this correlation. While individual countries have been able to peak and reduce their emissions while maintaining economic growth, this has been done predominantly by “outsourcing” their dirtiest sectors to other countries rather than by the categorical overcoming of this correlation.⁷⁴ Numerous analyses of global, historical trends have indicated that such absolute decoupling has indeed not occurred, and that it would be a misleading policy objective to pursue growth-oriented policies on the assumption that it can be achieved.⁷⁵ Further empirical data suggests that growth-oriented pathways are simply not compatible with the Paris Agreement and the 1.5°C pathways set out by the IPCC.⁷⁶

Secondly, the link between GDP and well-being is at best questionable. When GDP was first formulated in the 1930s by economist Simon Kuznets, it was simply a measure of economic activity – the amount of goods and services being bought and sold through market transactions. How much this leads to improvements in people's livelihoods depends on the extent to which consumption improves well-being. Undoubtedly, at lower levels of economic development such growth leads to widespread societal benefits, particularly in poverty reduction and the uplifting of people from material deprivation. This was certainly the case for Singapore in the earliest decades of independence, where rapid economic development propelled us to our current privileged status.

However, it has also been shown that past a certain point, the effects of increased GDP start to diminish. An alternative indicator for well-being, the Genuine Progress Indicator (GPI), has shown that in both the US and the UK, GPI rose in the period from 1950-1976 in line with GDP growth, but has since fallen in spite of GDP continuing to steadily rise.⁷⁷

Growth can also lead to a “hedonic treadmill”, where increased wealth drives greater desires and therefore greater consumption, but without a corresponding increase in well-being or happiness. In contrast, consumption beyond the level of material need becomes more closely tied to consumer culture and a desire to demonstrate or improve one's social status vis-à-vis his or her peers. Taking this even further, it has been shown that the conspicuous consumption practices of the ultra-rich creates an ecological footprint likely to surpass entire nations.⁷⁸

Between the clear links between GDP and emissions, and the questionable links between GDP and well-being, it can be seen that turning away from GDP as a metric would help to

make Singapore more ecologically sustainable without any compromise in our progress towards bettering other social outcomes.

Thirdly, Singapore is in any case already having to adapt to a “new normal” of slower economic growth. While Singapore since independence has always been able to expect high rates of growth, sometimes reaching double-digit figures, since approximately 2015 expectations have been revised down to 2-4%, with 2019 forecasted to achieve only 0-1%. The decisions facing policymakers during high-growth and low-growth scenarios are drastically different. In periods of high growth, there are enough economic gains that they can be spread around among different sectors of society without much conflict or division. In low periods of growth, on the other hand, economic gains become much more thinly spread, which has ramifications for division and inequality in society. This has been evident especially in the US. As Stiglitz has pointed out, even though the economy has grown in every year since the 1980s, most of the benefits have gone to economic elites, while real wages for the majority of the people have declined. The result is America’s present day political disarray.

This suggests that as a society’s rate of growth levels out, distribution of wealth becomes the more pressing issue than absolute wealth. A seminal book by Kate Pickett and Richard Wilkinson, *The Spirit Level*, argues that once a threshold for national income is passed, growth no longer leads to increases in health or happiness, and that social ills become contingent more on the amount of inequality in society than in the overall level of wealth.⁷⁹ Singapore’s political system is clearly still in much better health than America’s, but it is still worth noting that inequality has become an increasingly pressing today.⁸⁰ A pivot away from the current focus on GDP growth would thus help to shift our priorities by allowing us to directly target other forms of societal good, including the many forms of environmental and social well-being not currently accounted for in the GDP metric.

Lastly, other countries are already looking beyond GDP growth as a social priority. Most prominently, New Zealand recently announced that their 2019 budget would instead focus on how government spending impacts various forms of well-being, namely mental health, child poverty, indigenous rights, digital flourishing, and a low-carbon economic transition. One idea on trial in New Zealand is a shortening of the work week to four days. In addition to numerous work and well-being associated benefits such as better productivity and more leisure time for workers, a reduction in working hours would help to reduce levels of consumption and decarbonise the economy.⁸¹ Other countries such as Scotland and Iceland have also announced their intention to move away metrics based around GDP.

While this would be a major shift in the thinking that has defined Singapore as a nation for over five decades, I propose that at least serious consideration be given to these ideas. This could start by closely monitoring developments in New Zealand, with a view to assessing how this could be adapted to fit Singapore’s context.

Recommendation 25: To closely monitor developments in New Zealand in moving away from GDP growth-based societal metrics, with a view to adopting and adapting it for Singapore's context

Closing Comments

I would again like to thank the NCCS for opening this channel for public consultation. I am aware that many of these ideas go far beyond the current thinking of the government, but in my view they reflect the kind of transformative change needed given that climate change will surely become the defining issue of the coming generations. I sincerely hope these ideas will be given due consideration.

“Avoiding climate breakdown will require cathedral thinking. We must lay the foundation while we may not know exactly how to build the ceiling.” - Greta Thunberg

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