

Decarbonising hard-to-abate sectors with biomass, hydrogen, and algae?



Exploring Sustainable Development
with Dr. Goh Chun Sheng

In previous articles, concerns over emissions from manufacturing building materials for Nusantara were raised. Cement and steel manufacturing was referred to as 'hard-to-abate' sectors with high abatement costs to achieve net zero. Both sectors contribute about 16 per cent of global CO₂ equivalent greenhouse gas emissions. These sectors cannot be simply electrified as they require high-density, local energy sources that fossil fuels can only fulfil. For example, reducing iron ore in blast furnaces involves using coke. In addition, some emissions come from the processes (not due to energy use), such as the conversion of limestone into clinker in cement production. These industrial processes are highly integrated and not easy to change. The challenges to addressing cement and steel

manufacturing emissions are particularly pertinent for developing regions like Borneo. These materials are commonly needed for infrastructure development which drives economic growth and ultimately better quality of life. For example, improved connectivity enables complex supply chains of the modern economy to take place with large amounts of goods into towns and villages quickly and efficiently.

The Borneo territories have been actively seeking investment to close the infrastructure gap for decades. It is hoped that more bridges, roads, ports, better houses, schools, hospitals, etc., will overcome poverty and improve living standards. Today, per capita consumption of cement and steel in Borneo, especially Indonesian Borneo, is relatively lower than the world's average. However, the construction of Nusantara, if realised, may change the situation.

While the impacts of infrastructure buildings on local environments, such as forest clearing for roads and settlements, are more visible and thus attract more attention, the emissions associated with the manufacturing of building materials may be overlooked by policymakers. Given the globally increasing pressure on

climate actions, the potential of unlocking the hard-to-abate sectors should be envisaged.

On the demand side, partly replacing these materials with wood was discussed as an option to reduce the impacts. On the supply side, various technical and operational strategies have also been proposed to reduce emissions in these sectors.

Co-combustion with biomass

One option is to co-combust biomass in cement kilns for heat generation to reduce the share of coal in clinker production. Clinker is an intermediate in cement production. Its production requires enormous energy to heat the kilns to 1,450 degrees Celsius. In Europe, co-combustion of biomass is common in clinker production.

Furthermore, process emission can also be reduced by substituting clinker with biomass ash. A considerable amount of raw clinker materials may be replaced by biomass ash due to its similar burnability. Borneo has great scope to integrate biomass into cement production for emission reduction with a large amount of biomass generated from the oil palm and forestry sectors.

Green steel from green hydrogen

Another option is the use of 'green hydrogen' in steel production. 'Green hydrogen' is produced from water electrolysis, i.e. splitting water into hydrogen and oxygen, powered by renewable energy sources. In addition to heat generation, hydrogen may replace coke as a reducing agent to strip oxygen from iron ore, producing pure iron metal and water instead of carbon dioxide. This option has recently been gaining significant traction, with the term 'green steel' widely mentioned.

Almost all hydrogen used in industrial processes today is 'grey hydrogen' from natural gas. The use of 'green hydrogen' in steel-making may substantially improve the sectors' emission profile. However, due to cost constraints, the production of 'green hydrogen' requires vast amounts of cheap renewable electricity. At the moment, solar power and hydropower remain the two major types of energy used to generate grey hydrogen.

Frontier technologies: Algae-based building materials?

While some proposed solutions may seem like really wild ideas, in the long run, new discoveries and cutting-edge technologies may open up new decarbonisation pathways.

There are ongoing efforts to turn ideas into reality, like creating building materials from algae. Reportedly, a research team at the University of Colorado in Boulder found a way to biologically generate limestone with certain species of calcareous microalgae.

The process is described to be similar to creating coral reefs. The limestone generated can be considered carbon neutral or even carbon negative as it can be stored permanently in concrete. Innovative solutions like this, if they can be scaled up at a reasonable cost, may disrupt the system, reshape the construction industry, and provide new solutions to hard-to-abate sectors.

Newcomers' opportunities

One advantage of Borneo that should not be overlooked is its ability to adopt new technologies due to its relatively 'newcomer' status. A newcomer may avoid being locked into older, carbon-intensive technologies by venturing into the frontier of the 'green' industry. Unlike more mature economies, emerging regions have relatively fewer problems with sunk cost of existing infrastructure.

On the one hand, investment in new manufacturing facilities may be diverted to technologies

with fewer impacts on climate and the environment, such as biomass, green hydrogen, and even frontier technologies like algae-based materials. On the other hand, the expansion of cities and infrastructure can be designed carefully to avoid mistakes from previous experience. For mega projects like Nusantara, the risk of having 'white elephants', i.e., buildings or infrastructure that cost a lot but have little use and cannot be easily disposed of, may be minimised through careful planning.

Given the importance of infrastructure development in places like Borneo, addressing the 'hidden' emissions 'embodied' in (the manufacturing and supply chain of) building materials may require more attention. A clear account of embodied emissions based on comprehensive monitoring frameworks of material flows and energy balance may help to provide a numerical basis for policymaking.

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Three things we learnt from Perikatan's convention

SERDANG: Perikatan Nasional (PN) held its maiden convention Saturday, amid rumours of an impending next general election (GE15).

As the day drew on, it appeared that the coalition consisting of five political parties – Parti Pribumi Bersatu Malaysia, PAS, Gerakan, Parti Solidariti Tanah Airku (STAR) and Sabah Progressive Party (SAPP) – was far from being on the same page for many issues.

