

## How a proactive approach to ESG can limit downside risks in Emerging Markets

Within EM there are large discrepancies between companies in how they are tackling climate change. This paper examines stock holding, TSMC, one of the world's largest semiconductor companies, and how it is taking the lead in reducing its carbon footprint, not just among EM companies but also globally. This proactive approach to ESG is consistent with our observation that the best ESG performers in EM tend to outperform those with weak internal ESG processes.

*This information has been prepared by Northcape Capital, the underlying investment manager for the Warakirri Global Emerging Markets Fund.*

### Taiwan Semiconductor Manufacturing Company (TSMC) – Pathway to Decarbonisation

In our latest paper we take a deep dive into the challenges Taiwan Semiconductor Manufacturing Company (TSMC) faces in reducing its carbon footprint. As one of the world's largest semiconductor companies TSMC's greenhouse gas (GHG) emissions are currently sizable. **The last 8 years have however seen TSMC take a highly activist approach to reducing this footprint culminating in the company committing this year to being net carbon neutral by 2050.** TSMC's decision to commit to this target is not just philanthropic. If TSMC doesn't address its GHG emissions it potentially faces significant costs over the medium to long term as governments increase the price of GHG emissions.

We see TSMC as taking the lead in tackling its greenhouse gases not just amongst EM companies but also globally. This proactive approach to ESG is consistent with our observation that the best ESG performers in EM tend to outperform those with weak internal ESG processes. TSMC's tackling of its GHG emissions therefore reflects the company's high ESG standards and Northcape's view that it is a high-quality company under our "8 principles" framework.

### Semiconductor Industry GHG Emissions

The semiconductor industry is currently a significant generator of greenhouse gas (GHG) emissions. The 7 largest semiconductor companies (Samsung, TSMC, Micron, SK Hynix, Kioxia, Intel, and UMC) represent 71% of the total global semiconductor "wafer" production. These seven companies alone reported total emissions of 46.5 million tons of CO<sub>2</sub> equivalent in 2020. To put this in perspective, the emissions from these seven companies are equivalent to 30% of emissions generated from the burning of coal in Australia (165 million tonnes according to the International Energy Agency (IEA)).

Semiconductor manufacturing GHG emissions are approx. 35-40% what are termed Scope 1, or emissions generated directly from the manufacturing process itself.

Semiconductor manufacturing is an increasingly complex process utilising a variety of chemicals and high global warming potential (GWP) gases to burn in microscopic patterns and scrape off the unneeded portions on the surface of the silicon wafers. These gases are 1,000 to 10,000x more potent GHGs compared to CO<sub>2</sub>. Anywhere between 10-80% of these fluorinated GHGs can be released into the air during the semiconductor manufacturing process.

**Semiconductor manufacturing facilities also consume very large amounts of electricity.** Electricity is consumed both in the hundreds of process steps (including the use of ultraviolet lasers to etch transistors onto the surface of the semiconductor wafers) but also in the need to regulate the air temperature, humidity etc. in these very large manufacturing fabs. For example, TSMC's annual electricity consumption is estimated by Greenpeace in 2019 at 4.8% of Taiwan's entire usage, and more than that of the capital, Taipei. Approximately 60-65% of semiconductor manufacturing GHG emissions therefore come from sourcing this large amount of electricity (termed Scope 2 emissions), usually from the national power provider.

The end result has been that the overall GHG emissions from the major semiconductor companies have been growing by 9% per annum since 2015. The major semiconductor companies have realised that this situation is untenable. Given growing long-term demand for semiconductor chips and growing complexity in the manufacturing process, a lack of action would likely result in industry GHG emissions continuing to grow at close to 10% per annum. With governments committed to a significant reduction in emissions between now and 2050 **all major semiconductor companies have initiated actions to materially reduce their carbon intensity.**

### TSMC Carbon Commitment Timeline

In 2015, with growing global awareness of the threat from Climate Change the Taiwan parliament passed the Greenhouse Gas Reduction and Management Act. This legislation set the long-term national GHG emission reduction goal to reduce GHG emissions to 50% of 2005 GHG emission levels by 2050. The passing of this law was a spur for many Taiwanese corporates, including TSMC, to increase their focus on the issue.

