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TOWARDS A RESILIENT PLANET:
ENSURING A SUSTAINABLE AND EQUITABLE FUTURE

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Global Commons beyond Sovereign Domains: Oceans, Atmosphere and Biodiversity

PLENARY SESSION: SUMMARY

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Plenary Session

About the Session

Global economic growth has indeed led to the overuse of these resources leading to Hardin's 'Tragedy of the Commons' - for instance, the atmosphere has been overburdened as a depository for greenhouse gases leading to climate change and marine ecosystems have been over-exploited and polluted. Since global commons are outside national jurisdiction, policies related to their conservation and sustainable use, can potentially conflict with national sovereignty and regulation. This calls for different levels of governance in different ways, often requiring global cooperation. This also means that the implementation of such policies will conflict significantly with existing patterns of resource use, sovereignty rights and well-established interests, thus adding to the complexity. With regards to marine areas, the precise goal of the future would be international instruments under the UN Convention on the Law of the Sea (UNCLOS) on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ). The session sought to examine existing institutional structures and frameworks under various multilateral organizations such as the United Nations be effectively used and potentially reformed to ensure better governance and protection of the Global Commons especially in marine areas.

Speakers

Moderator

- Dr Shailly Kedia, Senior Fellow, TERI

Science Leadership Addresses

- Prof Jan Zalasiewicz, Chair, Anthropocene Working Group, International Commission on Stratigraphy & Prof Mark Williams, Professor, University of Leicester
- Prof Will Steffen, Emeritus Professor, Australian National University

Leadership Addresses

- Dr Bruno Oberle, Director General, International Union for Conservation of Nature
- Mr Emmanuel Lenain, Ambassador, Embassy of France
- Mr Hans Jacob Frydenlund, Ambassador, The Royal Norwegian Embassy, New Delhi
- Mr Raphael Goulet, Head of Unit for Ocean Governance, Law of the Sea and Arctic Policy, European Commission

(Launch of Vasundhara [9th Edition], a Student Magazine of TERI School of Advanced Studies)

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https://youtu.be/olPhdBldc_Y.

Actionable Messages

Message 1: We can avoid consequences of the Anthropocene by learning from nature and studying how the beneficial inter-relationships between organisms in natural ecologies can sustain the whole. If human ecologies can be modelled thus, even to the scale of whole cities, then perhaps there is a good way through the Anthropocene.

Message 2: Holocene has been the period of stability which has allowed the expansion of human activities around the world. Holocene is the baseline against which we Anthropocene is being measured. Since 1950, the period of great acceleration, humans have vastly changed the earth system in only a few decades. The great acceleration saw a massive explosion of human population, energy use, GDP and impact on the earth system.

Message 3: To understand the Anthropocene, the planet as a complex system needs to be considered to measure, monitor and examine the profound changes that are occurring not just to land, not just to the biosphere, not just to the geosphere but to the planet as a whole. Most of science is still organized around disciplines which inhibits systems thinking. Interdisciplinary approaches and systems thinking needs to be encouraged in research and action.

Message 4: Planetary boundaries are scientifically based levels of how much we can perturb the complex earth system, beyond which earth system functioning may be significantly altered. The framework tells how the earth system is changing and what a safe operating space is. All boundaries—except for stratospheric ozone are moving in the wrong direction. Novel entities including plastics, radionuclides, electromagnetic radiation could be considered as markers for the Anthropocene. This represents a huge puzzle in terms of addressing a hugely complex issue in a short time frame.

Message 5: At the moment, much of the policy thinking is still a very linear thinking instead of dynamic complexity. There is a need to think of an economic system that is just and distributive by design and one that promotes regeneration of biosphere by design.

Message 6: Ocean as a common is a shared interest of all of humanity and hence equity in approaches is important. The BBNJ agreement can be seen as a key platform to convene the relevant stakeholders in an integrated and transparent manner for raising collective ambitions through nimble institutions. There is a need for evolution of innovative area-based management tools like dynamic closures and migratory corridors and mobile marine protected areas. To improve our management of the global commons, joint research and data collection is essential to gain common understanding of problems and find solutions together.

Message 7: The High Ambition Coalition for Nature and People is a coalition launched to promote an international agreement to protect at least 30 percent of the world's land and ocean by 2030. Agreements like these are catalytic to spur global action and lead countries towards more ambitious global agreements.

Message 8: Biodiversity loss and the climate emergency are going faster than we had anticipated and it is critical to act now to conserve Antarctica's marine biodiversity and ecosystems. The establishment of the world's largest high-seas marine protected area in the Ross Sea in the Southern Ocean are milestones in the conservation of Antarctica's unique marine biodiversity and ecosystems. The goal of representative system of marine protected areas that the members of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) agreed to establish in 2009 needs to be achieved.

Message 9: Plastics makes up to 80% of all marine litter there is need for a strong global agreement on plastic pollution. Even with all the efforts that are being undertaken today, the world will only see a very limited reduction on plastic discharge into the ocean. Improved waste management and recycling is important along with producing less plastic and regulating types of plastic material. A global agreement on plastics is an effective response.

Making Words Count @WSDS 2022

“ Developed and developing nations need to work together to protect and govern the resources coming under global commons. There is a need to develop multi-level and poly-centric approaches that is inclusive of all those who use and depend on these commons including non-human species.

Dr Shailly Kedia
Senior Fellow, TERI

“ It is only in the last century, mainly in the last 70 years that this has taken a very steep upturn to load the atmosphere with carbon dioxide. It may be the steepest rise in all of geological history.

