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Submission to NSW Investment on the Green Paper: Securing future innovation and global competitiveness in NSW

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Dear Sir/Madam

The Sustainable Materials Research and Technology (SMaRT) Centre at the University of New South Wales Sydney (UNSW) is pleased to provide this submission to the NSW Investment on the Green Paper: Securing future innovation and global competitiveness in NSW.

Professor Veena Sahajwalla is Director of the UNSW SMaRT Centre, Director of the ARC Industrial Transformation Research Hub into Microrecycling, and is Leader of the new national Sustainable Communities and Waste Hub. She and her respective teams have particular expertise in materials science and engineering, reducing waste through recycling science and technologies such as SMaRT's MICROfactorie™ concept.

We have a track record in collaborating with industry sectors and businesses to research and develop innovative, 'circular' solutions that reuse and reform waste into value-added materials and products that align manufacturing and recycling, create localised supply chains and enhance sovereign capability.

The NSW Government and its agencies are to be applauded for their ongoing work to address waste, recycling and manufacturing challenges. It is essential we strive to develop a circular economy in which we keep materials in use for as long as possible and establish new business supply chains, to better manage waste as a resource and create new jobs, along with other economic, social and environmental benefits.

Various technologies and capability are now already available right here in NSW to reform much of this unwanted material into new products and manufacturing feedstock to help reduce the need for landfill, as well as reduce the need for mining and production of 'virgin' materials.

But currently there is little commercial incentive to adopt this capability because much of this material is seen as having no or little value and supply chains are often based on the principles of lowest cost and maximum convenience.

Our below commentary and recommendations are all particularly related to the following three of the paper's five transformation challenges/opportunities:

- Transition to net zero emissions
- Building a circular economy
- New value chains

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Give we are not representing an industry or sector, not are a commercial manufacturer, we will divide our feedback into a number of key themes that span each of the above three transformation challenges/opportunities.

In relation to net zero, recovering critical and valuable materials from waste has a big role to play in helping to electrifying the world as we move towards renewable energies and reducing our carbon footprint. Many of the commodities and critical materials needed for this electrification are being subject to record prices and supply constraint issues.

With the growth in electric vehicles, wind turbines, domestic solar systems, and so many batteries needed including for the huge range of electronic devices such as phones and computers, innovative manufacturing in NSW can play a major leading role.

Innovation and ‘waste-tech’ to align manufacturing and recycling

We must reconsider how we conceptualise and define waste. For example, in accordance with the definition of waste under New South Wales’ Protection of the Environment Operations Act 1997 anything made from waste (including plastic melted and remodelled to make a new product) remains waste.

This definition is out-of-step with the technology which allows waste to be reformed and become part of a new value-chain. It will be difficult to fully realise the concept of a circular economy, which values resources by keeping products and materials in use for as long as possible, if the concept of waste is not redefined to recognise the value of products made from recycled or repurposed materials.

The best options for reducing waste are those that don’t conceive of an item as waste following the end of a product’s life, but rather as a resource or component in the manufacture of a future product.

Therefore, the optimal solutions to waste management will be those that re-use or recycle products rather than burying them in landfill, or incinerating waste (including waste to energy proposals).

Incinerators should not be part of the solution when new, more effective and sustainable methods of dealing with waste are now available. The process of burning waste to create energy means that these materials are lost forever as forms of ongoing resources.

Waste to energy should be used only as a last resort only for those materials and items that can not be part of the circular economy or where there is no capability to reform them or where there is a viable, alternative use.

Solutions are available such as those identified by UNSW researchers at SMaRT which are peer reviewed, piloted and now recognised as world leading, and supported by industrial partners such as our various MICROfactorie™ technologies for transforming various wastes into value-added products such as high-grade filaments for 3D printing and Green Ceramics for the built environment.

Plan for future infrastructure

Mapping and planning of critical waste infrastructure is central to managing the immediate challenges facing the sector in light of the new national and state-based waste bans. Government and industry have a role to play in planning and implementing adaptive and sustainable waste infrastructure which can facilitate the transition towards circular economy goals highlighted by the NSW EPA foresight analysis.

Not everyone has necessary infrastructure or funding for it to solve these challenges on their own. So, rather than it being known as waste infrastructure, it really is process infrastructure related to materials supply chains. New infrastructure needs to be decentralised and to laterally integrate sectors that are not normally connected, as indicated by the examples and reports below.

The Senate Environment and Communications References Committee Inquiry into Waste and Recycling Report 2018 found the importance of investment in infrastructure for the collection and processing of recycled material and diverting waste from landfill. It said “this infrastructure is needed both to enable regions to participate in recycling programs and to reduce contamination rates, and the report noted evidence that “to reduce the contamination rate of recyclable materials, investment in material recovery facilities (MRFs) is required”. That report also highlighted the benefit of the MICROfactorie™ concept.