In 2016 TSMC’s first major step in tackling GHGs was the initiation of the company’s “Carbon Management Platform” incorporating executives from Corporate EHS (Environmental, Health and Safety), Finance, and Operations. This group was established to set up a formalised GHG monitoring process, forecast TSMC’s GHG emissions and oversee TSMC’s transition to renewable energy. Prior to the initiation of this group TSMC had no formalised corporate strategy to reduce GHGs. TSMC also joined the Science Based Targets Initiative, (SBTi) in 2016, an initiative which aims for companies to set reductions in line with the Paris Agreement (overall global emissions cut by roughly 50% by 2030).

In 2019 TSMC commitment to reducing GHGs was demonstrated by the establishment of a ESG Steering Committee led by TSMC’s Chairman Mark Liu. **This committee elevated the formulation of the company’s long-term GHG strategy to the highest levels within the company.**

TSMC’s efforts in reducing its carbon footprint culminated in 2020 when it signed the world's largest renewable energy purchase agreement with Danish firm Orsted. The 20-year fixed price agreement will see TSMC purchase all the 920MW of power generated by an offshore wind farm located in the Taiwan Strait to be built by Orsted. The project is expected to begin operations in 2025/26. This power purchase agreement sees TSMC become the first semiconductor company to join the RE100 initiative, committing the company to use 100% renewable energy by 2050.

In 2021 TSMC has further strengthened its commitments to reducing GHG emissions by revising its Climate Change Statement declaring the target of Net Zero Emissions by 2050.

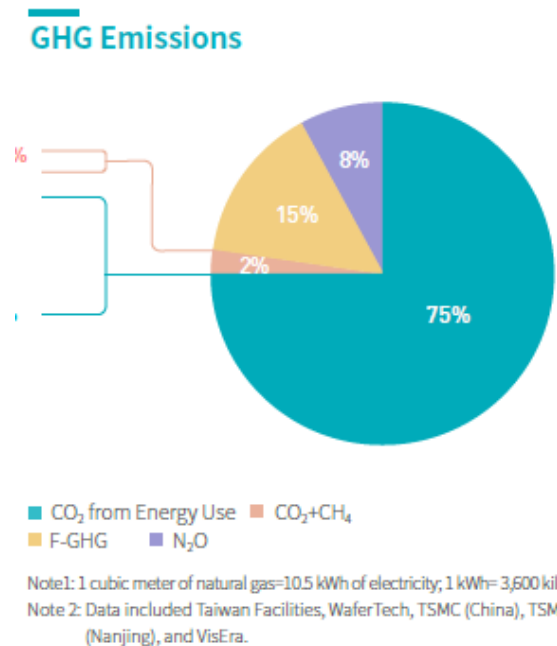
### TSMC GHG Reduction Progress and Initiatives

TSMC has highlighted **3 key strategies in reducing its GHG emissions:**

**1. Drive Low Carbon Manufacturing** - The key to reducing TSMC Scope 1 GHG emissions is the use of technology to minimise the release of fluorinated GHGs and nitrous oxide from TSMC’s manufacturing process, which represent 15% and 8% of TSMC’s total GHG emissions respectively (see Exhibit 1).

For example, in 2020, TSMC replaced and installed 684 point of use abatement equipment pieces for fluorinated GHGs and nitrous oxide with the aim of reducing the release of these gases. Despite these efforts GHG emissions generated directly from TSMC’s manufacturing process have grown 4% per annum between 2015 and 2020 demonstrating the difficulty in reducing these emissions. TSMC has indicated that with continued investment in technology they are hoping to achieve flat overall carbon emissions attributable to its manufacturing process over the next 5 to 10 years.

**Exhibit 1: TSMC GHG Emissions by Source**



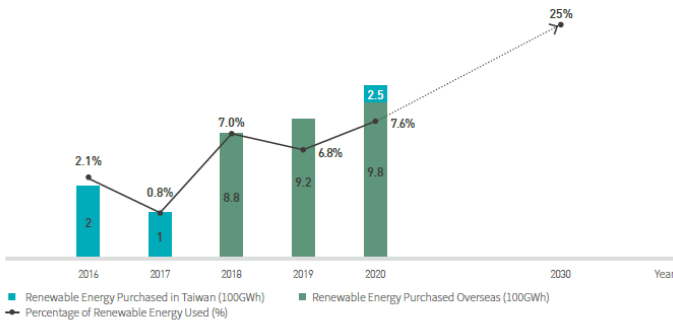
**2. Increase the use of Renewable Energy** - As of 2020, TSMC sourced 7.6% of its energy needs from renewable sources, up from less than 1% in 2017 (see Exhibit 2). Most of this renewable power has been sourced in the US and China. Both geographies have comprehensive regulations and ample renewables supply allowing TSMC to transition to 100% renewable energy relatively quickly.