Prof Jan Zalasiewicz
Chair, Anthropocene Working Group, International Commission on Stratigraphy

“ Humans, as a single species are more than 99% of all primate abundance on earth, which is a remarkable figure for any large species. We overconsume, we and our domesticated mammals account for 95% of the terrestrial mammal biomass and we appropriate as much as a third of the energy from all.

Prof Mark Williams
Professor, University of Leicester; Member, Anthropocene Working Group

“ We are now identifying a third core boundary, which we call ‘novel entities’, new stuff- plastics, radionuclides, electromagnetic radiation with Wi-Fi. All this stuff that we are throwing into the earth's system, many of these could be markers for the Anthropocene. Novel entities are a core boundary and those core boundaries represent one of the three spheres of the earth system. The geosphere (climate change), the biosphere (biosphere integrity) and the anthroposphere (novel entities).

Prof Will Steffen
Emeritus Professor, Australian National University

“ It is time now to be bold and visionary but also pragmatic. For the benefit of humankind and ocean, we need to adopt ambitious goals and objectives to secure ocean health, productivity and resilience. We need to manage the global ocean as a shared common based on principle of equity, informed decision-making, shared responsibility and accountability.

Dr Bruno Oberle
Director General, International Union for Conservation of Nature

“ Norway believes that rules-based binding international cooperation through the multilateral system is the best way to preserve our global commons. Contributing to strengthening and adapting global governance especially through the United Nations is a key priority of our foreign policy.

Mr Hans Jacob Frydenlund
Ambassador, The Royal Norwegian Embassy

“ India also gave us a great occasion to rejoice by joining the High Ambition Coalition for Nature and People. This is a coalition of grouping that was launched during the One Planet Summit in Paris in January 2021 to promote an international agreement to protect at least 30 percent of the world's land and ocean by 2030.

Mr Emmanuel Lenain
Ambassador, Embassy of France

“ Science tells us that one of the most effective ways to address this emergency is by respecting and promoting nature-based solutions, for example marine protected areas, which we need to pursue.

Mr Raphael Goulet, Head of Unit for Ocean Governance, Law of the Sea and Arctic Policy,
European Commission

Opening Remarks by Moderator
Dr Shailly Kedia, Senior Fellow, TERI

Global economic growth has indeed led to the overuse of these resources leading to Hardin's 'Tragedy of the Commons'. Since global commons are outside national jurisdiction, policies related to their conservation and sustainable use, can potentially conflict with national sovereignty and regulation.

Developed and developing nations need to work together to protect and govern the resources coming under global commons. There is a need to develop multi-level and poly-centric approaches that is inclusive of all those who use and depend on these commons (including non-human species).

We are now in the second day of the Summit and we have listened to political leaders including India's Prime Minister. So we now come to an extremely interesting segment of our Summit and we start this plenary session with Science Leadership Addresses so that we start the discussions on the basis of science.

Science Leadership Address
Prof Jan Zalasiewicz, Chair, Anthropocene Working Group, International Commission on Stratigraphy
Prof Mark Williams, Professor, University of Leicester

We are members of the Anthropocene working group, working on establishing the reality of this new epoch that we live in. This concept was started by Nobel Laureate, Paul Crutzen when about 20 years ago, at a meeting in Mexico, he said that we are no longer living in the Holocene, the stable epoch in which civilization developed and things have changed too much. He said this on the spot and improvised this new term and concept the Anthropocene which we have been working on ever since.

The logo of the Anthropocene Working Group is basically a horizontal line and a vertical line that marks 15,000 years' worth of change in atmospheric carbon dioxide. The line shows that for almost all of that time, the rate of change stayed very steady and very slow. It is only in the last century, mainly in the last 70 years that this has taken a very steep upturn to load the atmosphere with carbon dioxide. It may be the steepest rise in all of geological history.

It is not just carbon dioxide but there are a whole host of other changes. The global environment is being loaded with plastics, with concrete, pesticides, fertilizers, radionuclides, heavy metals and so on. All of these are marking the environment of today and these will of course make the strata of the future.

Much of this is driven by energy. The amount of energy used in the last 70 years has exceeded the amount of energy used in the previous 11,000 years by humans. It has been an extraordinary rise in energy mainly of hydrocarbons or fossil fuels.

That has led to a trillion tons of extra carbon dioxide in the air and that would make a layer about a meter thick as pure gas and that is currently thickening by about a millimetre every two weeks. This is causing a huge heat and imbalance on the earth. And the equivalent of that is the pouring into the oceans every second, of about four billion cups of hot tea. That is much more energy than we are actually physically extracting for use.

That is having consequences- ice is melting, sea level is rising and that is threatening low-lying parts of the world. Globally this is just one symptom of the Anthropocene, of this new epoch as conceptualized by Paul Crutzen. On the huge question of how Anthropocene is affecting life on earth, I wanted to start by saying that the human population that is driving these changes, now numbers 7.9 billion. Some of us consume more, some of us consume much less but the overriding pattern of human consumption is severely stressing the biosphere, shifting it into a new state. Now more than half of the people that live on this planet, live in towns and cities, some of which have become truly vast.

