Keynote Speech

Jim SKEA

Chair, Intergovernmental Panel on Climate Change (IPCC)

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Your Majesties, Excellencies, Colleagues, and Ladies and Gentlemen, Good Morning.

As Chair of the IPCC, the Intergovernmental Panel on Climate Change, it is an honor and a privilege to make this keynote speech at the start of this important event.

The last IPCC Cycle resulted in 10,000 pages of reports, more than 300 pages for every minute that I have been allotted. So, necessarily, I will distil the findings as shown in the outline of the speech. I'll start with the context in which we found ourselves before moving on to our findings oriented towards the three goals of the Paris Agreement. To remind you, these are limiting global warming, fostering resilience to climate change, and aligning financial flows with the first two goals. Governments also set these goals in the context of sustainable development and efforts to eradicate poverty. Finally, I will summarize plans for the IPCC's Seventh Cycle, which will run until 2029 or 2030.

First, the context under warming. This section includes some gloomy messages, but I do want to emphasize right from the start that our future is not predetermined, but lies within our own hands. We have agency.

This figure shows how the world has warmed during the last century, 1.1 degrees of warming in the decade 2011 to 2020 compared to preindustrial levels. As His Majesty, the Emperor mentioned, as confirmed by the World Meteorological Organization, 2023 was the warmest year on record with particularly startling extremes in ocean temperatures. Extreme weather events and wildfires ceased to be just part of future projections. They were evident on our television screens and, for too many of us, they were present reality. Sea levels continue to rise relentlessly with consequences for low-lying coastal communities. All this, as we have demonstrated, is down to more than a century of human activities, including burning fossil fuels and unequal and unsustainable patterns of energy and fossil fuel use.

A child born today is likely to live to see the year 2100. Those children could face a significantly warmer world with serious consequences in higher emission scenarios. Note, however, that the highest emission scenario on this slide with a warming of up to four degrees is now less likely due to actions that we have already taken. But only rapid and immediate emissions reductions consistent with the lower scenarios will avoid the worst impacts of climate change.

Unfortunately, we have yet to start reducing greenhouse gas emissions, never mind bringing carbon dioxide emissions to net zero, which is the prerequisite for halting global warming.

Emissions have grown at around 2% per year, with carbon dioxide from the combustion of fossil fuels and industry accounting for about two-thirds of current emissions with significant contributions also from carbon dioxide arising from land use and land use change, and from gases other than carbon dioxide, principally methane and nitrous oxides.

Both historical and present-day per capita emissions vary widely across the globe. North America and Europe together account for nearly 40% of cumulative carbon dioxide emissions since the start of the industrial era. The Southern Asia region and another region, Japan, grouped together with Australia and New Zealand, and the Pacific region each accounted for just 4%.

The right-hand panel shows per capita greenhouse gas emissions in 2019. North America had per capita emissions of around 19 tons of carbon dioxide equivalent, closely followed by Australia, Japan, and New Zealand grouped together, the Middle East and Eastern Europe at around 13 tons. On the other hand, in the meantime, per capita emissions in Southern Asia and Africa are only two to three tons per capita.

Now, this leads to a stark conclusion. This figure shows indices of national vulnerability to climate change on the vertical axis and plotted against per capita carbon dioxide emissions on the horizontal axis. The inescapable conclusion is that those who are most vulnerable to the impacts of climate change have contributed least to global warming. This has attracted much attention when IPCC findings have been presented at meetings of the UN Framework Convention on Climate Change. It is rather a depressing picture in terms of both progress on greenhouse gas emissions and equity.

Let's now move specifically to the goals of the Paris Agreement. The long term temperature goal is the full paragraph highlighted at the top of this slide. It is not a single number. It is the whole paragraph mentioning well below two degrees and pursuing efforts to limit warming to 1.5 degrees.

The IPCC does not produce its own scenarios, but it has assessed hundreds of scenarios published in the literature, including those produced by Japanese researchers. The left-hand panel in the figure shows assessed scenarios over the 21st century of carbon dioxide, methane, and total greenhouse gas emissions consistent with limiting warming to 1.5 degrees.

Please note what is meant by 1.5 degrees compatible pathways. First, 1.5 degrees refers to a 20-year average to smooth out the effect of the El Nino cycle and variations from year to year. It does not refer to warming in a single year. Second, it means limiting to 1.5 degrees in the year 2100, not necessarily throughout the entire 21st century. A temporary exceedance of about a tenth of a degree is considered compatible with 1.5 degrees warming. Thirdly, since scientists can only talk about the likelihood of limiting warming, given uncertainties in the climate science, the Panel refers to a 50/50 chance of limiting warming to 1.5 degrees. With all of these qualifications in mind, global carbon dioxide emissions reach net zero around 2050 in 1.5 pathways. Emissions of total greenhouse gas emissions, including the other gases, reach net zero somewhat later, around 2070.

