Climate Change – The Role of Space Technologies and Missions and Beyond

Seville Space Summit Lunch Speech

6th Nov 2023

Ministers, Director-General, Ladies and Gentlemen,

Some years ago, as the newly appointed Director of the Science Museum in London, I received a letter from Lord Tebbit.

Lord Tebbit had previously been Margaret Thatcher's Secretary of State for Employment and then her Secretary of State for Trade and Industry.

I had just been interviewed by the Sunday Telegraph and the Guardian about my views on population and climate change.

In his letter, Lord Tebbit said that he liked my views on population, but thought that what I had said about climate change was rubbish.

So I wrote back to him and invited him to a lunch to talk about it.

We had a lengthy and very pleasant meal and conversation:

I don't recall the details of what we discussed on population.

But on climate change he raised a lot of the common climate sceptic myths.

Two claims he made really caught my attention.

The first was that the climate science community's conclusions were based solely on computer models.

And second was that our results were too uncertain to provide a basis for decisions or policy.

So I explained to him that both claims were false:

Our conclusions on climate change were based on multitude of measurements - from satellites, ships, buoys, balloons, aircraft, the worldwide meteorological network - plus data on past climate from ice cores, tree rings, sediments - and so on.

All of which revealed a consistent picture:

That climate change was real, driven by us, and that it needed to be taken seriously and addressed.

On uncertainty - I made the point that there are few, if any, human activities that are carried out with 100% certainty – in business, war, science, medicine, politics - you name it – it's necessary to use evidence and judgement to make the 'best decisions you can under the circumstances'.

Lord Tebbit's reaction was really interesting.

He became persuaded, and explained why.

Before becoming a politician he had been a navigator on commercial passenger aircraft.

His route was Tokyo to Los Angeles non-stop across the Pacific.

Being a navigator was a skilled task, requiring expertise with a sextant - to take night-time star sightings through an observation bubble in the cockpit roof - as well as proficiency at spherical trigonometry and the use of trigonometric tables to analyse the measurements.

At that time, there were only two weather ships in the Pacific, and the forecasts the flight crews received were notoriously unreliable.

On one particular flight, extreme southerly winds had been predicted.

But Lord Tebbit's mid-course sighting showed them to be way off course – in the wrong place and heading in the wrong direction – only explicable if they had actually experienced strong northerlies – exactly the opposite of the forecast.

He could not repeat his measurements because they had started to run under high cloud.

The problem was that, if he had got it wrong, it was touch-and-go whether they had enough fuel to make landfall.

So he asked himself:

“Am I any good at this?”

“Did I get a good sighting?”

“Are my calculations reliable”

To which the answers were; “Yes, Yes and Yes”.

So he went to the pilot and instructed him to turn hard left.

The pilot argued, but he overruled him.

After a nail-biting journey - he lived to tell the tale.

Lord Tebbit saw the analogy with climate change.

Our climate sextant reading was telling us that we were in the wrong place and heading in the wrong direction.

And that there would be serious consequences if we did not change course.

He left the lunch saying that he was going to take the issue much more seriously – and I have to say that I felt rather pleased with myself.

Fast-forward to today, and what do our climate sextant and compass tell us now?

They tell us that we are definitely in the wrong place, and definitely heading in the wrong direction.

The underlying reason is that we have upset the energy balance of the planet.

The Earth intercepts energy – heat and light – from the Sun.

That energy drives the motions of the oceans and atmosphere, it powers photosynthesis – and it is then radiated as heat into the blackness of space.

Over the 4.5bn year history of the planet, the incoming and outgoing fluxes have been in almost perfect in balance, with slow excursions causing the world to gently warm and cool, within habitable limits.

But by adding greenhouse gases to the atmosphere, and by changing the Earth's reflectivity, we have upset that balance.

The upset is equivalent to every person on the planet – all 8bn of us – each using 50 x 1.5kw electric kettles to pour hot water continuously into the oceans.

It's an apt analogy, since 90% of the energy imbalance goes into the oceans, whilst the rest is absorbed roughly equally by the land, ice and atmosphere.

We don't live in the ocean, so we are not directly aware of the magnitude of what is taking place.

To put it in context, the imbalance is about 35 times the energy we generate on a daily basis to power the modern world – everything – heat, industry, transport, communications – the lot.

It doesn't take a rocket scientist to see that if a perverse consequence of an activity designed to create a benefit, is a disbenefit that is 35 times larger, then that the activity might not be so wise!

And the imbalance is increasing – by as much as a factor two over recent decades – and it appears to be accelerating.

It's the energy imbalance that drives the cascade of consequences – a warming world with more frequent and intense extreme events, wildfires, floods, sea level rise, melting ice – and growing impacts on our infrastructure, food supplies, economy, - and on habitability.

Nobody here can have missed the rising drumbeat of warning signals – the devastation of Acapulco by Hurricane Otis, and the flooding and damages in Europe due to storm Ciarán, are just the latest examples.

It's the backdrop to the UN Secretary General, Antonio Guterres, declaring 'Code Red for Humanity,' and coining the term 'Global Boiling'

It's why we urgently need to increase the scale and pace of global decarbonisation.

But even if we do manage to create the conditions in which the planet returns to energy balance, the climate we will have provoked will be different from the one we inherited – and so we will have to adapt.

The view from space will play a pivotal role.

Polar orbiting and geostationary satellites provide a view of the planet globally, and as an integrated whole – allowing us to understand it, to predict its behaviour, and to monitor and warn.

Satelites have been, and remain, a core source of information underpinning climate science.

Without them we would be flying blind.

And exploration makes a key contribution, in generating unique practical knowledge and new technologies exploitable on the ground, and in changing human perceptions of our place in the Universe:

As "A small blue jewel hanging in the darkness of space".