7.9 billion people is a very difficult number for us to imagine. One gets a feel for those the implications of that number, if we think about the abundance of some of our close primate relatives. Our two closest relatives, for example the chimpanzee numbers about 250,000 in the wild and the bonobo numbers about 20,000. So those two species really are equivalent to no more than one small human city or one small human town. Indeed, humans, as a single species are more than 99% of all primate abundance on earth, which is a remarkable figure for any large species. We over consume and our domesticated mammals account for 95% of the terrestrial mammal biomass and we appropriate as much as a third of the energy from all plants. And as geologists looking at life on earth, no species ever dominated land

and sea like humans in four billion years of earth's history. Humans have profoundly altered the earth's surface in using half of the habitable land for farming and our footprint can be found in pretty much every space on this planet.

And into these profoundly changed landscapes and their ecologies, we have delivered modified species. One of these is the broiler chicken, whose individual mass humans have increased fourfold in the past 60 years simply because we like eating them. We consume them in vast numbers. Over 20 billion of them are alive at any given time and about 63 billion chickens are eaten every year.

Now if one compares that to the next most populous bird on the planet--the red-billed quelea—it is an order of magnitude greater than anything in nature. We have introduced non-native species from far away across the world, many thousands of them, some of these are benign, some are actually beneficial to their new ecologies, but many are very damaging. And the latter—the damaging forms—proliferate in human changed ecologies just as the Manila Clam here is proliferating in San Francisco Bay.

These changes to the biosphere are truly profound by any measure that we look at in geological time and they have already left a significant fossil record, which geologists can clearly recognize. But the changes yet may be more profound and humans can join the ignominious ranks of asteroid strikes and sustained and massive volcanic eruptions as causal mechanisms of extinction. And that is a distinct possibility in the coming decades.

We want to finish with some hope though. We can avoid consequences of the Anthropocene by learning from nature and studying how the beneficial inter-relationships between organisms in natural ecologies can sustain the whole. If human ecologies can be modelled thus, even to the scale of whole cities, then perhaps there is a good way through the Anthropocene. Thank you very much.

Science Leadership Address

Prof Will Steffen, Emeritus Professor, Australian National University

I will talk about four things. First of all briefly on what is the earth system which is not as well-known even in the academic community as most people think after which I will briefly elaborate on the Anthropocene, then I will talk about planetary boundaries and finally the global commons.

The best view of the earth system is actually one from space. Earth as seen from the moon, looks like a little orb floating out there in the blackness of space. Even intuitively, one can see that is a single entity and everything on it is interlinked into a single system that we call the 'earth system'. This is pretty alien to science because most of science is organized around disciplines which is the exact opposite of what we need to do now. We need to understand how the system as a whole actually works. Lot of us now look at this as a single system- the atmosphere, the ocean, the land and so on, all interacting. And to understand the Anthropocene, you need to understand the fact that the planet is a single system with its own properties, its emerging properties at a planetary scale that we can measure, monitor and examine the profound changes that are occurring not just to land, not just to the biosphere, not just to the geosphere but to the planet as a whole.

So one of the most important things we need to understand is that all these parts of the earth system are interlinked. We know a fair bit about atmospheric circulation because we deal with weather every day and that is due to atmospheric circulation. Those of us who live in eastern Australia are dependent on what happens across the Pacific Ocean- El Niño and La Niña and what happens in the Indian Ocean. On longer time frames, we are dependent on the big ocean currents drawn here which move an enormous amount of energy, enormous amount of water, enormous amount of heat around the planet and really affect the way the entire planet operates.

These typical patterns of what we call a complex system. Complex systems have various scales of interaction. One can see, intuitively, how scales work. There are planetary scales like the circulation systems but when you go down in scale, for example around the coast of Japan, there are interesting circulation patterns in the ocean which affects what happens to the Japanese climate, what happens to the Japanese environment and so on. But even below that you can see even smaller scale eddies, which are these circular systems in the ocean. So we need to understand patterns of a system. We need to understand interactions between different scales—on the ocean, on land—interacting all the way up to the planet as well. The point is that when one adds this all up, in an integrated manner, you get one system that operates on the planet as the whole. That is the basis indeed for the Anthropocene. It is not about changes in the ocean or the land on their own, it is about a change in the state of the earth system as a whole.

So one of the ways, we can do this is to go back into time and see how the earth system has changed in the past. The data from an Antarctic ice core, the red line in the middle is a particularly important because it shows our earth's temperature has varied over 400,000 years that encompasses the time that modern humans have been on the planet. So this is our home. This is the part of the time scale in earth system, a tiny fraction of the time that Homosapiens has been on the planet. The rhythmic pattern of very warm short periods then long descents into ice ages and back out again can be noticed. It looks rather like a human heartbeat and indeed it is the heartbeat of the planet. But notice how strongly this is linked this temperature between two constituents of the atmosphere the blue on the top is carbon dioxide and the bottom is one which I think is equally important is methane. These things are all interlinked. They are patterns of the dynamics of the system as a whole and this has an extremely important role to play in the background for what the Anthropocene actually looks like. The last little bit on the end (of the ice core data) is the last about 12,000 years is the Holocene which is the preceding epoch in earth's history, the time before this is all part of the Pleistocene.

In terms of human history, one can plot human history in its entirety on one graph of global average temperature. So the best we understand now is how modern humans evolved sometime around 200,000 to 300,000 years ago in Africa. So we have actually experienced about two of these cycles Milankovitch Cycle they are called between ice ages and very warm periods. But interestingly about 12,000 years ago, we were hunter-gatherer societies. Be it in Africa, Asia, Australia or Europe. It has only been in the last 12,000 years that began to develop agriculture villages and then more recently the enormous mega cities that we inhabit today. Mark made a very good point about how much we now absolutely dominate this biosphere. We have come from being a part of the biosphere, a small part in terms of pre-agricultural humans, all the way through to making over at least half of the entire biosphere now to dominating the geosphere as well.