An Amendment to Electricity Act in Taiwan in 2017 has been important in opening the Taiwanese electricity market to renewables. In May 2020, the Solar Plant in Chiayi County generated and transmitted the first renewable energy to TSMC, and as previously stated TSMC also signed the world's largest renewable energy purchase agreement with Danish firm Orsted in 2020 for 920MW of power generated by an offshore wind farm. First power is expected to be transmitted in 2025/26.

These power agreements underpin TSMC’s target of 2,800 GWh of carbon-neutral power use by 2025. Given expectations of further renewable energy agreements TSMC has a stated target of 5,000 GWh of renewables by 2030 (25% of expected power usage, see Exhibit 2). TSMC has forecast that its GHG emissions from electricity consumption should peak in 2025.

### Exhibit 2: TSMC Use of Renewable Energy

Use of Renewable Energy and Ratio



**3. Drive Increased Energy Efficiency** - The third leg of TSMC’s drive to reduce carbon emissions is to continually improve energy efficiency. In 2020, TSMC’s Energy-saving and Carbon Reduction Committee worked to conserve more energy through company-wide roll-outs of energy-saving measures. The committee oversaw 460 energy-saving measures and was able to conserve 500GWh in energy consumption, the equivalent of 250,000 metric tons of carbon emissions per annum. The energy savings translated into NT\$1.25 billion of actual financial savings and external carbon costs reduced from lower carbon emissions were around NT\$380 million. Between 2020 and 2025 TSMC has set a target of finding a further 900 GWh of energy savings in its operations and by 2030 a further 2,200 GWh of savings (3,100 GWh of total savings). This represents 18% of TSMC’s 2020 energy consumption.

### Current Goals and Outlook

In 2021 TSMC, for the first time, committed to zero net emissions by 2050, meeting the Science-based Targets (SBTs) under the Paris Accord in line which attempt to limit the global temperature increase to a maximum of 2° C. TSMC has also committed to sourcing electricity from 100% renewables (joined the RE100 initiative).

Whilst these are commendable commitments, TSMC is at this point yet to fully identify how it will achieve these goals. The company as a first step has set GHG targets for 2030 that informs both short term (annual) and medium term (3-5 year) GHG reduction programs.

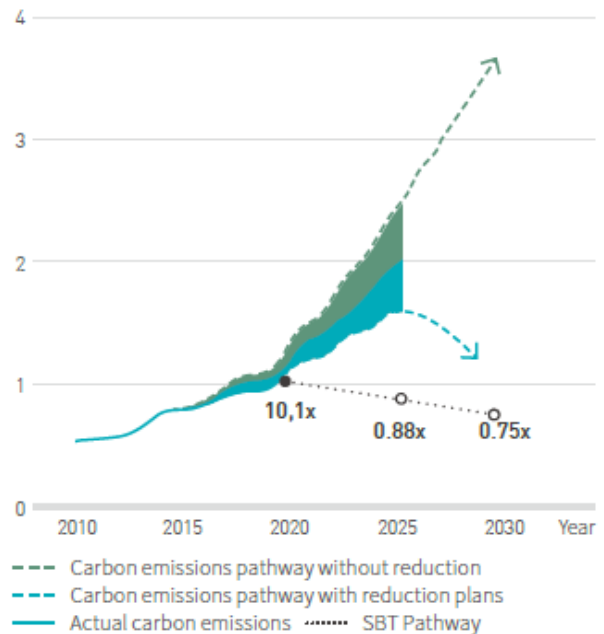
The key 2030 targets include:

- Reduce GHG emissions from fluorinated gases per unit of production (CO2 equiv. / 12-inch wafer mask layer) by 40% over 2010 levels.
- 25% of energy requirement for manufacturing fabs to be sourced from renewable energy, and 100% of energy requirements from non-manufacturing facilities to be sourced from renewable energy. Overall this corresponds to 40% of total renewable energy use company-wide.
- Save 5,000 GWh of cumulative energy between 2016 and 2030 through new energy saving measures.

