Q&A Segment: Responses to unanswered questions

We are glad to have received many positive responses from the audience during the webinar and we appreciate the enthusiasm. Since the conclusion of the webinar on 25 May 2021, the organising committee have noted the unanswered questions posted in the Q&A section and requested the speakers/moderator to provide their opinions and responses to them. The following were responses captured from the speakers/moderator after the webinar.

Panellist:

Name	Organisation	Designation
Mr Calvin Chung	JTC	Group Director and Chief Environmental Officer
Dr Jonathan Low	A*STAR SIMTech	Acting Director
Mr Chai Boo Choon	Glaxo Wellcome Manufacturing Pte Ltd	Director (Value Stream)
Mr Allan Lim	ComCrop & Alpha Biofuels	Chief Executive Officer

Moderated by Ms Yvonne Soh, Executive Director, Singapore Green Building Council

1. How do we encourage the public to be more conscious to lower carbon footprint?

Calvin: We ought to have a variety of initiatives to cater to the public with different levels of awareness for sustainability. For the less aware, it is important to start small with a low barrier to entry to help form good habits. We can then move on to initiatives that require more effort.

Jonathan: (1) Educate the young as they will have a huge role to play in the future; but also now as they can influence the parents - we are already doing this in schools and I'm optimistic for the future. (2) Make lower carbon footprint options more accessible. Companies need to take more responsibility by providing the better options for consumers. If they don't make, consumers can't buy.

Chai: Public awareness of the environmental impact caused by the carbon emission is crucial, as well as how we contribute to the carbon footprint in our daily activities. These can be achieved via public awareness campaign, educational program, out-reach programmes to the schools, communities etc.

2. How about other environmental impacts apart from GHG emissions e.g. Water depletion from washing masks, mineral depletion from carbon sequestration?

Jonathan: Yes, GHG emissions is just one measure of environmental impact. It's also important to look at the other environmental impact categories that are important for the context. In the reusable mask example, the water depletion among other impact categories were considered in the full LCA paper. As for the CO_2 mineralisation, the mineral feedstock

used is tailings (waste) from ore mining which would have been sent for disposal in a landfill in Australia.

Calvin: These efforts are definitely worthwhile to undertake. We are starting on the lower hanging fruits with things that we are more familiar with. It will be helpful for researchers in this field to help raise awareness.

3. Regarding life cycle assessment, it is interesting to know that certain green solutions might not be that green after all. Two of these come to mind, which are solar panels and wind turbines for renewable energy. The life span of these two are approximately 20 years. There are currently no good solutions for what to do after the equipment life. Does the panel think that the life cycle cost is high or unknown for the above two?

Jonathan: Yes, this is an issue that we recognise and in fact there is ongoing work to study the potential impact of these systems when they reach end-of-life, in terms of both environmental and economic impacts. However, there are also ongoing work to develop the technologies to remanufacture/recycling these technologies in the future.

Calvin: JTC does have some interest in taking a closer look at LCAs and recycling for solar panels, since we are facilitating the deployment of solar panels. To our knowledge there are a handful of studies in Singapore looking at this, and we would be interested to work with IHLs and potential solution providers when the opportunity arises.

Yvonne: Renewable energy systems do have environmental impacts during their production phase but through their operational phase, they are generally able to mitigate significant amounts CO_2 due to the avoided use of fossil fuels. For PVs, Full Recovery End of Life Photovoltaic (FRELP) efforts are being developed for 100% recycling of end-of-life PV panels in an economically viable way.

4. Another issue with Life Cycle Assessment is that this is a resource intensive methodology. If a company takes up such a methodology to account for its LCA for its green solutions, how can we know that they have done it well and comprehensively. Where is the quality control? Will there be some sort of certification?

Jonathan: I think we first need to ask, what is the goal of the LCA? If the LCA is for the purpose of reporting/communication to stakeholders, certification, regulatory compliance, or informing policy or investment decisions, then there should be a good level of rigour and QC to ensure robustness of the LCA. In the case of certifications, standards and regulatory compliance, there will be checklists/requirements to comply with. In the academic world, this QC is carried out when we publish the work in reputable journals in the field as it would be subjected to a scientific peer-review process. But a more important point is, it is always difficult at the beginning especially when we are starting from zero. But once you have built the "base" LCA model, it's about refining it thereafter and continuously improving on it as you gain more experience in LCA as well as acquire more data over time.

Calvin: We note and agree with this point. We will take this into account as we develop the methodology for the greenCompass/greenDIP.

5. Question for Calvin: Thank you for sharing on Circular Economy at Jurong Island. I wonder if you could share on challenges faced in this circular economy study and if there are knowledge gaps that our Singapore IHLs can contribute to?