Our reference is this last 12,000 years. Humans came to Australia about here during a dip when sea level was very low and Australians could between Southeast Asia and Australia. So our indigenous people have endured a very rough climate in this driest continent on the planet and also endured with their culture intact through this transition over about 7-8 thousand years into the Anthropocene. This period of stability, we now use as a marker of zero degrees Celsius. The stability of the Holocene has been the sweet spot for humanity which has allowed us to expand around the world, develop agriculture villages and so on. Holocene is the baseline against which we are measuring the Anthropocene in which humans vastly change the earth system in only a few decades.

So the last 2000 years of the Holocene is very important because most of the contemporary civilizations that we live in—whether we live in China or other parts of East Asia, whether we live in the middle east, whether we live in Europe, whether we live in Australia, whether we live in the Americas—all of us have experienced an exceptionally steady and stable state of the earth system. Temperature around the planet has varied only about one tenth to two tenths of a degree which allowed us to flourish to expand in numbers, to develop our economies, to develop the technologies that now totally dominate the biosphere. Anthropocene from an earth system science perspective, is actually changes to the stability domain of the Holocene, which in the last few thousand years was exceptionally stable. Geologists now have called that the Meghalayan Age which is the last approximately 4,000 years of earth history which was exceptionally stable and accommodating for the earth system. But in less than a century, we have completely changed the dynamics, the state and the future of the earth system.

One of the things that we did in an international program was try to track on what actually has happened in the last few centuries to the earth system. The first thing we did was to look at what has happened humans through (12) graphs that show aspects of human population, economy, energy, resource use and so on. The time scale goes back to 1750 and that was really a trigger. Paul Crutzen who said that things really started to change with the beginning of the industrial revolution which began in England in the late 1700s and then spread around the planet. When I first plotted and drew this, I was at the International Geosphere-Biosphere Programme (IGBP) and I was leading a program that was looking at the data over this last time frame. Our first set of data only went from the year 1900 to 2000. But after Paul's intervention, we went back in time and I expected to see a reasonably linear curve from 1750 to 2000. I did not. And I was a bit surprised when I saw when the data came in. And in fact it showed that things were happening with the industrial revolution but pretty slowly but when one looked at the mid twentieth century, I said something really happened there to the human enterprise. Things really changed- we used a lot more resources, our population exploded and our economy exploded even more.

So then the question was: Can we see any trace of this in the earth system? So we plotted indicators of the earth system including six of the geosphere, six from biosphere. So we looked at the atmosphere, we looked at ocean acidification, we looked at the stratosphere and so on. What we saw was pretty interesting because again from 1750,

things started changing but in many cases not very much. Again around the middle of the 20th century, in most of these graphs, things took off and then we dug into the literature behind the sets of 12 graphs and two things stood out. One is that these 12 graphs of the earth system—geosphere and biosphere—as far as we could see, were unprecedented. This was something, we had not seen before when we looked at the paleo record. So we said this is outside of natural variability for sure and we could demonstrate that extremely clearly. But the second thing we said is we know what the driver is. It is humans. It is direct human pressure on this, the combination of population, but actually more important than population, it was economy and technology that was driving this.

The term 'great acceleration' came a few years later from historian Robert McNeill who in a workshop looked at these graphs and used the great acceleration. It was pretty clear that we humans had shifted the earth system out of the Holocene stability domain. Plotting the whole Holocene and looking at human's population, cumulative energy use, GDP, we can see spikes at the end of the Holocene which are enormous and unprecedented. As Jan and Mark pointed out, it is really hard to find changes this fast in the 4.5 billion year history of earth. From about the 1700s onward, you see increase in population, energy use, GDP but nothing like what happens post 1950. An absolute explosion of human population, energy use, GDP and impact on the earth system.

We did a visualization as a bit of a fun thing with the National Geographic in 2011. They wanted to show the 'great acceleration' visually and they used an identity that John Holdren and Paul Ehrlich introduced in the 1970s - the IPAT equation. Here the impact of humans is sum combination of population times affluence times technology. So this can lend itself to a three-dimensional object. The National Geographic produced this where they used population, technology (measured by patents) and affluence (measured by GDP). The box is filled with stuff that we make, cars, airplanes, houses and all sorts of stuff that humans make. There is an interesting back story here because National Geographic had only two notches here: it had 1900 which is this little tiny wedge and it had 2011. And I wrote back and said this is completely missing the story. They were a bit shocked and I said put in 1950 not just and 2011 put in 1950. So they put 1950 and were stunned. I said this is exactly what you want to show this is the 'great acceleration'.

What we are talking about here is something astounding in the history of the planet. And then we look at the scientific representations. You have all seen this – the global average surface temperature. There is a bit of a lag but from about 1970 it is going up quite strongly.

So in 2020, we are about 1.2 degrees above the long-term average which is a pretty significant change, much higher than anything we have seen probably already passing Eemian conditions of the last interglacial period. But if you look at that in a longer term perspective of 2000 years record, the late Holocene baseline, the spike in the long-term timeframe is visible in what happened in just a few decades. As Mark and Jan have both pointed out, this is extraordinary. It is unprecedented in probably the 4.5 billion year history of earth. Perhaps, the only exception was that of 66 million years ago which saw a spike when the meteorite struck. But it drove the temperature in the opposite direction. It cooled the planet so it is safe to say that the earth has never experienced a warming trend this fast in its 4.5 billion year history. And this spike is definitely human influence without a doubt, not natural variability.

