OFFICE OF THE PRIME MINISTER'S CHIEF SCIENCE ADVISOR

Professor Sir Peter Gluckman, ONZ KNZM FRSNZ FMedSci FRS
Chief Science Advisor

Will the road to 2030 be evidence paved?

Sir Peter Gluckman
Grantham Centre for Sustainable Futures
University of Sheffield
Oct 19th, Sheffield, UK

The 2030 agenda, generally encapsulated within the 17 Sustainable Development Goals (SDGs) and its 169 targets (and an even larger number of indicators), was approved by the UN General Assembly two years ago. It was seen as the follow-on to the Millennium Development Goals (MDGs). Unlike the MDGs, the 2030 agenda arose from extensive stakeholder consultation, not least with member states. It is probably inevitable that this process has led to both the large number of goals and the associated 169 targets. These have been criticised as being too broad to be meaningful, unrealistic in their scope and more aspirational rather than having the concrete, focused and very specific nature of their predecessor MDGs.

Irrespective of such critiques, the SDGs have become the roadmap for the global agenda and thus they are a critical framing device. The goals certainly encompass the broad nature of social, environmental and economic aspirations and in contrast to the MDGs they are aimed at all countries regardless of income level. They are open to domestic interpretation and goal setting.

As a framework for action, the SDGs' reach must extend beyond the policy community. This is because uptake and success will depend on the complementary (and if possible, coordinated) actions of many others including the private sector and civil society as communities of interest and action.

Two years in, it is already clear that the uptake of the SDGs is variable at best. Many high-income countries have tended to frame the goals within a developmental assistance model, rather than seeing how these goals address their own issues as well. And their scope challenges some of the political rhetoric that has emerged recently – with the agenda's appeal to multilateralism, promotion of trade, promotion of human rights, action on climate change and so forth.

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

It is difficult to disagree with the aspirations encapsulated in these 17 goals. And so the direction is clear – at least we roughly know the road we are going down.

The question has to now become a pragmatic one of how will we progress down this road. What practical tools do we need? How will science help?

I want to address this in three ways: first, how science can help to plan the journey; secondly how we decide on the acceptable tools we'll need for the journey; and thirdly how science might help policy makers keep on the best path and get to the desired destination.

In each of the SDGs, natural science, social science, data science, economic and political science and particularly implementation science will be needed. Technological developments will also be critical to many of the goals. The importance of robust social sciences to success cannot be overstated. When I refer to science in this talk I am being all encompassing.

Before proceeding, I also want to pause here to make special reference to the humanities. The SDGs speak to a critical juncture in human history. We are changing our environments and our human cultures and behaviours at a pace that makes the implications difficult to fully comprehend. The skills of historians, philosophers, ethicists and others are needed. It would be a mistake to assume a technologically deterministic approach to the challenges we face. We must, above all, remember our most human qualities as we strive for both sociological and technological solutions to meet the SDGs. Science and technology are, after all, deeply human activities. The challenge is how to make deliberative and concerted decisions about how they are deployed in our best interests.

To this end, the role of the sciences twofold – first to distil, collate and apply extant knowledge better, and second, to identify critical knowledge and technology gaps and fill them. I will discuss this first. In many cases this will involve engaging with society to ensure social acceptance of new technologies: digital, biological, medical and perhaps mechanical – this is the focus of the second part of this address. The role of policy making is to make and implement decisions at different levels of government. So the third component becomes how can science help ensure better policy decisions in accord with the agreed direction of travel.

One more stop before we get moving down the road. We must parse out one word in my talk's title – "evidence".

Evidence to most people, including many decision makers and I suspect many scientists, does not mean robust science alone. It can refer to knowledge that comes

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

from religion or tradition, to dogma that persists in a community or to personal observation, experience or anecdote. In short, 'evidence' can be construed as anything that supports a line of argument.

Indeed for most people these are the dominant influences on their thinking and even when science is put in front of people, cognitive biases – themselves often determined by prior beliefs or experience – are such that the same information may be viewed quite differently by different people. We have seen this repeatedly in formal studies of perceptions of climate change, in debates about drug use, and more broadly in the increasing polarisation within the political discourse that is currently occurring in some of the major polities of the rapidly changing world order.

