Zero waste the desired goal

How do we strive towards zero waste, wonders
Aneeta Sundararaj

WHAT do you do with unwanted clothes? Donate to charity, discard or hand them down.

But if you turn them into insulation or upholstery stuffing, or simply recycle into yarn to make fabric, you are working your way towards achieving what's called zero waste.

"Zero waste means all parts of the resource are used. To achieve it, efficiency is the buzz word," says Professor Dr Pieternel A.M. Claassen, 59, from The Netherlands' Wageningen UR Food & Bio-based Research. Dr Claassen led the 5th World Islamic Economic Forum Foundation (WIEF) and Universiti Teknologi MARA (UiTM) Global Discourse On Zero Waste recently. She also shared how we can unlock the hydrogen energy market while contributing to a zero waste society.

SCIENTIFIC CONTEXT

Dr Claassen uses the following comparison to explain zero waste in a more scientific context: "Think of the vastly developed refinery processes of oil and coal where you obtain several products: fuels, chemicals, fertiliser etc. These refinery processes are fairly efficient. However, these processes will always be associated with waste because there will be a net emission of carbon dioxide since fossil resources are used."

When the resource is biomass though, she says, "even when you burn part of the biomass used in bio refinery processes the carbon dioxide emission is still regarded as carbon dioxide neutral. If heat is used, moderate efficiency is achieved and burning must be avoided."

The mother-of-two adds that in anaerobic digestion (which is also called fermentation) installations, carbon dioxide is discharged and methane can be used to give energy by combustion. Research shows that hydrogen is formed as an intermediate product during degradation of carbohydrate-rich biomass and it is this hydrogen that is of interest to scientists today.

Dr Claassen is certain that it's one of the most promising means to provide clean power for the future. This is how it can be generated: "Anaerobic digestion is a process where micro-organisms grow in the absence of air and excrete (useful) products like hydrogen or methane. An example is when special micro-organisms convert soya to tofu. If air is not available, micro-organisms can produce hydrogen from sugars. This occurs in things like waste water treatment systems."

This kind of advanced technology is particularly useful in agro-industrial processes where hydrogen can be produced from waste biomass with high moisture content. The hydrogen generated can used as fuel for cells to generate electricity with only water as emission.

*Educating ourselves about the **waste issue** is the first step, says Dr Wan Mohd Zahid.*
PICTURE BY SHAHRUL M ZAIN

PALM OIL

For Malaysia, the industry of choice to use such technology would certainly be palm oil. Tan Sri Dr Wan Mohd Zahid Mohd Noordin, the 73-year-old chairman of WIEF Education Trust (Wet), is involved in a research project that focuses on precisely such technology.

He says: "Currently, there is a possibility that the effluence from oil palm estates will pollute the air and our water ways. Although it's good nutritionally, it's doing a lot more harm than good. What I want is this: That nothing goes into the ground and nothing goes into the air. We trap all that and produce good things. Those were the parameters. Wet was formed, but we needed a research institution to become a conduit for more research.

"Therefore, we decided to see how to conceptualise in scientific operational manner so that zero waste can be achieved. The team from Universiti Kebangsaan Malaysia came up with the best presentation, but we decided we needed a second opinion and their theories needed to be tested against their peers."

Dr Claassen gives the scientific explanation to all this: "The focus of research and development is on hydrogen production from palm oil mill effluent and hydrolysates derived from palm oil biomass. The effluent of the dark fermenter is fed to an anaerobic digester to produce biogas which is studied for methane cracking to add to the hydrogen production from the fermentation."

In simpler terms, Tan Sri Wan Zahid says: "We will use algae that will eat up the effluence. What they produce will be used to harvest more algae. If we can succeed with this, we can legislate it, patent it and capitalise on it. What we're trying to do is to convert something that is successful on a laboratory scale to something that can be successful in an industry."

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PRACTICAL USE

Is this knowledge already being used?

"The world is gearing towards the implementation of hydrogen in certain industries," explains Dr Claassen.

"For instance, in something called a FC CHP unit (Fuel Cell Combined Heat and Power unit), a micro-Combined Heat and Power unit (CHP system) is a small engine that provides electricity for a building. It is also used for heating or cooling. When you equip the CHP with a fuel cell and feed this fuel cell with hydrogen, you have a 'FC CHP' system which is more efficient compared with a regular CHP unit."

Even though the focus is on the palm oil industry, Wan Zahid thinks the average person here can play a huge part towards zero waste. He says: "There are two aspects of waste management that we need to look at — prevention of excessive waste generation in the future and management of existing waste. One easy step is to educate oneself about the waste issue and its threat to the environment. For example, something as simple as segregation of garbage for recycling or using containers to pack food instead of plastic bags could help the environment in a long run."

As for the waste generated so far, Wan Zahid says we are fortunate that technology allows us to put a value to this waste, "... converting the waste to job opportunities and financial interest."

Ultimately, he advises that everyone should start practising zero waste immediately. "One single step from an average Malaysian can lead to one leap forward for zero waste."