So we can look at the rate of atmospheric CO₂ increase over the past two decades, it is about a hundred times faster than when compared to the maximum rate during the last deglaciation which is pretty fast. In the last half century, global average temperature has risen at a rate 200 times than the background rate over the past 7,000 years of the Holocene and in the opposite direction. This is why ice is melting fast, this is why Eastern Australia is burning, and this is why massive flooding is hitting Europe and so on. These current rates of CO₂ and temperature changes are almost unprecedented in the entire 4.5 billion year geological past. And that is from a synthesis project done by the Geological Society of London.

So let's look at human transformation of the biosphere in the Anthropocene. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services in 2019 published a synthesis of what is happening. Nature is declining globally at rates unprecedented in human history. About one million of seven or eight million animal and plant species that we know of are now threatened with extinction, many within decades. The sixth grade extinction event is already underway and the web of life on earth is getting smaller and increasingly frayed. So in fact one could argue that we are affecting the biosphere at least as much or perhaps more than we are the geosphere at present. This paper where Mark is the lead author comes with some extraordinary conclusions on the global homogenization of flora and fauna. We are mixing flora and fauna on every continent around the planet and we have started to do it in the ocean. We commandeer up to 40% of the productivity of the entire biosphere. Every year, we are mining fossil productivity of the biosphere i.e. fossil fuels. We are now directing the evolution of other species like the chicken. We are increasingly interacting the biosphere with all the technical stuff that we are throwing that we often call 'novel entities'. Radioactive

materials, plastics, and chemicals- they are ubiquitous around every corner of planet earth. This could be a new third stage of biosphere evolution this is really extraordinary.

The first stage was the evolution of life, the second stage was the evolution of complex life from single-celled organisms. What we are doing now to the biosphere may be equivalent in its impact in its importance for the future of the biosphere on earth than the first two stages.

A group of us put together what the earth system actually looks like in 2020. We would not have drawn this 20 years ago but what we show is the geosphere which geologists have known about for a long time, the biosphere, but now the anthroposphere or the human sphere which is interacting in multiple complex ways with the rest of the earth system. It is a very different earth system than it was a few decades ago and certainly a very different earth system from the Holocene.

Let us go on to planetary boundaries. It is important to understand why we are talking about planetary boundaries in the earth system science community. We are well outside of the Holocene. What will it take to get back in there? How can we define a Holocene like state-of-the-art system? If we could possibly get back (which we may not be able to)?

The concept was introduced by Johan Rockström from Sweden in 2007 at a meeting of the Tilbury Forum up in Northern Sweden. And it was quite a profound. In an introduction, Johan was saying- look you scientists and your fellow scientists, we have been talking about the problems. What really needed is what do we need to do? Where do we need to get to? How do we find what is actually the stable safe state of the earth system? And can we get back to it? So that is the origin of the planetary boundaries.

There are scientifically based levels of how much we can perturb this system, the entire earth system, beyond which earth system functioning may be significantly altered. Now you will see that we are already beyond the planetary boundaries. That is what the Anthropocene is telling us. But how far and how badly are we out and can we get back? The framework does not dictate how society should develop but it certainly tells you how the earth system is changing and what we need to do to stabilize it. So we call this a safe operating space and we hope it makes a valuable contribution to decision makers and how we go forward.

And we have published a lot, starting with the original paper in 2009 and an update in 2015. We are now on the third update which is underway. It should be published later this year and I have to tell you it is sobering, it is upsetting and it is probably saying that you are not going to get back to anything near what the Holocene was like. We have gone too far. It is not a good thing for scientists to say but we have to be honest. That is what it looks like.

In 2015, the paper showed a radar diagram with nine planetary boundaries that represent the geosphere and the biosphere. In the radar diagram, the green zone in the middle is the Holocene-like state. It is not quite the Holocene but it is where we can probably live in. Then there is a zone of uncertainty where we think that the science is not very clear but we know that we are in trouble. The red zone where we know that we are in deep trouble. So the ones we know we are in deep trouble are biosphere integrity. The other ones are the important element cycles of nitrogen and phosphorus. But land system change, climate change are moving fast away from the stability zone. I can tell you here that on this diagram, four of the nine boundaries have transgressed. And I can tell you in the paper that coming out, a minimum of six and possibly eight of the nine boundaries will be transgressed. All boundaries—except for stratospheric ozone which we have under control—all other of the other eight boundaries, we are moving in the wrong direction. And they are accelerating which is not a good story. We have documented in great detail on what is the current status of these so-called control variables. We will update them and publish them next year.

So in this update, as I mentioned, the two core planetary boundaries, so climate change really is the core boundary representing the geosphere and what we call biosphere integrity is the integrity of the biosphere which is a complex concept represents the biosphere, both of them have been transgressed, and they are accelerating away from a stability domain. We are now identifying a third core boundary, which we call 'novel entities', new stuff- plastics, radionuclides, electromagnetic radiation with Wi-Fi. All this stuff that we are throwing into the earth's system, many of these could be markers for the Anthropocene. We are now saying that now 'novel entities' are a core boundary and those core boundaries represents one of the three spheres of the earth system. The geosphere (climate change), the biosphere (biosphere integrity) and the anthroposphere (novel entities). We are looking at interactions too between climate change, biodiversity, health, water as they are all interlinked.