There is little doubt that entrenched views and disregard for robust scientific evidence are being aggravated by the impact of the echo chambers of social media, which mean that people increasingly live almost entirely within the viewpoints of their like-minded community. Increasingly one's selection of peer group is via social media where people inherently befriend others with similar views and experiences and then that community of peers validates and anchors the views of its members – cognitive science has much to tell us about these inevitable behaviours.

As a result it is becoming harder to have those important but difficult conversations in a constructive way – a matter I shall return to later in this talk. So when we ask the question – will the road be paved with evidence, we need to ask 'whose evidence' – that of the community, that of the blog, that of the political advocate or that of the scientist? I will make the case for the importance of robustly derived scientific evidence, and in the final part of my talk I will discuss how this best informs the policy process. It is certainly not a matter of declaring governments must do as science says.

And when we talk about science we need to remind ourselves that science is not a compilation of facts, rather it is a set of processes that aim to discover relatively reliable information about the world around and within us. There are many different definitions of science but virtually all of them focus on the processes, its inherently provisional nature and its essential value of institutionalised scepticism.

These issues become more acute in the post-trust, post-expert world that now seems to be taking shape. There can be no doubt that, at least in the global north, the climate of trust in experts and institutions has changed. It seems probable that the greater transparency and access to information, reliable or otherwise, has had a negative impact on trust in experts, institutions, and elites. This has been aggravated by the experiences of many who feel squeezed by the policies of the last decade. The challenge we could face is that science, while it still engenders high levels of trust, reflects these three characteristics: experts, elite, and institution.

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

The irony of this changed context is that it originates in a greater access to information and communication and an effort to make institutions more transparent. Yet the impact has been an increasing mistrust and rejection of institutions and experts for at least two reasons: on one hand, if people can access information themselves, they may see no need for expert interpretation; on the other hand, when the curtains are pulled back on some institutions, maybe people don't like the messiness that they see.

We all applaud the greater access to information but there has been a commensurate shift in much of the mainstream media, from being filters of unreliable information to a more polarised machinery often intended more to advocate or entertain than to inform. Worse still are the effects of social media platforms based on artificial intelligence which filter what "news" you receive passively, thus further entrenching social networks that are generally not that diverse in opinion.

As we come to understand more about what Steve Sloman describes as collective knowledge within a social network, or the role of cognitive biases in how people reach conclusions, we can see how it is a challenge to ensure that policy makers and their publics trust, accept and apply scientific knowledge. Because of the critical role of science in achieving the SDGs it will be very important not to ignore this challenge.

Of course, I am painting a very generalised picture here, which is nearly entirely based on experiences of large countries in the global north – the countries that, arguably, have the most influence on the scientific agenda setting and behaviour. It is less clear if the same phenomena are felt in the global south, where countries and communities within them have their own sets of experiences and challenges with institutions, beliefs and practices and where societal networks may operate in different ways.

One final preliminary comment in this regard; while science appears to have been largely immune from the loss of institutional trust to date, we cannot take that for granted. While I am uncertain about Andrea Saltelli's description of a full-blown crisis in science, I think his diagnosis is important – it highlights the importance of the scientific institution looking at itself. It is not just the obvious issues of scientific malfeasance, it is more the enormous industry centred on bibliometrics rather than societal impact and the complexity of the changed relationships that follow from the utilitarian agenda that generate concern and can invite contestation.

So with this background let me turn now to the first of my questions: what scientific evidence is needed to map out and prepare for the road ahead?

In 2015, late in the process of consideration of the SDGs, the International Council for Science (ICSU) provided a pointed analysis of the targets. ICSU pointed out that there

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

were some quite substantive knowledge gaps to be filled before a number of the goals could be reached. Others require the more systematic application of current knowledge and issues of knowledge and technology transfer are real and complicated. It leads to the interesting question: Could developing deliberative research roadmaps help us to address these knowledge gaps?