Recall the words of Jim Lovell, Apollo 8 command-module pilot, who famously said: "*We went to the Moon and we discovered the Earth."*

So at this point in my talk, I could remind you that Europe is the unquestioned world-leader in Earth Observation satellites and systems for climate research, and in developing their use for monitoring, policy guidance and action.

I could talk about past ESA and European visionary investments – in the Earth Watch series and Earth Explorers, the Eumetsat weather satellites, the Copernicus Sentinel missions and their upcoming Expansion – and in the ISS.

And I could describe how the new knowledge and understanding those assets have created, and the climate services they provide, have made a material difference to European commitments and actions on climate change, and continue to do so.

I could talk about progress with the Space for a Green Future and Rapid and Resilient Climate Response accelerators, which you endorsed in the Matoshinos Manifesto.

How they are aimed at creating new European partnerships to ensure that Earth observation satellite data penetrate deeper into societal knowledge and decision making - as described in the ESA submission to this Summit.

But you know all of that – You approved a great deal of it!

So instead I'm going to use my remaining time differently.

I'll start with another short anecdote.

Almost coincidently with my Letter from Lord Tebbit, I received an invitation to brief the Board of Coca-Cola on climate change.

It was the first time the Board had held its annual meeting outside the USA, and they had hired Kensington Palace, in London.

I was given a strict 7-minute slot following the main course of the closing dinner.

In the event, it went so well that the discussion lasted nearly 45 minutes, - until we were politely asked to leave by the palace staff.

To be honest I had not expected much from Coca-Cola by way of environmental or climate credentials.

But I was truly impressed by their plans to reduce their carbon emissions and water usage.

Those commitments were very evidently driven by the leadership, determination, and passion of the Board Chairman.

So on the way down the Grand staircase, as we were leaving, I asked him ‘Why are you doing this?’

He gave three reasons:

- That he was the appointed Board Chair and CEO; was in command, and had the power to set and drive the company's direction.

- That Coca-Cola had a turnover in the tens of billions of dollars, and operated in over 180 countries – So decisions that the Board made would have a larger impact on the planet than those of many nations.

- And thirdly – that he had a 6-year-old grand-daughter, and did not want her, when grown up, to say that he could have done something and had not.

The inter-generational motivation really struck me.

It formed the basis of the play '2071 – The World We'll Leave Our Grandchildren' that I wrote in 2014 with the playwright Duncan Macmillan, and performed in London's West End and the Deutsches Shauspielhaus in Hamburg.

The play was quite a success.

A performance in July 2015 in Brussels, to an invited audience from the European Commission, European Parliament, and other Brussels influencers – which included Connie Hedegaard, then the European Commissioner on Climate Action – is credited with having influenced early deliberations in Brussels in the run up to COP21 in Paris.

So I considered finishing this talk by reading extracts from the play.

For example, it closes by reflecting on where we are and where we are heading, and asks the question; "*What kind of Future do we want to Create?*"

But instead, I decided to read something else, - something that builds more directly on that same issue of inter-generational legacy and moral duty.

It's a short story by my grand-daughter, written in 2017, when she was 11 years old.

I have her permission to read it.

The title is '*3017*':

Here are her words:

"*I step out onto the dusty, parched earth; Mother once told me that the Earth was verdant and fertile, but I'm too young to remember those happy times. The Sun's glare begins to gnaw at me and I retreat to our home. Mother and I have a tunnel all to ourselves; we died of natural causes, when I was four. When we passed, my grandfather gave our bodies to science. They froze us using cryonics, but only worked out how to reanimate us around five or six years ago.*

In the year 2017, Yellowstone erupted, killing thousands of humans, before climate change killed many more. Now, whenever we leave the tunnel, we have to don a moisture suit, so that we don't dehydrate. We no longer eat food (we

ran out of that three years ago); instead we extract atoms from the atmosphere, then combine them to create the nutrients that sustain us.

Many of our friends have left the Earth to try and find a more hospitable planet, but we lost contact with them. My only friend left is Anna-Rose.

"Lara," she asked once as we explored through our forests of twisted blackened boughs "Did you know that these trees were once green?"

I wondered then, and I still do, what green looks like.

Anna-Rose and I roam through our forests all day, every day. We imagine that the cockroaches we avoid, as they scuttle up the walls of our home; or the lungfish and toads we carefully watch in the stagnant pools in the deeper tunnels, are evil witches, coming to get us; and we run up and down the tunnels, laughter echoing in the darkness that surrounds us.

Now, while we are exploring, we accidentally venture further into the cave-system than I would otherwise have gone. The magical glitters and glimmers of crystals that we behold as we enter the colossal dome are overwhelming. We gaze in awe around us, at the precious treasures that lie in our path. Scarlet shards, red as blood, drops of amber, yellow as the Sun, and then, - wait what is this colour? It isn't blue or orange, it looks nothing like red, yellow, pink or purple. This must be green. Green, the colour of a long-lost world, the colour of hope."

My granddaughter has a vivid imagination and a compelling writing style.

She, and all her generation, will experience the legacy that our generation bequeaths them.

They will live through 2050, 2071, and possibly 2100.

Other generations will follow.

But my grandaughter has no power to influence that journey – (at least, not yet!).

You do.

You have power over the future development of European space, and its ability to serve society by helping inform our response to the Climate Crisis.

So my appeal to you is to use that power – 'as best you can in the circumstances' - to ensure that the vantage point of space guides Europe and the World as we radically change course - aiming for a Green Future – Green; the Colour of Hope.

Thank you for your time.

(w2341 =14.5m at 2.7w/s)