So the update that I have talked about. Three core boundaries and at least six, possibly eight planetary boundaries will be transgressed. The critical thing for most boundaries is that we are moving deeper into the red zone. The rate of transgression and the earth system is being destabilized at an increasing rate. There is absolutely no doubt. The evidence is showing we are moving in the wrong direction and at an increasing rate.

So in conclusion, the global commons is what we as humans do about this. We are trying to do something the UN sustainable development goals and you can see there's 17 of them and when you unpack them there are more than a hundred indicators and so on. Hugely complex. And it represents obviously a big opportunity but also a huge puzzle. How do you actually achieve something that complex in the short time frame that we have.

Can the planetary boundaries help? I hope so. As I said, they give an indication of how far away we are. They have been picked up by the OECD, UNEP, and World Economic Forum and so on. But I have to tell you when I look at the outcomes of all of those over the last decade, there has been no appreciable evidence that anything we are saying with regard to the planetary boundaries have actually been taken up. And there is no evidence that it has shown any difference to any of the trajectories of the global economy, of the energy system or anything. We have a serious problem in front of us.

Basically what we need to do is to move off this trajectory which shows that we are at present accelerating away from the planetary boundaries. We need to get within the planetary boundaries by 2040 or 2050. Is it even possible? We do not know. All we can say is that the science is saying this is what you have got to do if you want to stabilize the earth system in any sort of state that is close to being commensurate with human well-being.

I work with a lot of colleagues from the social sciences so I take their advice on this. One of the most interesting ones is Kate Raworth from Oxford who has developed the concept of 'donut economics'. It is an approach where what we all care about (health, food, water, equality, gender, jobs, resilience education) and what a good human society looks like is inside the donut but we do not have an infinite planet to work on. We have a ceiling which are the nine planetary boundaries. If we want a stable planet to inhabit and work and to develop our social system, we have to have a stable natural system on the planet. And we do not have that. That is what the planetary boundaries are about. And if one drew the wedges, we are way outside of that. She says that what we have to aim for a safe and just space for humanity and she had seven major points and I have picked out three of them. One is systems thinking. We have got a very linear thinking. The whole neoliberal economic system is based on linear very simplistic kindergarten thinking. We need to think of dynamic complexity. We need to think of equity. We need to think of an economic system that just and distributive by design. The most important one, in my view, is that biosphere has to regenerate by design. If I had anything to do with this, I would ban the word 'resource' from the English language. The rest of the living part of this planet is not a resource. We are part of it. We have to be stewards of it. It is our life support system and we have to regenerate it and our economy.

One interesting idea comes from Portugal from my colleague Paulo Magalhães, a legal expert who says that humans have missed the most important thing from a legal point of view. You do not recognize the earth system and you divide up the physical earth into nation states, ocean zones and maybe even bits of Antarctica but you do not recognize your common home which is the earth system. The intangible system that operates around this planet so his whole goal is to have legal recognition for the system and not the bits of physical territory that we all occupy but the earth system.

My colleague Katherine Richardson says clearly that we should not be trying to manage the earth system. We should focus on managing ourselves and our relationship to the earth system and our activities. The indigenous people from my continent, this Noongar people from Western Australia have it right. We are only here for a short amount of time to do what we have been put to do which is to look after the country. We are only a tool in the cycle of things. We go out into the world and help keep the balance of nature. It is a big cycle of living. With the land and then eventually going back to it. Indigenous Australians understood cycles, systems, and the earth system. We have lost that and we need to get it back. Thank you.

Leadership Address

Dr Bruno Oberle, Director General, International Union for Conservation of Nature

Having looked at the geological scale, the size of global challenges we have in face of us are enormous. And to then find an answer or even start looking for an answer. There is a strike between our request to the system and the boundaries that the system is posing to us. Do we have a landing zone at all? Or is it impossible to solve this question? This on one side is a scientific question that was very well described by the previous speakers. Thank you very much for that. And on the other side, it is a political question. How can we try to get there? I will concentrate on one specific topic of marine protected areas beyond national jurisdiction which is probably the biggest 'common' that we have on this planet.

Let me start by telling that it is time now to be bold and visionary but also pragmatic. For the benefit of humankind and ocean, we need to adopt ambitious goals and objectives to secure ocean health, productivity and resilience. We need to manage the global ocean as a shared common based on principle of equity, informed decision-making, shared responsibility and accountability.

Pragmatically, we need to adopt systematic, strategic and collaborative processes to identify common interests. It will be key to avoid competition while building nimble institutions that can manage the challenges of a rapidly changing ocean considering the urgency of rebuilding and maintaining ocean health. All stakeholders will have to cooperate to conclude an ambitious BBNJ Agreement in 2022.

Today many sectorial and regional bodies have a mandate to establish specific rules but these have limited membership that do not apply to state that are not party to the relevant agreement. The upcoming international conference on marine biodiversity on areas beyond national jurisdiction in March is a critical opportunity to consolidate progress made since the last meeting. But negotiators have to strike a deal with a delicate balance, reaching an ambitious agreement that empowers all parties and protects marine biodiversity while also accommodating and respecting the rights and interests of all states.

Another point that I would like to make is that the global ocean is a common whose health is a shared interest of all of humanity. Hence we need equity in our approach to the ocean so that we can unlock benefit for all of humankind in the oceans in areas beyond national jurisdiction. The management of the ocean should take into account connectivity in addition to marine protected areas. The BBNJ agreement could enable the evolution of innovative area-based management tools like dynamic closures and migratory corridors or even mobile marine protected areas. The BBNJ agreement should be seen as a key platform to convene the relevant stakeholders in an integrated and transparent manner and the channel for raising collective ambitions.