In 2017 ICSU returned to this question and dissected out in some detail four of the goals: goal 2 – zero hunger; goal 3 - good health and wellbeing; goal 7 - affordable and clean energy; goal 14 - life below water. Their analysis identified a large number of knowledge gaps. We need a similar analysis across all 17 of the goals. ICSU also pointed out in that report the high level of interconnectivity between the goals and this has implications for filling these gaps and certainly for policy decisions related to implementation. This gap analysis needs a coherent effort rather than being left to the somewhat capricious efforts of foundations and donor nations.

Certainly I share the view of scientists expressed in last year's UN Global Sustainability Report that globally coordinated research roadmaps for most of the SDGs would help.

But who should do the coordinating? The report suggests that the 'science and engineering communities' could do this through many platforms such as the UN Technology Facilitation Mechanism to the SDGs, but I would argue that this has neither the construct nor the mandate to do so, although the 10 member advisory group has made some very cogent commentary in its advice. At least this group does link to the multiplicity of UN agencies which is something the previous Secretary General's Scientific Advisory Board could not do, being most closely linked with UNESCO instead. I think it is generally accepted that there were problems with the limited mandate of the last SG's Scientific Advisory Board, but without it, a void has been created at the very moment we most need a coordinating body.

The annual Science Technology and Innovation forum to the SDGs is a stakeholder forum and is not designed to take on this role either. Rather, it is largely focused on the related issue of technology transfer, which itself is a broad theme within the SDGs.

Thus, although the Global Sustainable Development report has cogently identified roadmapping as an important step, it has not identified how this can be resourced and implemented.

We are left with a significant void. The complexity of the UN itself means there is no truly comprehensive view of its various advisory inputs. The multiple agencies of the UN tend to work in silos and the full scope of sciences do not have a strong voice in many of the agencies that could be making great use of scientific advice. There is a need to get beyond capricious progress to address these knowledge gaps.

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

The ICSU analyses suggest that getting a high level roadmap of key knowledge gaps could be achieved relatively rapidly. Perhaps their model needs to be systematically applied across all 17 goals. Indeed, without an agreed roadmap, the vagaries of contestable research – which is increasingly managed and directed to areas of donor interest – may limit progress unless roadmaps exist against which relative claims of priority can be put. Even then there will inevitably be gaps. So the question then becomes: Even if they were identified how would the global community coordinate to fill them?

There is no generalised global research funding system and never likely to be one. Understandably, most governments spend their research dollars almost entirely within their own borders and on issues of domestic relevance. Funding provided for development assistance is also often constrained to link to donor's objectives. And other funders such as foundations tend to have their own agendas and priorities.

So inevitably it is going to be left to uncoordinated and somewhat capricious national funding, development assistance funding and the various interests of private funders and charities to pick from the unknown menu of possible research programmes, all claimed to be relevant to the SDGs. There will be the temptation to go immediately to the development community for input rather than going somewhat more upstream for novel ideas and solutions. The indicators within the SDGs repeatedly identify ambitious targets for impact – but in many cases this will require considerable innovation to achieve. This requires a mix of implementation science and more upstream research.

Implementation science is essential for much of what the SDGs require, yet that is often the most difficult type of research to fund. It can be politically sensitive because it is either judging a program that is in place, together with those implementing it, or it is trialling a program where continuity of provider jobs and client support is uncertain. All of this is complicated often by programmes being initiated without baseline data, in an unassessable way or without necessary ongoing data collection. Many providers are not focused on measures of efficacy – rather simply on measures of input and service provision. This is a general issue of policy relevant research. It is magnified enormously against an agenda that is full of stated targets, some of which are input focused and others that claim proxy measures of performance.

Thus it seems to me that a major step forward in imagining progress toward 2030 would be to implement what the Sustainable Development Report suggested. But this needs to be a highly systematic approach to identifying the type of knowledge that is needed and then ensuring national governments have access to agreed roadmaps to promote it to funders within their public research systems. In addition to this, while

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

we will not ever have a global funding system should we be thinking about novel models for coordinated knowledge production? Can we learn from existing models that could address this challenge?