Following its conclusion, here are three main takeaways from the event:

PN still undecided about whether to go solo or form alliances

It was clear that the coalition led by Tan Sri Muhyiddin Yassin has been dilly-dallying over whether to work with other political coalitions.

Despite jibes and jeers aimed at political rivals receiving roaring cheers from the 1,300 delegates who attended the convention at Malaysia Agricultural Exposition Park (Maeps) here, Muhyiddin did not rule out the possibility of cooperating with other political parties or coalitions, even Barisan Nasional (BN).

"The combination with BN is difficult to say. There is an 'if'. I don't want to say that we rule it out due to the uncertain and dynamic situation... the turmoil and division in Umno. Politics is a game of possibilities," he told reporters during a press conference marking the end of the convention.

PN 'poster boy' position still up for grabs

Despite being named repeatedly as their prime ministerial candidate by leaders of the coalition's component parties, Muhyiddin said that he was willing to cede the title to a younger leader.

The 75-year-old former prime minister expressed his gratitude towards the leaders who named him as PN's 'poster boy' but said he was willing to make way for other leaders who are capable with the right qualities.

"For me, it is okay, but the most important thing is (the candidate) must be experienced, the right background. We can see there are a lot of countries with a young head of government."

"But is Malaysia ready for that? We cannot say yes or no to that yet, but why not? After all, it cannot always be the same face," he said with a chuckle when fielding reporters' questions during the press conference.

He was responding to one of the delegates who said a younger candidate should be considered as the next prime minister to set PN apart from other coalitions.



Muhyiddin (fifth left) with PN secretary-general Datuk Seri Hamzah Zainudin (left), Datuk Seri Yong Teck Lee (fourth right), Tan Sri Abdul Hadi Awang (sixth left), Datuk Dr Dominic Lau Hoe Chai (seventh left) and Edward Linggu Bukit (third right) are pictured during the Perikatan Nasional Convention 2022. — Malay Mail photos



Muhyiddin rallies conference delegates.

Uncertainty looms over the future of PN
From its logo and seats to building alliances, the coalition that celebrated its second anniversary has no clear path going into GE15.

However, it is clear that Bersatu is leaning towards working with Pakatan Harapan (PH) rather than BN as the latter, particularly its lynchpin party Umno, is helmed by leaders with ongoing court

proceedings.

This perspective was confirmed by Muhyiddin who labelled BN as PN's main political rival riddled with kleptocrats. "Prior to this, I talked to a few parties about possible

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cooperation. However, they might have thought that the election is probably still far away, and that's why they decided to leave it be.

"But if they think that the election is near, I'm open to discussion. We know that our main rival is BN. All the corruption, power abuse from BN, this is not good for the country," he said in apparent response to the coalition's Youth chief Ahmad Fadhlil Shahr's remarks on the possibility of negotiations with a 'changed Umno'.

On Saturday, the five-member PN coalition marked its second anniversary.

Some 1,300 delegates from Bersatu, PAS, Gerakan and Sabah-based entities SAPP and STAR gathered at Maeps for what would be the coalition's last major bash before GE15 is called. — Malay Mail

GE15: Gerakan eyes one Parliament, seven state seats in N. Sembilan

SEREMBAN: Gerakan hopes to contest one parliamentary and seven state seats in Negeri Sembilan in the 15th general election (GE15), said its president Datuk Dominic Lau Hoe Chai.

He said these seats are the Rasah parliamentary constituency and state seats of Temiang, Bahau, Bukit Kepayang, Rahang, Seremban Jaya, Lukut and Repah.

"We know there are many seats where we can contest in especially Chinese-majority areas but we want to focus on constituencies where there is potential to win. Leaders must go to their areas and win the people's support by making early preparations."

"The performance of (prospective) candidates will be monitored by the state Gerakan before the list is sent to the central level for a final decision," he told reporters after opening the 47th Negeri Sembilan Gerakan delegates conference and 35th Wanita and Youth delegates conference here yesterday.

Meanwhile, Negeri Sembilan Gerakan chief Choong Vee Hing said the state Perikatan Nasional (PN) had agreed on a 6-3-1 formula for allocation of parliamentary seats.

"Based on preliminary discussions on parliamentary seat distribution, it is four for Bersatu, three for PAS and one for Gerakan, but the actual constituencies for parties have yet to be finalised," he said. — Bernama

GRS roadshow begins in Keningau

KENINGAU: Chief Minister Datuk Seri Hajiji Noor yesterday officiated at the first Gabungan Rakyat Sabah (GRS) roadshow in the state here.

Hajiji, who is GRS chairman, joined the leaders and members of its component parties for lunch at the Dewan Kompleks Keningau.

More than 7,000 people attended the programme which also saw the presence of Parti Solidariti Sabah Tanah Airku president Datuk Seri Dr Jeffrey Kitingan, United Sabah National Organisation president Tan Sri Pandikar Amin Mulia, Parti Bersatu Sabah deputy president Datuk Seri Dr Yee Moh Chai and Sabah Progressive Party deputy president Japirli Suhaimin.

Also in attendance were Parti Kesejahteraan Demokratik Masyarakat president Datuk Perti Anthonny, Parti Cinta Sabah president Datuk Seri Anifah Aman, Parti Harapan Rakyat Sabah deputy president Rina Jainal and Liberal Democratic Sabah leaders.

This is the first GRS's roadshow which will also be conducted in other districts.