The right-hand panel shows pathways likely to limit warming to two degrees, which means that

the chance is 67%. Here, carbon dioxide emissions reach net zero around 2070. Greenhouse gas emissions, in fact, do not reach net zero at all in most of the assessed scenarios, though some pathways do reach net zero during the 21st century.

The question is, what does this mean for action in the near term? This slide focuses on the period out to 2050, the net zero year for carbon dioxide under 1.5-degree scenarios. The pink band at the top shows what might happen if currently implemented policies are followed. Emissions would continue to rise, leading to warming of perhaps around three degrees by the year 2100. The blue band, at the bottom, shows pathways consistent with 1.5-degree warming. The middle of that range, emissions fall by 43% by 2030 compared to 2019. The green band shows scenarios consistent with two degrees warming, and these involve a 26% reduction by 2030. Finally, the purple band shows scenarios in which current nationally determined contributions or NDCs under the Paris Agreement are achieved, followed by accelerated efforts to get back on track towards limiting warming to two degrees. Let's make it clear simply, following the current NDCs 2030 puts 1.5 degrees warming virtually beyond reach.

What this figure does is highlight two gaps. There is an emissions gap between current NDCs and what is needed to achieve the long-term temperature goal under the Paris Agreement. There is also an implementation gap in the sense that currently implemented policies are not enough to achieve the NDCs.

Let's remind ourselves that the world has moved on since this figure was first published about two and a half years ago. Emissions have continued to rise. The goal of limiting warming to 1.5 degrees is slipping away without urgent action. Indeed, IPCC concluded that it is likely that warming of 1.5 degrees will be exceeded in the early 2030s, albeit temporarily, in ambitious emission reduction scenarios that could bring warming back down again.

Another way of looking that is through the lens of the carbon budget, because carbon dioxide emissions accumulate in the atmosphere, and these cumulative emissions or a carbon budget are associated with a given level of warming. IPCC has estimated that the remaining carbon budget for 1.5 degrees warming starting from 2020 was about 500 gigatons of carbon dioxide. This is the upper green bar in this figure. The two-degree carbon budget is obviously somewhat larger.

Some estimates made subsequent to the last IPCC report put a revised 1.5 degree budget as low as 200 gigatons, less than five years of current emissions due to continuing emissions and revised estimates of the Earth's climate sensitivity. The 1.5 budget on this slide is also just above the current level of emissions if maintained from 2020 to 2030. At the bottom of the figure, the carbon budgets are compared with lifetime emissions from an existing and planned fossil fuel infrastructure. Emissions from existing infrastructure alone exhaust the 1.5-degree budget, indicating that some fossil fuel assets could be stranded in a 1.5 degrees world.

The UAE Consensus agreed last year talked about transitioning away from fossil fuels. This slide shows in stark numerical terms what this would imply. For 1.5-degree warming, coal use globally is

eliminated from the power sector by 2050 and is reduced by 95% over oil, oil use falls by 60% and gas use by 45%. These declines are, of course, slower consistent with two degree warming. There's the flag there. There will be continued use of fossil fuels for some decades' time, but the use would need to go down under the Paris long-term temperature target.

Let's make it clear. There are reasons for cautious optimism here about future energy developments. There have been huge declines in the cost of renewable energy—wind, solar, and electric batteries—in the last two decades. Battery and solar costs have declined by as much as 80%, and there has been accelerated market adoption. Wind and solar now account for 10% of global electricity generation and the fleet of battery electric vehicles—two, three, and four wheelers—growing rapidly. Other reports have shown that other energy carriers such as hydrogen have a role to play in specific geographies and in markets where electrification is going to be challenging.

Looking forward, wind and solar offer the largest potential for emissions reductions to energy supply by 2030 and other options with significant though lower potential over this time scale include bioelectricity, geothermal energy, nuclear power, carbon capture and storage, and reducing fugitive methane emissions from oil and gas systems. This latter option is particularly attractive in the near term. It could help shave peak warming because methane is a very powerful greenhouse gas with a relatively short lifetime in the atmosphere.

Let me emphasize also the colors here. The blue part of the bars indicates potential which is available at a negative cost. In other words, it would pay to do it even if there was no climate change. There are many low-cost opportunities available there.

Let me also, for this section, just conclude not all emission reduction options are on the supply side. For the first time, the last IPCC mitigation report had a chapter dedicated to the demand side—consumption and human behavior. The authors assessed how human needs for nutrition, mobility, shelter, and manufactured products could be met with lower emission levels.