One model is the Global Research Alliance on Agricultural Greenhouse Gases. This consortium emerged out of the infamous Copenhagen climate change meeting in 2009 when NZ, supported by Canada and – at that time – the USA and several other countries, proposed a coordinated approach to agricultural emissions, given that 20% of GHG are associated with food production. This led to considerable diplomatic efforts and then a meeting in NZ in 2010. At that time diplomats and scientists from some 30 countries had parallel meetings to develop the alliance model which was then endorsed by ministers when they signed a charter in Rome in 2011. The Alliance now has 49 member countries and a large number of agency partners. The members include all the major food-producing countries at all income levels. The secretariat consists essentially of two people and is based in Wellington. The secretariat supports a science-led effort in which scientists jointly identify the needs and then largely seek domestic funding to address these in a very coordinated fashion.

The activities are grouped into streams each with lead countries: paddy rice, livestock cropland and integrated systems. Several of the countries have supported international funding. For example NZ funds international research in the area of ruminant GHG emissions – obviously an area of high priority as it represents about 50% of NZ's total emissions profile. In some areas I think the progress has been substantive and has involved research that would likely not have happened and certainly not in a coordinated and open way.

There are other models of global research coordination without consolidated funding – the human genome project was one such example. Of course in science with a big physical infrastructure like CERN and the Square Kilometre Array, formal cooperation with national funding contributions does exist. There are international organisations such as IIASA, which is funded by national subscription, that undertake some complex systems analyses.

SDG 9 generally labelled "infrastructure" is worth noting. Target 9.5 reads "*enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including by 2030, substantially increasing the number of research and development workers per 1 million people and public and private research and development spending."*

This is echoed in other targets that also refer to domain specific research promotion and production. The drafters of the SDGs clearly saw the importance of investing in

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

national research infrastructure. But the significance of this target can be muted by nations' own priorities

Certainly an increasing number of low and middle-income countries are establishing robust institutions for delivering science through universities and academies and sector-based public research institutes. However, with many competing priorities in low income settings, only half the countries in Africa, for instance, have national academies and many do not have the basic institutions for delivering scientific knowledge for policy development. The possibility of some more formal partnerships between countries to build these capacities seems obvious.

For example INGSA has been working with the Pacific Community look at ways to develop an academy for the Pacific Island states to enhance the standing of scientists within their community and link that group of low income small islands to the global science community.

Now let me turn to a second set of issues related to the SDGs. While a gap analysis and roadmapping exercise will be needed to coordinate a truly global response to the SDGs, we have a good idea of the general type of research and technologies that will become significant as the SDGs emerge as a global agenda; indeed the Sustainability Report provides a great list to start with. But is society willing to accept the technologies that could be most effective? For instance, the report points to new data-science, bio-tech, nano-tech, neuro-tech and green-tech that could offer solutions. At the same time, it makes reference to geo-engineering, new extraction technologies and other areas of research that are not without controversy. There can be no doubt that we need to anticipate issues of social license that will likely emerge.

In my view, at least three classes of such technology merit particular consideration as areas for which the implications have not yet been fully imagined.

Firstly, there is data science. The last STI forum in New York last year was very much focused on the role of data and indeed throughout the SDG papers, data is repeatedly mentioned. But there are many issues. For one thing, data collection is not free and in many cases it is not simple. I chaired the WHO Technical committee on birth outcomes 10 years ago and it was concerning to see the high fraction of children born each year for which no birth weight was recorded, to say nothing of those children who are entirely without birth and identity records. Many countries do not have effective national statistical centres, data curation requires a major investment, and big data analysis cannot be done simply by data analysts alone. It also needs expertise to define the models and interpret the data.

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

There are many caveats about big data but the one that worries me most in the context of the SDGs is the issue of social acceptability of data use. Where there is good data being collected, we must still consider who owns the data, who has access to the databases, and how it is interpreted. These issues are real in advanced economies, they will be equally large in LMICs. And globally, the issue of indigenous data sovereignty is another matter that mainstream data science has largely not begun to address. This is important because data science necessarily must set out a number of assumptions in developing its models. If these assumptions are not culturally informed, the outcomes could be wrong.

