

Overcoming Environment Challenges by Engineering

Mr Chan Chun Sing, NTUC Secretary-General and Minister in Prime Minister's Office,

Er. Tan Seng Chuan, Chairman of the Steering Committee for the World Engineers Summit on Climate Change 2015,

Ladies and gentlemen

Introduction

1 A very good evening to all. I am deeply honoured to be part of the Forum on Engineers and Sustainable Development and thank for the organisers for inviting me.

2 Along with most of you here, I consider myself an “engineer”, because I studied engineering when I was pursuing my undergraduate education almost 40 years ago. Even though I did not go on to practise hard core engineering in my career, my training as an engineer has been indispensable to me throughout my career, whether it was in the armed forces, the Ministry of Defence, the Ministry of Transport and now in the Ministry of the Environment & Water Resources. It was also tremendously valuable in the board appointments that I have held over the years, in Singapore Technologies Engineering subsidiaries, JTC, and also Singapore Power. I am continually fascinated by how engineering can overcome the challenges that men face and able to transform through engineering, vision or even imagination into reality. I therefore have no hesitation in commending all of you who are practising engineers for spending your lives in this fraternity and furthering its frontiers whether it is in practice, research and academia.

3 Allow me to say just a few words about how engineering has waxed and waned in Singapore as well as various other parts of the world over the last 40 years. Let me qualify that these are my own views and do not represent the observations of anyone other than myself. In the early days of Singapore's independence, engineering was almost certainly the most exciting area to be in. There was a metropolis to be built, industries to be established and infrastructure of all kinds from ports to airports to trains lines to be constructed. A high percentage of good students went into engineering because it was interesting, rewarding and what young people would consider ‘cool’. Gradually that phase passed as these activities stabilised and eventually some even began to shrink. The ‘cool’ factor also diminished and moved on to other disciplines like finance and life sciences. Young talent flowed elsewhere and our engineering capabilities actually plateaued and, in some places, have even declined. This phenomena is not unique to Singapore, but happened first in the US and Britain, amongst other places. Fortunately, I think we are beginning to see an upswing again. In the US, it is partly because of the recognition that new infrastructure is badly needed after years of neglect and partly because the tech sector is beginning to boom again, hopefully in a more sustainable way than before. In Singapore too, we are seeing a new wave of interest in engineering, and I am very glad about that, and we also see a new portfolio of infrastructure investments. The lesson to me is clear – we need to have continual investment in engineers and

engineering capabilities, and I am glad to hear these evening about what the IES is doing on these together with the NTUC as a country we need to have this, or else we are to build the best future for ourselves. A few areas where we have not gone through this up-and-down cycle are in defence technology, and to some lesser extent water and land transport technology. It is fortunate that we still have such pockets of excellence there. We need to re-build capabilities in other areas where they have declined and do so urgently.

Overcoming Environmental Challenges by Engineering

4 Let me now turn to environmental challenges and how engineering has and will play a key part in overcoming them. Since Singapore's independence, engineers have played a very crucial role in facilitating sustainable development. There are many examples, but I will just restrict myself into two.

Semakau Landfill

5 The first is in waste management. Because Singapore is land-scarce, we cannot deal with waste for a growing city in the same way that other cities do it. Incineration in all but a small fraction of the daily waste that we generated was put in place gradually from as early as the 1970s. To take care of the incineration ash and non-incinerable waste, we have to design an offshore landfill site out of two previously existing islands. This gradually became Semakau Landfill which has been in operation since 1999. There, the ash and other waste are disposed of in a series of small landfill cells. Its construction was carried out without harming the surrounding marine ecosystem, including mangroves and corals. Indeed, wildlife continues to thrive on Pulau Semakau, and the air and water quality remain good, thanks to good engineering. NParks even conducts highly popular nature walks there.

