



# GREEN RESEARCH FOR A BRIGHTER FUTURE

BY JAY GARCIA



## A JOINT RESEARCH ALLIANCE BETWEEN THE TECHNISCHE UNIVERSITÄT BRAUNSCHWEIG AND THE UNIVERSITY OF NEW SOUTH WALES IS EXPLORING THE IMPORTANCE OF LIFE-CYCLE ENGINEERING AND CREATING A SUSTAINABLE PROCESS OF MANUFACTURING.

With some of the most volatile and unpredictable weather patterns, plus an increase in government regulation, it's irrefutable that we're seeing a global increase in environmental consciousness. People are seeking more sustainable means of living, and these sentiments are emerging in the pockets of local manufacturing.

It all began at a conference in Tokyo from a chance meeting with Professor Christoph Herrmann of the Technische Universität Braunschweig. He met Associate Professor Sami Kara from the Life Cycle Engineering Research Group at the University of New South Wales (UNSW). Sami recalls the encounter: "We were talking about how frustrated we were, the reason being that manufacturing is a complex global business. I'm not just talking about stuff like relations, but in terms of different parts and components manufactured, shipped to a different location, and assembled according to local standards. If you really want to look into a company's sustainability, where do you draw the boundaries? What is sustainable?"

"A company can be based in Australia," Sami continues, offering a hypothetical scenario, "and the Australian section can actually be sustainable; but what about their offshore operations? So Christoph and I started talking about it, and then the idea came that the research in one country, on my own, will never be able to account for manufacturing as a global business. We needed to have some sort of decentralised research group – unified, but on a global scale."

Therein was the launch of a joint research group between the Technische Universität and UNSW, focused on life-cycle management and sustainable manufacturing. Sami explains: "To us, manufacturing is just one stage in the product life. You can have a sustainable stage in the product life cycle, but that doesn't mean that the rest of the stages are actually sustainable. Sustainability, in this sense, we understand by the triple bottom line: economic, environmental, and social sustainability. It's not just sustainability in terms of the environment, but you've also got to take into account the other dimensions; people actually call these the 'three pillars of sustainability'."

Manufacturing supply chains can span many stages of production and refinement, with each stage contributing to monetary, social, and environmental costs, often across global borders. "To really address the sustainability issue," Sami highlights, "you've got to look at the whole product life cycle, from cradle to grave. We believe that the whole product life cycle needs to be engineered so that we can progress and actually achieve sustainability in each state. Otherwise, what happens is that these companies simply outsource their pollution-intensive industries to other countries, wash their hands of the responsibility, and claim they are green and sustainable."



Sustainability isn't just an act of social responsibility; it's also a means of reducing the cost of manufacturing. Sami illustrates: "Energy, water, gas – they've always been considered utilities and part of the overhead costs in manufacturing. Traditionally, we're focused on the reduction of material wastage. Now that's changed; companies have actually started looking into how to reduce energy consumption. In fact, there are certain occasions, peak hours for instance, where the cost of energy could be higher than labour costs."

Australian manufacturing is becoming more sustainable, with a national manufacturing union assuring us that new clean-energy jobs will remain in Australia. But while the future looks bright, the past mistakes need to be rectified. Sami says, "The majority of the factories here are what we call brown fields, not green fields. They were built during the 1960s to 70s without actually giving any consideration to local conditions. A good example of this is when a multinational corporation built a factory in Australia: instead of redesigning the factory, they just took the design from the US and built exactly the same thing in Australia. The design in the US was built to withstand two metres of snow and, of course, we don't have that kind of snow. Instead, it heated the building unnecessarily, and as a result the company had to use airconditioning to cool it. What can we do about this? It's quite obvious we can't knock down the building. That would be the radical solution. We need to consider how to use that heat – maybe using thermoelectric devices to regenerate electricity and feed that back to the grid." ►

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There needs to be a global understanding about the importance of sustainability. Every country needs to adopt greener modes of manufacturing or no real changes will emerge. Sami explains: "When the carbon emissions scheme was introduced in the European Union, what they did was to outsource all of their emissions, in terms of industries, to other countries – places like Ukraine and Brazil. And the EU washed its hands of it and said, 'We are clean'. But this is what we call the rebound effect; they are just pushing the environmental impact either down or up the supply chain.