They concluded that greenhouse gas emissions could be reduced by between 40% and 70% by 2050 using demand side measures alone. Some of these can be achieved by exercising choice, what they term sociocultural factors, especially for food and nutrition. But they also stress that the full potential could not be achieved without infrastructure and the provision of the technologies that allow people to make their choices. Think for example about the supply of electricity or hydrogen fuel cell vehicles and the provision of charging infrastructure.

I have spent a lot of time on the long-term temperature goal, so let's now turn to the second goal of the Paris Agreement on adaptation and fostering resilience.

I think a first warning here is that people and nature are sensitive not so much to average temperatures as they are to extremes. In a warming world, extremes are more pronounced. Hottest day temperatures are projected to increase by between 50% and 100% more than average temperatures in mid latitude and semi-arid regions.

A warming world raises risks for human health through the combination of heat and humidity. With warming of around three degrees, some low latitude parts of the world could experience mortal risks to human beings for most of the year.

The productivity of food systems would decline. Maize yields could fall by up to 25% if warming exceeds three degrees. Fisheries yields would experience particularly widespread decline at higher levels of warming, though in fact yields could actually rise in some of the Arctic waters.

Now, the assessment of the risks associated with climate change has moved on since the last IPCC cycle and, indeed, it has become more worrying. This slide shows a so-called burning embers diagram which communicates the level of risk associated with a given level of warming on the vertical axis. Increasingly intense colors indicate a higher level of risk. Just to calibrate this, the very high risks in purple are those risks which have severe consequences and are irreversible. The transition from moderate to high risks for unique and threatened ecosystems, for example coral reefs, and for extreme weather is now assessed to occur at above one degree warming, the very zone in which we are now entering. Recent extreme weather events are consistent with this finding.

The transition to higher risks takes place at lower levels in land-based systems. Between one and two degrees warming, risks associated with wildfire damage, permafrost degradation, and biodiversity loss grow rapidly. For ocean and coastal systems, warm water corals are already affected. Their decline will be almost complete at two degrees warming and three quarters could be lost even at 1.5 degrees warming, a worrying set of messages.

Let me also get to a positive message. Adaptation measures can substantially reduce the risk of climate change. Proactive adaptation can keep risks to human health to moderate levels at warming levels of below two degrees. The socioeconomic development pathways we follow can reduce risks to food availability and access.

Again, a warning, adaptation action has certainly increased, but progress is uneven. We are not adapting fast enough. Most observed adaptation is fragmented, small in scale, incremental, sector-specific, and focus more on planning rather than implementation. Hard limits to implementation as well as soft limits caused by lack of resources and institutional capacity are being reached in some sectors and regions. The increasing gaps between adaptation, action taken, and what's needed are largest among lower income populations.

Let me turn to the third goal of the Paris Agreement, on finance and means of implementation. Here there are manifest gaps between tracked climate finance and what is needed to put us on a low emissions and climate resilient development pathway. Only 4% to 8% of tracked climate finance is allocated to adaptation and lower than 90% of adaptation finance comes from public sources.

Meanwhile, this slide compares current emission mitigation investment flows in blue on the left-hand side with those required by 2030 to put us on a 1.5 or 2 degrees pathway. These are in gray on the right-hand side. Now, although the gaps are actually narrower than for adaptation, tracked

climate finance for mitigation is still a factor three to six below what would be required to put us on 1.5 or 2-degree pathways. The gaps are there, but they are least for energy supply, noticeably electricity generation, but greater for energy efficiency, transport, and land use measures. They are also substantially greater for developing countries.

Closing these investment gaps requires increased levels of public finance and publicly mobilized private finance flows from developed to developing countries in the context of the New Collective Quantified Goal on Climate Finance (NCQG) agreed at COP28. It also requires reducing risks and leveraging private flows through public guarantees, local capital market development, and building greater trust in international cooperative processes. To emphasize, trillions of dollars are needed; hundreds of billions are not going to be enough.

Finally, the three goals of the Paris Agreement are set in the context of sustainable development and efforts to eradicate poverty, and this obviously links to the central theme of the GEA conference. The last IPCC report systematically explored the links between climate action and the 17 Sustainable Development Goals (SDGs), including goal one on the eradication of poverty, goal two on zero hunger, and goal three on health and wellbeing.

This slide summarizes the consequences of mitigation and adaptation, action taken in respect of energy systems, urban systems and infrastructure, land systems, ocean ecosystems, society, livelihoods, and economies and industry. At this point, I just want to recall a saying which says that a good figure can save you 1,000 words. I have another saying, an IPCC figure takes 1,000 words to explain. Let me not go into detail on this figure, but just try to convey the high-level messages.