If we need to go beyond the existing mandates of the various competent organizations in delivering transformative change that we need to conserve the ocean, for almost 23 years IUCN has been one of the key players bringing the issue of rising risk and threats to marine biodiversity in areas beyond national jurisdiction to international attention. IUCN has been promoting the need for using existing instruments better. At the IUCN World Conservation Congress in Marseille last year, our members adopted a resolution called acting for the conservation and sustainable use of marine biological biodiversity in the ocean beyond national jurisdiction. The resolution recognized that the ocean in areas beyond national jurisdiction is a common concern of humankind and it should be protected as one ocean. Let us all rally around this message not just at this conference today but far into the future.

Ladies and gentlemen, once again it is time to be bold and visionary but also pragmatic for the benefit of humankind and ocean kind. Thank you very much.

Leadership Address

Mr Hans Jacob Frydenlund, Ambassador, The Royal Norwegian Embassy, New Delhi

It is my pleasure to once again address the WSDS. It was a very stark message that we just heard from Professor Stefan and that goes straight into the issue of the 'global commons' and he actually puts it 'the planet as a global common'. And then it is our problem as diplomats and as practitioners, how are we going to move forward to actually counter these processes?

For Norway, as a small country, we are affected and dependent on action of larger states. We have always worked intensively to enhance the global governance of the resources that we own together. We believe rules-based binding international cooperation through the multilateral system is the best way to preserve our global commons.

Contributing to strengthening and adapting global governance especially through the United Nations is a key priority of our foreign policy. In this intervention I will just focus on one important issue that was picked up by Mr Oberle, the oceans. The oceans is of vital importance to our society and culture and the ocean industries are the backbone of our economy accounting for nearly 70% of our export earnings and it has huge potential. According to the OECD, ocean-based industries could double the contribution to the global economic economy by 2030.

But the oceans are under pressure today as result of climate change, overfishing and pollution. Plastics makes up to 80% of all marine litter and this is why Norway has been working for several years for global agreement on plastic pollution. Improved waste management and recycling is important. But to save our oceans and our climate, we need to produce less plastic and regulate what types of plastic material we use. Later this month, at the UNEA 5.2, we are co-sponsoring a resolution calling for setting up an international governmental negotiating committee to negotiate a legally binding agreement on plastics. If adopted, this will be a landmark achievement by the UNEA, a unique opportunity to restore faith in our multilateral systems ability to protect the commons.

We also engage in greater outcomes to push for better management of the global commons to promote sustainable ocean economy. Norway took part in setting up the High-level Panel for Sustainable Ocean Economy in 2018. The 16 member states of the ocean panel, accounting for at least 45 percent of the world coastlines, have taken steps to apply the latest ocean knowledge as presented transformative set to priority actions to catalyse and scale-up ocean solutions that benefit people, nature and the economy.

To improve our management of the global commons, we need joint research and data to gain common understanding of problems and find solutions together. We need global goals and national actions to ensure we work on the same objectives and measure our progress. We need trust and mutual respect so that we understand each other's specific circumstances and find effective ways of moving in the same direction.

We need international cooperation that transfers technology, provides financing and builds capacity in all countries. Norway is ready to do its part that is why the Norwegian government has a target to double it's overall climate financing by 2026 among other initiatives. The engagement and participation at this year's WSDS is a good sign that we are taking our global commons more seriously. Norway is a proud partner of TERI and WSDS. Thank you TERI for organizing this event.

Leadership Address

Mr Emmanuel Lenain, Ambassador, Embassy of France

Thank you very much. I am very happy and delighted to participate. It is a great pleasure to come back to an event organized by TERI. We really appreciate the good work done by TERI. We have an old connection with TERI. We remember that it was led by Dr Pachauri who had studied at La Martiniere and had a very good French connection and we know that this connection is still very much alive today. So thank you for all of this.

Let me just stress on a few achievements of the Indo-French partnership because we have had quite a few successes and we are very happy about it. In the last few weeks, we had the One Ocean Summit in the city of Brest which took place from 9-11 February and Prime Minister Modi blessed us with a message and he confirmed India's support to ambitious coalition on biodiversity beyond national borders. Basically it means that with like-minded partners like India, we are going to try to conclude as soon as possible, in 2022, the so-called BBNJ treaty on Ocean protection it's very important that we conclude it this year. We have been discussing the need to better steward marine areas beyond national jurisdiction for almost ten years now so it is high time.

And as you all know, these areas represent grossly 95 percent of the ocean and they provide great ecological, economic, socio-cultural, and scientific and food security benefits to humanity. So it is really a priority to preserve them. For that we need to secure a very strong legal framework which is based on science and which would set additional legal obligations. So thank you India. It is really a game changer that India joined this initiative.

The second achievement that I would like to stress is the fight against marine litter plastic pollution. It is a key issue to protect our coastal areas and oceans. During the One Ocean Summit, the President of French and the Indian Prime

Minister decided to join forces and agreed to work together on the global initiative against single-use plastics. That is very significant and is a powerful momentum at the global stage, at the multilateral level. We are working also on this issue and my country supports UN Environment Assembly Resolution that is proposed by Peru and Rwanda on the launch of negotiations on a global agreement on plastics.

