Bio-industrials and the Green Transition

Kasim Kutay

In my view, the green transition will not happen at the pace or the cost desired if we do not harness the power of biotechnology. As everybody in the audience knows, we are in a golden era of biotech innovation. What we've seen over the last six or seven years in terms of biotech innovation is nothing short of staggering. I can give many examples, but perhaps the best one of late is the innovations associated with applying mRNA and the successful use of that technology for vaccines against COVID. Ten years ago, mRNA was nothing but a moonshot, but today it is a reality. And I can give numerous other examples of how much progress and how many drug approvals and new healthcare developments have taken the place of late. So we understand the impact of this biotech innovation on human health. What is less understood is the effect of this incredible innovation on industrial solutions.

I believe that the world needs a bio-industrial future. Bio-industrials will help us act on climate change by reducing waste, increasing the use of sustainable materials and feeding growing populations. At the same time, from a company perspective, they can help you win customers as consumers focus on sustainability, and they help firms meet new and growing sustainability regulations.

I came across this recent example of the power of bio-industrials. I will use it to illustrate the growth in new applications of bio-industrial technology. Every year in India, farmers torch millions of acres to prepare the fields for next year's harvest and crop. But today, there is an alternative; rather than doing all this burning, there is a new spray-in development using an enzyme that breaks down stalk stubble into fertilizer, with benefits to the soil and atmosphere.

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I just gave you an example from agriculture; let me give you some other examples of how bio-industrials are working today. On the left, I'm using an example of biobased fibers for things like apparel. So a perfect example of that is the German-based AM Silk, a manufacturer of recombinant bacterial silk; silk is one of the most durable, natural materials, as many of you will know. And silk can be used not only in apparel, but the company is, among other things, in discussions with certain airplane manufacturers to explore the use of silk in airplane wings. Another example is a bag that MycoWorks is developing with Hermes, the French luxury goods manufacturer. But it's not made from leather, although it looks and feels like leather. It is made from mycelium fungus. There's no killing of animals. There's no need for cattle from which you derive your leather, and, therefore, less agricultural land, less carbon footprint, less methane, etc. And on the right, and this is an incredible innovation; building materials made with bacterial processing. The company is called Biomason, based in the US, that uses bacteria to produce bricks essentially. It's the same microorganisms used in the production of coral reefs and applied industrially, the results are highly durable bricks. And of course, as we all know, building materials, such as cement, are one of the most significant contributors to carbon pollution.

Now just to put things into perspective, I believe we can do a lot more. But even if we did just a little bit, the numbers are pretty staggering. So what if, for example, 10% of the world's annual proteins were replaced with alternative proteins. We would have 700 million tons of CO_2 avoided and 900,000 million km^2 squared of agricultural land saved. That's about equivalent to 50% of the EU's agricultural area. Enzymes in detergents have been around for decades and are highly successful. But unfortunately, a lot of detergents don't use enough enzymes and still use chemicals.

If detergents were all bio-based, five million tons of fossil-based chemicals would be avoided. Another way of looking at it would be to prevent 10 tons of chemicals from being poured down the drain every minute. It's staggering numbers. We're all familiar with biofuels; we're all familiar with the use of micro-organisms to turn starch into biofuel. And if 3% of all liquid transport fuels were bio-based, 300 million tons of CO_2 would be avoided. That's equivalent to 125 million cars off the road. I use these examples because none of these are farfetched or require change that cannot be executed over the next decade.

So in light of that, Novo Holdings is building a portfolio to accelerate this transition. We do this because we've been involved in bio-industrials for many years now, for decades since our founding. And that is because of our shareholding in Novozymes, a world leader in the production of enzymatic bio-industrial solutions. And given this knowledge and network that we have from Novozymes and later on from our shareholding in Christian Hansen, we are now expanding into other areas. We have invested in all the companies you see in Fig. 1. If we look at the need for more sustainable agriculture, we have companies like Vestaron, which use biopesticide. So that is an enzymatic-based pesticide that helps avoid chemical pesticides. We have companies that supply alternative proteins to feed the world sustainably.

Finally, waste, where today we can take industrial off-take gases like carbon, and convert those and recycle them. A perfect example is LanzaTech, which uses bacteria

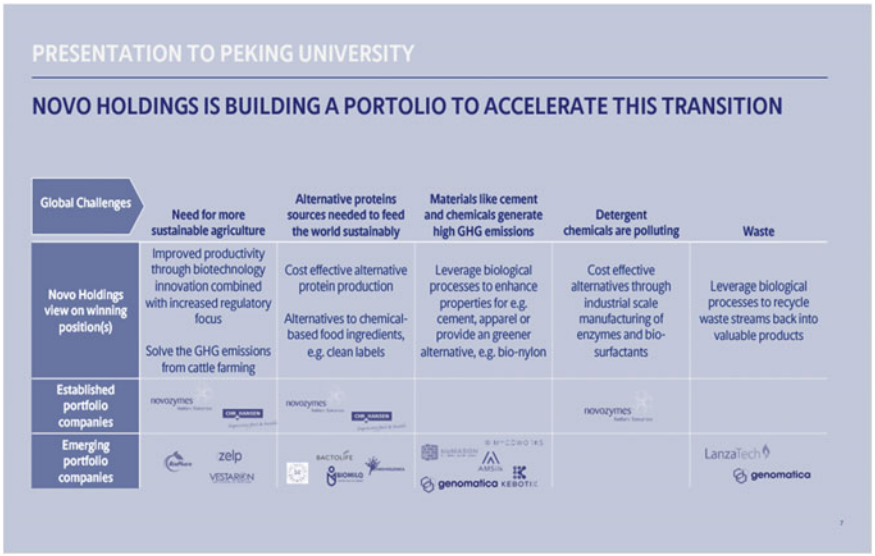

Fig. 1 Portfolio being built by Novo Holdings

to take industrial off-take gas to produce jet fuel. And some planes have already been powered using LanzaTech's jet fuel in combination, of course, with fossil fuels.

There are issues facing the greater adoption of bio-industrials. One is the scaling challenge, as I call it. A lot of these small companies find it very difficult to scale production to a level where that production becomes cheap enough and competitive with the fossil fuel alternatives. That is a considerable challenge. So if you look at the big companies like Novozymes or Christian Hansen, then the economics of biosolutions become viable. But the scaling is very challenging initially.

It is also challenging for those companies to scale to maintain the stability of the quality of the microorganisms they're trying to produce. We will gradually work and develop and overcome those challenges with time. But it is a serious one. The other big challenge is the regulatory pathways. And whether we're talking about Europe or China, the US, and other jurisdictions, there are regulatory pathways that frankly have not kept up with the developments on the biotechnology side. And those pathways are still, in many instances, archaic and arcane and do not allow the approval of bio-industrial solutions to take place at the speed we need. Very often, multiple agencies need to be involved in regulatory approval for anything relating to genetic research or Genetically Modified Organism (GMO). And I will give you an example in Europe, where bio-industrial products can take up to seven to eight years to receive approval, versus in the US, for example, where we're talking about two to three years. So, a lot of regulatory hurdles to overcome on a global basis, but I would urge all policymakers, all those that are focused on hastening the green transition, to focus on simplifying and speeding regulatory pathways to realize the goal of having bio-industrials play a more important role in decarbonizing our planet.