BLUE SKY GREEN SEA

ENGINEERING AND ECOLOGY ARE NOT necessarily supposed to be deadly bedfellows. But that, says George Hooper of the Centre for Advanced Engineering at the University of Canterbury, is misconception. "I would argue that actually the first environment-friendly jobs are with the engineers," he says. "Hooper. After all, clean water and sewerage systems in essence are the first outcomes of our early engineering." Hooper is one among a chorus of expert voices heralding sustainability as the keynote of New Zealand’s technological future. "It’s a fundamental. I know that special-interest groups like to claim the environment as their particular debate but, actually, it’s been integral to New Zealand for a long time. We have a strong tradition in biologically-based industries and in managing impacts, and that needs to extend across all aspects of the work we do. It’s very important in an island state to understand ecosystems and their management," Hooper’s view is echoed in Navagent towards our future, the first report of the science “scanning” group the Navagent Network, an initiative that says the network’s project manager, Dr Barbara Nicholas, emerged in part from the Royal Commission on Genetic Modification and its lessons that society needed to be helped to keep up with science. The report - available at www.navagent.network.nz - covers biofuels (suggesting that so-called willow could be grown here for conversion into ethanol) and the "untapped commercial potential" of bio-processing for new enzymes and organisms in the oceans around us. It also suggests that research into ways of cutting methane emissions from ruminant animals "may well be the best investment New Zealand could make towards greenhouse gas mitigation." "At this point it’s very hard to predict the long-term implications of climate change and how well our communities can adapt to a changing ecosystem and changing energy sources," says Nicholas. "If we become less fossil-fuel-based as a global economy, what will that do to the way we organise our social lives? The technology may provide us with all sorts of possibilities as to how to improve some of those issues that are fundamentally social."

MICHAEL BERRY

Hooper sees a future where "individuals take more responsibility for their own energy production and utilisation" because "basically there’s no lifetime for New Zealand if we go on our energy balance wrong, no one else suffers but ourselves." Dr David Haywood, a research engineer with RMI in Christchurch, agrees that sustainable technologies will be playing a growing role in the future. He expects wind energy to provide as much as 30 percent of our energy and notes the "best untapped potential" of tidal and wave energy, where technologies are currently "nowhere near maturity" but will become viable in the next two decades. "I regard the marine environment as New Zealand’s biggest resource," says Haywood. "I think the opportunities from the oceans and the atmosphere are enormous. We have the fourth-largest exclusive economic zone in the world, the fifth-largest coastline, we’re able to remove it right offshore. We say that in 20 or 30 years’ time, within a complex ecosystem, a network of renewable energy devices will be presented with a list of treatments appropriate for your personal physiology, with the do-ityourself-of-diagnosis done by computer. The body of knowledge in the relatively young discipline of genomics (the word was first aired in public in 1960) has been doubling every year since 1960. Blowing on past the iconic milestone when the human genome was sequenced in 2003. The next iconic goal is more prosaic: the so-called Shooter’s Binge, a quick, affordable profile of every individual’s personal genetic information. "Now, if we don’t get it right, that’s it, we’ve blown it up into some potential points for us," says Rodriguez. "The first thing being, how do I protect that information? Because of the chance that what’s going to happen is that people are going to start looking at genetic material of human beings, most of it going to start making links as to how your genome affects your health and your susceptibility to diseases. Essentially, your genome contains all of the clues about how you’re going to live your life. It’s hard to fathom what the future job creation of useful real-world objects to order, from constituent molecules it’s horizon-science territory but I don’t see it in the next few years, but it’s definitely a possibility. In principle, you can see how it’s possible to custom design it so that making it a manufacturing process is not quite clear."

But Mike Tredre of the New York-based Centre for Responsible Nanotechnology (who will be here in September for a speaking tour) urges governments and individuals to start thinking about molecular manufacturing now. "This is the first application that will really change the lives of ordinary people," says Tredre. "Operating under computer control, using inexpensive, widely available chemicals as raw materials and working in parallel, trillion of sub-microscopic machines will be connected in an assembly-line arrangement inside a desktop-size appliance known as a nanofactory." "It’s called exponential manufacturing: one product of a nanofactory will be another nanofactory, which means the manufacturing base theoretically could increase by a factor of five or ten per day. If this just a game for economic superpowers with billion-dollar research budgets? Not at all, says Paul Callaghan, director of the MacDiarmid Institute for Advanced Materials and Nanotechnology at Victoria University. "A lot of nanotechnology is benchtop-scale" says. "It involves relatively small levels of investment. The power of this technique and I think it’s almost the best definition of nanotechnology, is that it’s convergence of chemical, biology and chemistry. So in a new science at the interface of these disciplines. For now, we have relatively mundane products such as anti-bacterial coatings and drug screens using nanoparticles. Callaghan sees the first real social impact coming with new energy technologies. Callaghan says: about the most so far dimension of nanotechnology is in energy. "We can’t yet make it a manufacturing process is not quite clear."

But men both agree on one thing: countries that don’t direct resources into nanotechnology now risk missing out later.