We feel that we really need this agreement. Even with all the efforts that are being undertaken today, the world will only see a very limited reduction on plastic discharge into our ocean. According to one estimate, only seven percent annually within 2040. This is not enough we cannot go like this. So this new global agreement is really the only truly effective response. We hope that India also will join.

On this, let me now conclude by saying that at a broader level, India also gave us a great occasion to rejoice by joining the High Ambition Coalition for Nature and People. This is a coalition of grouping that was launched during the One Planet Summit in Paris in January 2021 to promote an international agreement to protect at least 30 percent of the world's land and ocean by 2030. And again, we believe that having India on board is really a game changer and this will be a real catalyst to spur global action and lead other countries toward a more ambitious agreement.

India is one of the 17 mega-diverse countries with at least four biodiversity hotspots. This is an area where our two countries are working extensively with each other on protection issues. We have regular exchanges and cooperation projects through our development agency called AFD. As a part of numerous projects on reforestation and biodiversity management, we have a great program in Assam in the park of Kaziranga and it has yielded some very significant results for example the increase of the rhino population.

To conclude, we very much value our cooperation with India where much progress has been achieved. We should continue to increase and speed up to protect global common goods, especially biodiversity. Thank you very much.

Leadership Address

Mr Raphael Goulet, Head of Unit for Ocean Governance, Law of the Sea and Arctic Policy, European Commission

Our assessment is that the world urgently needs a new economic model, one that decouples economic growth from resource depletion, one that promotes innovative solutions which are carbon neutral and less harmful to the environment. The post COVID-19 recovery gives us the opportunity to develop such a model. So let us build all our efforts and resources to make it happen. In Europe, we call these efforts 'a green deal' which starts from the belief that the best way to achieve long-term growth is by decarbonizing our economy, by moving from linear to circular production and consumption models, by protecting nature, and by cutting waste and pollution the oceans and marine ecosystems are part of the solution to contribute to the transformation we want.

We all know what the current situation of our ocean is. It is suffering from pollution and over-exploitation of marine biodiversity and is at risk and climate change exacerbates this phenomenon. Science tells us that one of the most effective ways to address this emergency is by respecting and promoting nature-based solutions, for example marine protected areas, which we need to pursue.

Limited progress achieved so far. The protected areas that are already designated, cannot remain abstractions. We need to give them management plans to implement and to monitor them. Together, we also need to encourage a perception shift beyond protection well-managed marine protected areas also generate economic benefits in parallel to strengthening the management of existing marine protected areas. We need to expand the network in particular to cover the sensitive areas of the high seas.

Within the EU, we want to expand the network of marine protected areas to 30 percent of our seas and protect a wide range of marine habitats and species.

Marine protected areas can also be instrumental for building cooperation and transformative change at global level. We do have some success stories. The establishment of the world's largest high-seas marine protected area in the Ross Sea in the southern ocean comes to mind. It was a milestone in the conservation of Antarctica's unique marine biodiversity and ecosystems. But we are still far from the representative system of marine protected areas that the members of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) agreed to establish in 2009.

The designation of new marine protected areas in the southern ocean is a priority for the EU. Large-scale marine protected areas can help conserve marine biodiversity and build ocean resilience against climate change impacts. To deliver on these commitments, the European Union and its member states have proposed to CCAMLR where India is also a member, the designation of two marine protected areas, one in East Antarctica and the Weddell Sea.

There is wide-spread support for these proposals within CCAMLR including India as co-sponsor which we are very grateful for. But there is still a few members which continue to block progress on this important issue so we will therefore continue our outreach efforts to convince more members to join this. There is no time to lose. Biodiversity loss and the climate emergency are going faster than we had anticipated and it is critical to act now to conserve Antarctica's marine biodiversity and ecosystems. The EU also wants to work with the international community to establish marine protected areas elsewhere in the high seas including with India, as stated in our joint roadmap 2025.

We are particularly happy that India joined the high ambition coalition on Biodiversity Beyond National Jurisdiction (BBNJ) launched by the European union at the One Ocean Summit organized by France in Brest last week. These ongoing negotiations in the United Nations on BBNJ are a great opportunity to protect the ocean. The new treaty will provide the mechanisms to create globally recognized marine protected areas in the high seas. It would also be instrumental to achieve the ambitious targets, we would like to see reflected in the future post-2020 global biodiversity framework in particular to ensure that at least 30 percent of the global ocean is conserved.

If we succeed, it will be a most significant achievement in ocean governance. We should therefore, all join forces to reach an ambitious agreement as soon as possible in 2022. Meanwhile work in regional fisheries management organizations and regional seas conventions needs to continue unabated to put in place of the protection of sensitive ecosystems and species in a regions beyond national jurisdiction.

Inclusion of better protection of marine ecosystems can bring substantial health, social and economic benefits to coastal communities and the world as a whole. The need for action is clear. Let us join our efforts to make a difference. Thank you very much.

Launch of Vasundhara [9th Edition], a Student Magazine of TERI School of Advanced Studies

The session saw the launch of the Ninth Edition of Vasundhara. Vasundhara is a student magazine which is an initiative of the Eco-club and is the official Sustainability magazine of TERI School of Advanced Studies, entirely run by the students. For the Ninth Edition, 'Wetlands' is the central theme, covering a wide range of topics, such as restoration, technology and its different aspects, impacts on the lives of indigenous communities, economic importance and much more. The issue can be accessed from <https://terisas.ac.in/pdf/TheWaterPalette.pdf>.