Secondly, digitalisation, AI and machine learning offer many opportunities but also threaten fundamental concepts of autonomy, democracy and national identity. The power of platform companies and social media is real – and it cannot be taken for granted that this power is innocuous or in the public interest. For example, the future of financial systems and national accounts could be seriously disrupted by block chain crypto-currencies. Are we satisfied that the putative 'transparency' of these technologies can replace the 'accountability' of institutions? I could extend my discussion of this issue at length but that is not for today.

Thirdly the life science technologies from GM to GE to synthetic biology to whatever comes next offer enormous opportunities to deal with biosecurity, disease, food security, environmental management etc. But each of these technologies has real, perceived or unknown risks, creating for a complex discourse that can easily degrade into the entrenched views of one side or the other. Yet it seems likely that some of these technologies will have a role to play if we are to balance sustainability with the increased need for food production and against the background of climate and ecological change.

Each of these three technologies offers enormous positives but also creates major issues of control and social licence. How this is managed will be critical – it will require both jurisdictional and transnational consideration and yet I do not see systems in place to undertake this.

One role of an effective science advisory ecosystem about which I will soon say more, would be to ensure adequate dialogue both with the public and with governments on such issues. It also highlights the importance of science and technology communication in socially meaningful dialogues in every country. Co-production models of doing science will clearly be very important.

So now let me segue to the third question I want to address – one that I believe has gone largely unnoticed by the otherwise very useful analyses and reports on how

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

science can support the SDGs. This is the question of how will science practically engage with the policy-making *process* to progress the SDGs?

An examination of the targets suggests that many of them require policy and/or regulatory development and all have policy implications. And here we have an enormous challenge. While civil society including the private sector are key to achieving the goals, the first road stop must be the policy makers who are those first charged with addressing the 2030 targets. There is not one goal that does not involve policy development and indeed goal 16 is essentially about building robust governance systems.

Policy-making is fundamentally about making choices between options that involve different trade-offs affecting different stakeholders in different ways. More effective policies may be made and implemented if they are informed by scientifically derived evidence. This latter statement should not be contentious, and it should be true both globally and nationally, regardless of the policy context and even though the policy processes and considerations at global and national levels differ.

An increasing number and diversity of countries are establishing more formal science advisory mechanisms within their own domestic ecosystems.

Parenthetically I have tried very hard to eliminate the phrase 'evidence-based policy-making' from my lexicon and talk instead of 'evidence-informed policy-making', but the phrase 'evidence-based' seems to be a particularly persistent meme.

I have spoken at length elsewhere on the nature of domestic science advisory ecosystems and I do not want to dwell on them at length today. I will only make a limited number of points.

Firstly comprehensive domestic advisory systems have some key components: those dealing with knowledge generation, with knowledge synthesis and with knowledge brokerage. Knowledge brokerage is the actual process of transferring policy needs to the science community and transferring an understanding of what we know and the limits on that understanding to the policy community to better inform their options; a decision that will always have a large values component.

My view is that in all countries there is a need for a multi-dimensional ecosystem. Components within the government that can provide informal advice throughout the policy process and components that reflect the input of the scientific community – by means of more deliberative advice – for example via an academy. These internal and external sources have different functions and operational modes but between them and other components I do not have time to discuss, it allows for the full breadth of

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

advisory type. These include technical and regulatory advice as well as policy advice, for advice in emergencies and at the other end of the timescale, foresighting and horizon scanning.

In addition to these diverse and complementary components, I strongly believe that a single focal point speaking to the chief executive of government can help that office make sense of it all. Other components are also needed, for example parliamentary support is desirable, independent regulatory agencies over matters such as drug and food safety are needed and so forth. But whatever structures are used they rely on sufficient institutional development – of government, of academia, of policy making. It is noteworthy that a conclusion of the 10 member group to the Technology facilitation mechanism in 2016, reinforced by conclusions of the STI forum in New York earlier this year, was that all countries need a science advisory ecosystem and single point of focus – in other words a science advisor. And, in a recent discussion in the Pacific, ministers there endorsed a declaration requiring science-advisory focal points in their small countries.