Furthermore, the COAG Waste Ban Response Strategy released March 2020 added weight (p16) to the argument of centralised support for new and innovative processes and infrastructure, saying “significant challenge raised in industry consultation is the ability for businesses to secure investment for facilities and equipment upgrades, and to develop and test new technologies for creating value-added products from waste”.

It went on: “Governments have a role to play in ensuring that viable proposals from start-ups and small and medium enterprises receive the support they need to scale up, achieve commercialisation, and compete in the open market. Support offered could involve access to test facilities, expert knowledge, and seed funding for cross-sectoral approaches to solving waste challenges. ***All governments opportunity: Investigate opportunities for regional microfactories, to enable regional and remote areas to process locally generated waste resources into useful value-added products for community benefit.***”

Commercialisation of such technology / infrastructure will be slower than needed if left to market forces alone. Incentives from Government (regulatory and financial) will accelerate greater take up and rollout of existing capability across the value-chain.

Create end markets

Decentralised infrastructure needed to create end markets as mentioned above in relation to perhaps expanding the number and capability of CRCs and SAPs so actual processing and reformation of waste materials is done locally and regionally.

This creates new supply chains and markets while addresses waste issues. Importantly, though, feedback through SMaRT-led pilots projects show that end markets benefit from a

‘design thinking’ approach to the end product to ensure appealability and ultimate adoption of new ‘green’ products, such as a this [built environment project with Mirvac](#).

One example is a commercially operated MICROfactorie™ - set up and operating in regional Cootamundra NSW under the guidance of the SMaRT Centre and with support from the NSW Physical Sciences Fund - which has been able to create new localised supply chains aligning waste, recycling and manufacturing, as well as new jobs, with the independent operator planning additional modules in other regional areas.

Standards for recycled content and materials

Local and state government policy and regulations could encourage councils to address the whole life-cycle of waste, going beyond waste collection to also include the creation of recycled products by supporting partnerships with manufacturing companies.

Reforms requiring for the use of ‘green materials’ would produce a shift in the market for green products, for example:

- Testing and regulation development ahead of mandatory targets for the inclusion of green products in construction and other manufactured items;
- Incentives for the retail sector to introduce recycling of packaging from their products sold;
- Incentives for the purchase of products made from recycled and repurposed waste products could be included in procurement guidelines/standards and enforced.

Match suppliers with markets

A number of different initiatives are underway in NSW and other states and at national levels, to bring stakeholders together to address market gaps and ‘close loops’ around materials supply.

This is disparate and across jurisdictions with little coordination. There is also little incentive to industry participants unless there is a demonstrable revenue benefit. Greater incentive (regulatory or otherwise) and coordination may provide businesses with more confidence in participating in such schemes and to adapt manufacturing processes or introducing new processes to replace virgin materials with previously used but reformed materials.

Incentives are needed to ensure critical mass of suppliers and participants is reached for the benefits to emerge at scale. Businesses often work across State boundaries, so an integrated approach is needed. But there also needs to be localised networks/exchange platforms to cater for localised circular economy participants at a regional level.

Councils and local business chambers could play a role in being part of an integrated (mandated) approach thereby achieving a critical mass of participants, accounting for local, regional, state and national players.

In conclusion

Innovative supply chains based on new technologies that align sectors with waste as a feedstock for manufacturing is needed to create a true circular economy, enhance sovereign capability while creating new job and export opportunities. Businesses and organisations generally rely on traditional supply chains where reformed materials are usually not part of the chain.

We need to ensure alternative solutions to current common supply chain practices adopt new and local supply chains that incorporate the use of resources made from our waste resources. Given the severe impacts on global supply chains from COVID-19, the future of global manufacturing lies in small-scale, decentralised technology that will enable communities to produce many of the products, materials and resources they need locally by using resources largely derived from local materials that are unwanted or thought of as waste.

Technologies such as MICROfactories™ can enable the lateral integration of different industrial sectors to achieve various stated goals in the green paper, by recovering and reforming so-called waste materials to create new and localised supply chains, materials and products, offering economic and environmental benefits including new, skilled jobs.

The science and technology we already have available can now make it possible for a complicated waste stream to produce value-added materials which can then feed into different industrial supply chains for manufacturing products. This emerging model will profoundly disrupt today's centralised, vertically integrated model of production, where, for instance, a single material or part available only from an overseas supplier can disrupt the manufacturing process.

Already millions of tyres have been diverted from landfill, partially replacing coke in EAF steelmaking, which is one example of lateral integration of sectors not normally aligned or connected but become so by using waste as a resource. Other materials, such as glass, textiles, biowaste and e-waste are being transformed into feedstocks and products like tiles, metals, industrial grade ceramics and plastic filaments that are then used in 3D printing. Market forces alone are extremely unlikely to ensure the take up of these to help meet the necessary goals expressed in the green paper.

Yours sincerely

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