6 Phase One of the Semakau Landfill is now almost full, and we are increasing its capacity with a Phase Two expansion. In order to maximise every inch of space available in Semakau Phase Two, our engineers have come up with a way to innovate further by forming only one giant cell for the remaining half of the island. This cuts down on the need for internal bunds, which requires sand to construct. This is done in this way to free up the much-needed landfill space. The challenge of how to dump safely in such a large cell was also overcome with good engineering by deploying a floating platform.

Water Sustainability

7 Secondly, engineering has also been one of the primary means by which we are working towards achieving self-sufficiency in water. From the construction of key water infrastructure projects to the daily operations and maintenance of Singapore's waterworks and water reclamation plants, engineers play a critical role in ensuring our water needs are met.

8 The development of NEWater and desalination technologies was fundamental to our water sustainability. NEWater and desalinated water are our two most resilient water taps and together can meet up to 55 percent of our current water demand. Their capacity will be expanded to meet up to 80 percent of our water demand by 2060. Thanks to the strong vision of our pioneering leaders and the drive to apply engineering expertise to overcome our water resource constraints, Singapore is now on the world map for innovative water management and solutions.

9 The Marina Barrage is another engineering solution that culminated from the vision of our founding Prime Minister Lee Kuan Yew and his vision to clean up the Singapore River. The Barrage dams up the Marina Channel to create Singapore's fifteenth reservoir and is right in the heart of our city, forming the largest and most urbanised water catchment. Comprising nine crest gates and seven drainage pumps, this innovative facility has not only boosted water supply for Singaporeans, it also helps alleviate floods, and also doubles up as a venue for various recreation activities.

Achieving Sustainable Development through the SSB 2015

10 These examples show how engineering has contributed to Singapore's sustainability to date. We aim to be even more in terms of sustainable in the future through our Sustainable Singapore Blueprint, or SSB in short.

11 The SSB outlines our national vision and strategies for environmental sustainability. The SSB 2015 was launched late last year by Prime Minister Lee Hsien Loong. Its 3 themes are "A Liveable and Endearing Home"; "A Vibrant and Sustainable City"; and "An Active and Gracious Community".

12 The SSB 2015 outlines the targets we hope to achieve by 2030 to build and to maintain a quality living environment, and to ensure that we make efficient use of our resources. Compared to the earlier version of the SSB, which was produced in 2009, we have made 2 major changes: (1) We have incorporated the looming challenge of climate change into the SSB and this leads to a much stronger push to make better use of energy resources and also putting in place adaptation measures; (2) We have more closely integrated the SSB with the economic side of Singapore, resulting in trade-offs being made as early as possible and on as holistic a basis as possible.

13 The 5 big ideas that encapsulate what the SSB will achieve are (1) Eco-smart Endearing Towns, (2) Car-lite Singapore, (3) Zero Waste Nation, (4) Leading Green Economy and (5) will be undergirding Active & Gracious Community. Good engineering will be a key part of how we achieve each of these.

"Eco-smart" Endearing Towns

14 I will just run through a few of these to show how engineering has actually made improvements on these big ideas. Under "Eco-smart" Endearing Towns, future towns will be designed and built with sustainability in mind, such as by minimising the

heat island effect, having treatment that promotes air flow and natural ventilation, and greenery that keeps temperatures as low as possible. At the precinct level, they will have solar panels to power the common facilities and rainwater harvesting systems for general washing. There will also be other sustainable features for each block, like lifts which can regenerate energy from their motion, and the use of LED lighting with motion sensors. Existing towns will also be retrofitted to have such features too wherever possible. Inside homes, there will be energy and water efficient appliances, and smart meters to manage both electricity and water better. Engineers of all kinds will be required to help us achieve this transformation from today's towns to eco-smart towns that we are dreaming about now.

Towards a Zero Waste Nation

15 The next big idea is to move towards becoming a Zero Waste Nation. Even with our current innovations, waste management will be an ongoing challenge for us as a small city with a high population density. Becoming a “zero waste nation” is a tall order because we generate a lot of waste and continue to do so at quite an alarming rate. In 2013, we generated about 7.5 million tonnes of waste, which is 50 percent more than 10 years prior to that.