But how do domestic advisory mechanisms link to decisions made at a global level? Largely they don't and that is a problem.

The reality of transnational and multilateral policy agenda setting is that much of it is aspirational and advisory rather than treaty based obligations. The UN system and its agencies make many policy guidelines – in some rare cases this leads to formal agreements. But in either case while the inputs for developing this advice may come from disparate scientific inputs – either internal to the agency or via some forms of advisory committee, these processes are largely isolated from the inputs of domestic processes. Even when national scientists are part of global working groups such as with the IPCC, there is still often a domestic disconnect that really slows the vertical integration of understanding and option selection from global to local of putative solution.

Yet when it comes to decision making and voting in multilateral fora, this is largely done by member states through their foreign ministries. And relatively few foreign ministries are well linked to their domestic science advisory ecosystems. This is a recipe for miscommunication.

I chair the International Network for Government Science Advice (INGSA), where we are working with countries, regions and organisations to identify and address these issues through capacity building. INGSA also has a special interest in science diplomacy and administratively supports the Foreign Ministers Science and Technology Advisory Network, FMSTAN. This is an informal network of science advisors who have a formal connection to their foreign ministries. It is not a large group although it is growing. In

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

my view, greater connectivity will be essential between domestic and internal science advisory mechanisms to achieve better global and domestic decision making about the SDGs.

In the eight years I have spent as New Zealand's chief science advisor I was never once contacted by an international agency (excepting the WHO in respect of the Commission I headed, based on my own research expertise) – and I think this is a general experience. Given that any action recommended at the international level must be implemented nationally, and that science is increasingly helping to steer those actions, it seems essential that there is better linkage between global science advisory systems and domestic science advisory systems if we want more effective science inputs into policies related to the SDGs. But for that to happen, these respective systems must be solid and willing and able to interact, and herein lies a problem.

The UN itself and the international system as a whole is lagging in providing the necessary and effective leadership for ensuring coherent scientific input into policy advice both internationally and nationally. The UN system is largely built in silos, agencies have their own science inputs which are largely inchoate, science in a more holistic sense is often left to UNESCO and yet science and technology are obviously key to progress across the whole agenda. Logic says some coordinating group close to the centre of the UN system is needed. Because, unless whatever science advisory systems exist at the international level are coherently and appropriately linked to national science advisory systems, progress on key SDGs will be impaired.

So what is the solution? The SDGs are somewhat aspirational and I am a pragmatist. What is realistic and what is possible? There is no reason why domestic science advisory mechanisms cannot be developed – or in many cases – better integrated.

Does the recent disestablishment of the last UN Secretary General's science advisory board offer an opportunity to think about what might replace it? For example something along the lines of the following was proposed at and following the STI forum in May this year. It was proposed that a UN Scientific Advisory Board should be re-established but that its membership should be carefully drawn from distinguished scientists with a clear vision of the role of science, technology and innovation in supporting Agenda 2030 and deep experience at the science-policy interface. Its chair should be from within that group and it must report to New York. The board's mandate should be to: ensure better coordination across UN agencies and programmes in the development of scientific input into UN policy development and implementation framework; promote effective linkages between the UN system and international scientific bodies; contribute to coordinated science roadmap development for the SDGs perhaps by contracting it to ICSU; encourage the

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz

development of domestic science advisory systems and their coordination with UN agencies and advisory mechanisms; and assist the Secretary General's office as appropriate through the promotion of science diplomacy.

The road to 2030 could be robustly evidence-paved – indeed robust evidence developed through the broad spectrum of sciences could accelerate progress and make the aspirational achievable. Some goals can be met, some will not, but all of them suggest a direction which if travelled could lead to somewhere with social, environmental and economic progress. I believe that science can indeed help to make it a smoother journey along a more certain path.

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 Email: csa@pmcsa.org.nz Website: www.pmcsa.org.nz