The result of these goals and associated programs put in place to meet them is that TSMC expects its GHG emissions to peak in 2025, but at a level 50% above 2020 levels (see Exhibit 3). Without the mitigation programs already enacted and planned over the next few years TSMC has forecast it would have seen emissions in 2025 250% higher than 2020 levels and continuing to climb. Instead, the actions by the company since 2016 should see GHG emissions approach 2020 levels in 2030 despite the company forecasting revenue growth of 15-20% per annum over this period. Whilst this is a good first step it is unclear how TSMC will reduce its GHG emissions further beyond 2030.

### Exhibit 3: TSMC GHG Emission Trend and Forecasts

GHG Emissions and Reduction Trends



Note 1: GHG emissions include Scope 1 & 2; standardized baseline is the values in 2020.

Note 2: TSMC revised the base year for Science Based Targets from 2017 to 2020.

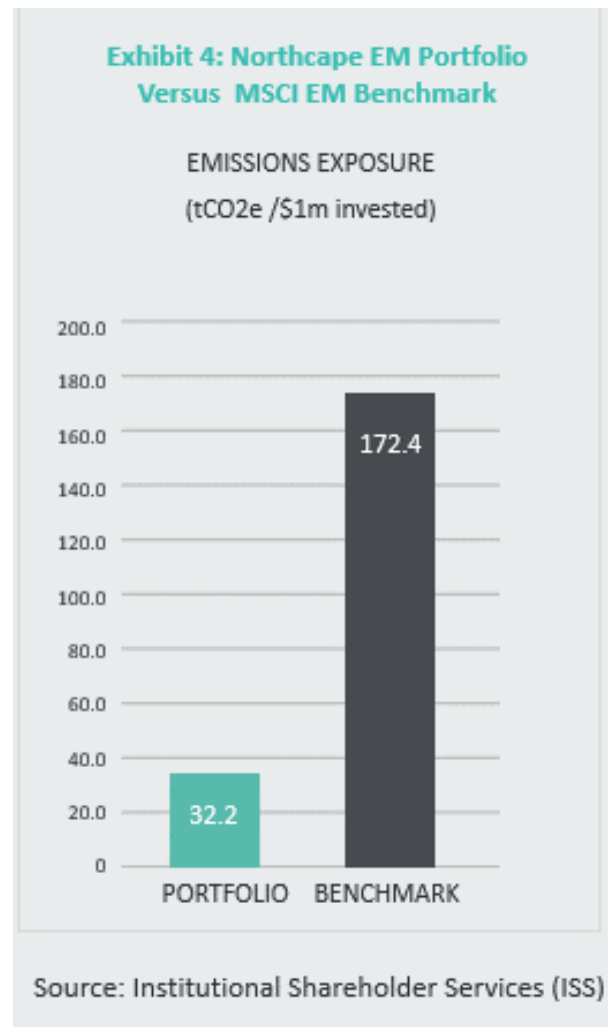
## Conclusion

TSMC has made significant progress over the last 7 years in addressing its sizable GHG emissions. The commitment that the company has shown to reducing GHG Emissions has seen it become a world leader in GHG mitigation as recognised by the Carbon Disclosure Project (“A list company”), S&P Global (Gold Class Sustainability Ranking) and MSCI (ESG AAA Rated Company) amongst others. TSMC understands the importance of being a good global citizen to its brand and long-term ability to partner with governments and other corporations around the world. For TSMC being a leader in GHG emission reduction makes business sense.

**Within EM there are large discrepancies between corporations in how they are talking climate change. Whilst we see many moving in the same direction as TSMC unfortunately other companies are not grappling with the issue.** For example, many companies in China are yet to begin measuring their own carbon emissions, a first step to mitigate these emissions. This lack of urgency is often driven by the regulatory framework and energy infrastructure the companies operate within. With large state-run coal fired power plants making up the majority of power supply in China, it is fair to say that Chinese corporates in general are behind most other North Asian counterparts in measuring GHGs and dealing with climate change within their operations.

**Finally, Northcape considers climate change as an economic risk for all corporates going forward.** Over the past few years, we have also begun to monitor emissions from the corporates within our portfolio to estimate possible economic risks to these businesses from the pricing of carbon. As a result, our portfolio has a substantially lower carbon intensive than the emerging markets benchmark (Exhibit 4).

This in our view is another important feature in our overall **aim to limit downside risks in our EM investment strategy.**



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