16 Under the SSB 2015, we are aiming to revitalise our national recycling efforts to attain a national recycling rate of 70 percent and a domestic recycling rate of 30 percent and we hope to do this by 2030. We must make both recycling and waste disposal highly convenient and manpower efficient. To become a Zero Waste Nation, we are working towards achieving a Singapore where no food or material is wasted and is reused and recycled wherever possible. We will have to engineer new ways to re-use materials of all kinds, including treating bottom and fly ash from incineration plants so that they can be re-used safely. Only then can there truly be no residue. Getting there does not require rocket science but they are very significant engineering challenges.

A Leading Green Economy

17 The third big idea that I want to touch a little bit upon is our quest to be a Leading Green Economy. Under this idea, we will not only to have a vibrant green sector in our economy, but also for every part of our economy to become greener. In terms of the green sector, we hope to make Singapore a test-bed for smart and sustainable urban solutions. This will mean more renewable energy, especially solar but also wind, wave or any other renewable source that works in our circumstances. It will also mean water, mobility and other urban solutions. These will help make our city greener which is highly desirable in its own right, but the expertise can also be profitably shared with other cities in our region and beyond. As we are doing now in water, we can certainly make a virtue out of our national constraints.

18 In terms of greening the rest of our economy, we have made a strong start with buildings. We have the world's first sustainability standard for buildings in the tropics and our target is to have 80% of our buildings to be green buildings by 2030 from 25%

today. That's a lot of engineering and re-engineering work. We are also aiming for a green port, green airport and of course green manufacturing industries. The last will require a big push towards energy efficiency in every industry up to and beyond the boundaries of what is possible today. Beyond energy, our economy also has to be very land efficient, such that things that will be spread out in other countries will have to be stacked vertically or underground, challenges that requires good engineering to help solve. For example, we have a Deep Tunnel Sewage System (DTSS) which will be extended to cover the western half of Singapore, freeing up land in the process. In addition, we are integrating a state-of-the-art waste management facility with our next water reclamation plant. This will also achieve many synergies and efficiencies that will be the first of their kind in the world.

Climate Change Challenges for Engineers

19 Lastly, let me say a few words about how Singapore is planning for climate change adaptation as a long-term insurance policy for Singapore.

20 As a low-lying and densely populated tropical island state, we are already experiencing increases in the frequency and intensity of intense rainfall events, as well as higher mean temperatures. Both international and national studies, have continued to confirm a trend of increased intensity and frequency of heavy rainfall events, as well as sea level rises of between 25 to 79 centimetres above current baselines by the end of the century.

21 We are adopting engineering measures to future-proof our assets. For example, we have raised the minimum reclamation levels for all new coastal lands by one metre, to at least 2.25 metres above the highest recorded tide. We also need innovative solutions to deal with other challenges that rising sea levels will pose to existing coastal areas, buildings and infrastructure. We also need to find ways to deal with more intense rainfall as well as the opposite condition of prolonged dry spells. Let's also not forget that a 2 to 4-plus degree increase in temperatures is likely to result in a significant change in activities and lifestyle for Singaporeans unless we can find a way to cool urban temperatures or achieve cooler micro-climates through other innovative engineering techniques. Mr Lee Kuan Yew once said that the most important invention in the last century was the air-conditioner. For the 21st century, it may well have to be the portable version that each of us can wear on ourselves – who can invent that except an engineer?

Conclusion

22 In conclusion, our engineers have contributed significantly to the development of Singapore, but there is a continued need for engineering talent as we look to the future. As our policies and operating environment have become more complex, technological innovation will play an even more crucial role in providing the solutions for Singapore to thrive, and ensure that our future generations will continue to have the capability to chart their own course.

23 With support from the government, the engineering fraternity needs to continue to work together to groom the next generation of engineers. Let our future generations be convinced that engineering skills and talent will always be cherished, and that Singapore vitally needs to have a fair share of talent in engineering in order to undergird our future success.

24 Thank you, and I wish everyone here every success.

National Archives of Singapore