The blue bars indicate synergies between climate action and the sustainable development goals, while the orange bars indicate tradeoffs. The clear message is that in the near-term, adaptation and mitigation options have far more synergies than tradeoffs with the sustainable development goals. As an example of a synergy, we have the impact of the adoption of electric or hydrogen fuel cell vehicles on urban air quality with positive consequences for human health, but we also need to be aware of the potential for tradeoffs. Again, another example is the consequence of large scale land use change associated with bioenergy production. This can have implications for biodiversity, sustainable development goal 15, and food security, sustainable development goal 2.

Your Majesties, ladies and gentlemen, that concludes my summary of the findings of the IPCC's Sixth Cycle which ended in July last year. If you will permit me, just a few words on plans for the Seventh Cycle which governments have agreed will last for between five and seven years.

Now, we have actually had some invitations from the UN Framework Convention on Climate Change to consider. The first there from the outcome of the first Global Stocktake, which concluded at COP28, is to consider aligning our work with the second Global Stocktake in 2028 and subsequent Global Stocktakes. The second invitation coming from COP27 in Sharm el-Sheikh is to consider updating 1994 technical guidelines for assessing climate change impacts and adaptation.

I recall that this work was actually co-led by my good friend and colleague, Shuzo Nishioka-sensei, who I had the good fortune to meet again yesterday.

What has IPCC decided to do? IPCC has considered these invitations at its first plenary session of the Seventh Cycle in Istanbul in January this year. After lengthy discussions that run overnight, the Panel decided that the three traditional Working Group reports would be produced in the traditional order: Working Group I, The Physical Science Basis; Working Group II, Impacts, Adaptation and Vulnerability; and Working Group III, Mitigation of Climate Change. However, the Panel could not agree on a time scale for these reports, thus deferring any decision on alignment with the second Global Stocktake. Again, regrettably, neither the Bureau, the elected scientific leadership of IPCC nor the Panel at its second plenary session in July could reach agreement on the schedule. There is going to be a scientific scoping meeting for the three Working Group reports taking place in Kuala Lumpur in December. Following this, the Panel will need to agree the scope, the budget, and the schedule for the three Working Group reports.

Now, the debate on the schedule, I should say, is centered on the desire of some countries to complete the reports in time for the second Global Stocktake and the aim of other countries to allow time to enhance the inclusivity of IPCC processes and for more literature to develop. That is the debate that is taking place.

Work has already started on a Special Report on Climate Change and Cities under the joint leadership of the three Working Groups, and the Panel has agreed the scope of this report already, and the selection of authors is almost complete. It is due to be published by 2027, and a first lead author meeting will take place in March next year.

Too often in presenting the work of the IPCC, we omit reference to the Task Force on National Greenhouse Gas Inventories or the TFI. I am not going to forget that Task Force as it is led by the Institute for Global Environmental Strategies or IGES here at Hayama in Japan. I had the privilege of visiting IGES yesterday and was most impressed by the range of activities underway, much of which supports the work of IPCC.

The Task Force and Inventories plays a vital role in developing the methodologies by which countries report estimates of emissions and removals of greenhouse gases to the UN Framework Convention on Climate Change. In this Cycle, the TFI has been charged with producing two methodology reports. The scope of the first methodology report is on short-lived climate forcers such as sulfur dioxide, NOx, carbon monoxide, and volatile organic compounds. The outline of this report has now been approved by the Panel. A scoping meeting for a second Methodology Report on Carbon Dioxide Removal Technologies and Carbon Capture Utilization and Storage was held only last week in Copenhagen in Denmark. The proposed outline of this will go to the Panel next February for approval. This will fill a very important gap in inventory methodologies in respect of approaches for removing carbon dioxide from the atmosphere.

Finally, the Panel did respond positively to the invitation from the UNFCCC to update the Technical

Guidelines on impacts and adaptation with an emphasis on adaptation indicators, metrics, and methodologies. This will support work under the UN Framework Convention, the global goal on adaptation. It will be developed alongside the Working Group II Report on impacts, adaptation and vulnerability, but will be published as a distinct product.

Finally, there will be, as in previous Cycles, a Synthesis Report due by late 2029 which is under the responsibility of the IPCC Chair.

Your Majesties, ladies and gentlemen, this concludes my overview of the findings from the IPCC's Sixth Cycle and plans for the Seventh. When I was campaigning for the position of IPCC Chair, two of my key themes were policy relevance and inclusivity. As you can see, the Seventh Cycle is shaping up with these aims in mind.

But I do want to leave you with one final message. We must not despair in sight of these gloomy messages. The future is in our own hands, and we do have the means to confront the challenge of climate change. I thank you for your attention and very much look forward to discussions over the next two days.