Calvin: IHLs can potentially look at partnering with some of the companies at Jurong Island and waste solution providers, to create waste-to-resource solutions for waste that is traditionally difficult to treat and thus incinerated. This will potentially help with Singapore's carbon constraints as well.

Currently there is a lack of expertise and experience in this area, since this topic is niche per se, and on top of that industrial processes are extremely varied and numerous. It is difficult to find experts who have knowledge across domains. A second challenge is with regards to data collection, since even waste data can be commercially sensitive and is closely guarded by companies.

In general, Jurong Island has well established frameworks in place that are quite optimised - more opportunities might come from further new estates, and we should give that some attention and focus.

6. Question for Chai: What is the minimum expected Return on Investment for sustainability initiatives?

Chai: There is no fixed target set for the return on sustainability investment. For some very good projects, we do have very good return, whereas for some others the payback period could be long. As I shared in the webinar, for example, the solar panel project we did in 2006, the payback was more than 10 years. The benefits we assessed will include the contribution to the carbon footprint reduction and not necessarily the financial benefits.

7. Question for Jonathan: Is there a LCA conducted to assess nuclear energy as an alternative energy source compared to existing renewable energies (e.g. solar, wind, hydroelectric, etc.) which are known to displace huge amount of land or bio-diversity and may not be necessarily efficient given the changing climatic conditions?

Jonathan: I believe there should be LCA studies done on nuclear energy overseas but I'm not familiar with them. Agree that solar, wind and hydro may cause significant environmental impact so like the other question earlier, environmental sustainability needs to be looked at more holistically as it's not just about carbon emissions. On nuclear, although it has a much smaller footprint as compared to the solar/wind farms, I'm also curious about the impact of the nuclear waste and how to deal with the plant at its end-of-life. There is no silver bullet and very often unfortunately, we need to make a trade-off.

8. Question for Calvin and Yvonne: I read that in some major cities overseas, commercial/retail space in city centres are becoming underutilized because brick-and-mortar retail has been declining, and now remote working has accelerated that. In some places, they've begun to repurpose city buildings for urban farms, or even to house homeless people. What does JTC forecast for Singapore, and how are you preparing for it? Might it be feasible to bring more urban farming into commercial/retail space?

Calvin: Occupancy rates for JTC properties have held steady through this period. JTC will continue to monitor the situation and support the needs for industrialists.

Regarding urban farming solutions, JTC is in the process of carrying out studies with partners that seeks to combine PV deployment together with urban farming solutions.

In our partnerships so far, we realised that the suitability of the space is a constraint. Apart from the size of the space, the utilities supporting the space are also critical, since urban farming is very sensitive to sanitary, water, ventilation and light requirements. Not all spaces are suitable for urban farming use even with retrofits.

Yvonne: Adaptive reuse of buildings is a sustainable strategy. A key challenge has been to find ways to communicate its value. Such efforts are now gradually being evaluated from the viewpoint of embodied energy, in addition to potential economic and social gains.

9. Natural gas is not considered green. Is there a plan to move to nuclear (green) electricity generation?

Calvin: On the green energy front, our focus is on solar energy deployment and using imported green energy sources where possible. The risks regarding nuclear energy for Singapore still outweigh the benefits right now, but we will continue to strengthen our capabilities in this area.

10. Regarding the National 2GW target for solar energy by 2030: Where are we today? And in view of the COVID situation today are we still on track?

Calvin: As of 2020 Q1, Singapore's solar installed capacity is around 384 MWp. The public sector effort for solar deployment is mainly through programmes such as JTC's SolarRoof and SolarLand programs and HDB's SolarNova program. Together with private sector efforts, we will continue to work towards the national target of 2 GWp installed solar capacity.

11. Question for Jonathan: How are we also incentivising our tech talent to partner with industry to solve problems? I was fascinated that there's the Innovation & Enterprise Fellowship under the Start-up SG

programme where A*STAR researchers can partner firms to help start-ups. How popular and successful is that programme so far? Have you seen that contribute to sustainable initiatives in any way?

Jonathan: I've heard of this I&E Fellowship but I'm not very familiar with it. If I'm not wrong, it's quite new and only time will tell if it's going to be a success. But if I was to refer to a similar scheme for SMEs called the T-Up (Technology Upgrade) programme, I'm very optimistic. Through this programme, many of our researchers have been seconded to our local SMEs to help beef up their R&D capabilities not just in the area of sustainability.

Some of the success stories can be found in the link below:

https://www.a-star.edu.sg/enterprise/innovation-offerings/programmes-for-smes/technology-for-enterprise-capability-upgrading