"Now, it depends where you put the boundaries, because some are actually paying the price. The biggest problem that we have is that environmental pollution is actually a global problem. Local solutions being addressed in the short term could actually develop into long-term problems. We really need to have a look at the whole product life cycle so that the rebound effect doesn't happen. Therefore, one of the key objectives of our research group is to find 'glocalised' solutions. This is a new term used to describe finding local solutions to a global problem. For instance, mobility issues are a global problem. Our current solution is to have an IC

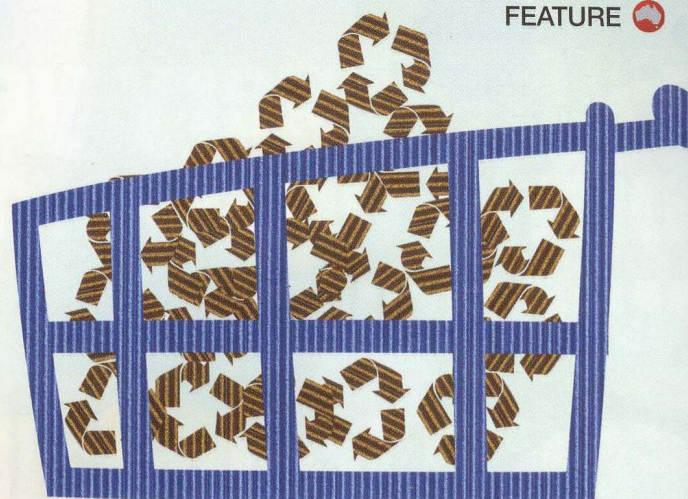
engine powered with gasoline everywhere, despite the fact that not every country has the resources.

"In the future, we need to find alternative fuel sources based on the local availability – for example, running the same engine with ethanol where available. The same concept applies to having cars powered with electricity as a fuel source everywhere. This would be a solution if the source of electricity is green or sustainable – for example, hydropower, solar, wind. Introducing electric cars as one blanket solution where the energy source is not green may end up shifting the environmental impact from usage phase, as in the IC engine case, to the energy production phase, as in electric cars."

Locally, steps are being taken to ensure Australia creates a more sustainable future. "The carbon tax is actually very tricky," Sami comments. "We need a specialist to start the process. As someone who has been working in the industry since the early 90s, I believe it's about creating awareness. Is it going to give us time to go through a transition from our present economic system to a green economic system? What will they do with that money? Are we going to invest that money back into green technologies so that in 10 years time we are in a better position? We know that our environmental footprint is going to go up because of economic growth. So the question is whether we take the money and invest in clean energies and clean technologies, and gradually shift the carbon-based manufacturing, or use that money to reimburse people or companies."







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As contentious as the upcoming carbon tax is, it shows that steps have been made towards a more sustainable future on a national level. The federal government has recently vowed to pump \$13 billion into Australia's renewable energy industry as part of its Clean Energy Future plan.

The Australian population is warming to the idea of environmentally sustainable practice, but there are still some public concerns, particularly with the rising cost of living throughout the nation. Sami notes, “Manufacturing is a business. To make manufacturing sustainable in the long term, the demand should be coming from the consumer. The consumer should be willing to pay for it. If the manufacturing companies are going to pay a carbon tax, obviously they need to have that tax as a cost to the consumer. Now the question for society is: are we willing to pay that extra cost so that, in the long run, we can have a greener society? These are the philosophical issues we need to ask ourselves.”

It's not just the consumers that need to become more environmentally conscious. Corporations are going to bear the brunt of the carbon tax and therefore need to adopt greener modes of operating. Sami says, “As far as I'm concerned, companies are very proactive. They want to be good citizens; they want to do the right thing. Managers often say, ‘I don't mind paying a carbon tax, but will you be in a position to turn 80 per cent of my energy into green energy in the next ten years?’ – because, we all need energy to survive in this country. If, in 10 years time, 80 per cent of our energy is still coming from brown coal, what's going to happen? This requires more integration. There is a huge debate, and you need to wait until the dust settles to make a judgement. Believe it or not, despite the per capita environmental footprint, we still have a green image around the world. It's because of our food manufacturing, and we need to capitalise and build on that.”

“The consciousness is there; we just need to gain a bit more momentum,” Sami observes. “Two weeks ago, I was in Germany at a presentation on electric cars – and people there are very active. However, we are just shifting the energy impact from the user stage to the energy production stage. So it's not going to do anything. This is my dilemma. Internally, is it going to actually do anything about cleaning up the environment? Unless we do something about the source of that fuel or the energy coming in, then there is no benefit.”

The manufacturing process is far more intricate and extensive than most people realise. The global scale of manufacturing gives way to wastage in energy, water and other resources. We are witnessing a shift in consciousness towards sustainability, but we're still building the foundation for this international understanding of the environment's vulnerability.

Local manufacturing is taking steps towards this goal, but it's clear that the issue of sustainability is an all-encompassing one – and we need to create awareness across borders and industries to really make a significant impact. 