

## Interview with Dr. Jean-Pierre Gattuso

*The Our Shared Seas team is excited to welcome Dr. Jean-Pierre Gattuso for a conversation on the ocean-climate nexus.*

*Dr. Jean-Pierre Gattuso is a CNRS Senior Research Scientist at the University of Sorbonne and the Institute for Sustainable Development and International Relations (IDDRI). Dr. Gattuso served as the coordinating lead author for “The Special Report on the Oceans and Cryosphere in a Changing Climate” (SROCC) released by the Intergovernmental Panel on Climate Change (IPCC) in September 2019. He also served as lead author for the IPCC Fifth Assessment Report released in 2014. He has published widely both on ocean solutions and on the impacts of climate change on marine organisms and ecosystems.*

**Our Shared Seas: Welcome Dr. Gattuso.**

**Dr. Gattuso:** My pleasure, thank you.

**Our Shared Seas:** We recognize that the IPCC has produced dozens of reports over the past three decades. The recent report that you’ve been collaborating on, the “Special Report on the Ocean and Cryosphere in a Changing Climate,” is significant for a number of reasons, one of which is that it is the first standalone assessment by the IPCC which focuses specifically on the impact of climate change on the ocean and ice. As a coordinating lead author for that report, can you provide some background on how and why the IPCC decided to elevate this topic to its own report? Additionally, can you share some insights for our readers about what the approval process looks like behind the scenes for the IPCC?

**Dr. Gattuso:** Sure, there are 195 governments represented in the IPCC. At the beginning of every cycle of assessments, and the last one started last year (2018), governments are invited to provide proposals for special reports. The IPCC can only provide a few reports in every cycle, a maximum of two or three. This time the IPCC received around 30 proposals and had to decide which themes would be covered in this assessment cycle. The Principality of Monaco submitted a proposal to have a special report on the oceans and climate change. This proposal was supported by several countries, including Chile, France, China and others, and there were many other proposals. In the end the IPCC in its plenary session decided to combine proposals from the ocean and the cryosphere in order to make them a single report, which actually makes a lot of sense because of the strong connections between these two subsystems of the planet.

For the two other reports, one of them was requested by the UNFCCC, and this was following the Paris Agreement. As you know, the objective of the Paris Agreement is to limit warming to 2 degrees, getting as close as possible to 1.5 degrees, and the UNFCCC asked the IPCC to provide a report on the difference in terms of impacts and also pathways to reach those objectives for those two levels: 1.5 degrees and 2 degrees. The other report was about land use change and desertification.

In the end, the IPCC was tasked with the “Special Report on the Ocean and Cryosphere in a Changing Climate” and work started three years ago with a scoping meeting which took place in Monaco, a country which has been a strong supporter of this report. It hosted a scoping meeting where the outline of the report was designed, and then once the outline was designed, authors were nominated. There were 104 authors in various categories—coordinating lead authors, lead authors and review editors were involved in producing this report. It took four meetings for the main report and one additional meeting for the “Summary for Policymakers” (SPM). In the end, once all the work was done, it took two years, and the final approval session took place in Monaco last week.

To answer the second part of your question, what happens at the approval session. In fact, the delegates of the 195 different governments represented at the IPCC need to approve line-by-line the “Summary for Policymakers” (SPM) report, which is about 30 pages, perhaps a little more for this version. The Summary for Policymakers is displayed on the screen, and authors are grouped collectively in one area of the auditorium. The authors responsible for each section of the SPM are invited to the podium and are there to reply to comments from the delegates and also to questions, to criticisms sometimes and sometimes the SPM needs to be revised according to the comments from governments.

Sometimes there are sticking points where it is not possible to make real-time changes and the chairs of the approval session ask selected authors and government delegates to meet in a separate room and to make progress on those sticking points. This is a very, very difficult and very exhausting effort. It was supposed to be four days long and at the beginning of the fourth day, only 50 percent of the “Summary for Policymakers” had been approved. We started the last day at 8 in the morning for a 27-hour session until 11 am the next day. It was a really exhausting process. But in the end, it was successful. And it’s a really important process because once the SPM and the report are approved, then, the governments own it. They take ownership of it. It eases the negotiations as part of the Conference of the Parties (CoP) meetings. Once reports approved by all governments are on the table, it’s very difficult to dismiss the findings of those reports.

I would like to add one thing—there is a quality control there because the governments cannot request additions to the SPM that are not consistent with the underlying chapters. The governments don’t approve the chapters, and the changes made to the SPM need to be consistent with the science. So that is a very important quality control and the authors have the ultimate decision on whether the changes in formulation or the additions are consistent with the chapters. That is extremely important. The science prevails.

**Our Shared Seas:** Thank you for those behind the scenes details, I think many people just see a very large report and don’t really understand the level of depth and several years of work that goes into these processes, so thank you for that background.

**Dr. Gattuso:** I can add that it’s not a battle between authors and the governments. Many of the comments and slight changes made on the “Summary for Policymakers” are very constructive. At the end of this process, the SPM is better than the one that was initially submitted to the governments. So, it’s a very long process, but in the end, it benefits the report and the SPM.

**Our Shared Seas:** The SROCC is based on a substantial body of scientific evidence—nearly 7,000 peer reviewed studies to be exact. What would you say that we know now that might not have been apparent 10 years ago or alternatively might have had a wider confidence interval attached to it?

**Dr. Gattuso:** First of all, the IPCC doesn't produce research. The task of the IPCC is to assess as you say the literature, assess publications, and gray literature but mostly peer-reviewed literature. So it's an assessment; it's not a research document. That being said, of course a lot of knowledge is accumulated. I mean the number of publications being produced each year is just outstanding.

There is a lot of evidence to be reviewed and as you said, we assessed 7,000 studies. I can speak only about the ocean in terms of what's new because I'm not a cryosphere expert. For the ocean, what is new—in my view—mostly the report confirms previous reports about the warming and ocean acidification that are happening and are projected to continue, as well as sea level rise.

Probably the most prominent conclusion of the SROCC is the revision upwards of sea level rise. In the IPCC Fifth Assessment Report, the maximum sea level rise under the high-emissions scenario—that is without climate action, in IPCC terminology RCP 8.5—the sea level rise was projected to be just under one meter in 2100. This report found that in fact the melting of Greenland and the Antarctic ice sheet has been much larger than it was projected in 2013. Therefore, the sea level rise was revised upwards and now it could be up to 1.1 meter by 2100. It has risen by 10 cm which maybe seems small for some, but in fact it has a tremendous importance for coastal populations, especially populations in low-lying areas.

The governments also asked the report authors to provide information on sea level rise beyond 2100. The report makes projections for 2300 which might seem quite far. But it is important for policymakers to understand what is happening in the long-term when they design new coastal infrastructure—harbors, airports, bridges, and such—to make sure that the infrastructure planned in the next decades will stand for a long time. And the SROCC report found that—there is a lot of uncertainty of course—but with a high-emissions scenario (meaning without climate action), it will be multi-metric sea level rise at 2300, probably up to 5.1 meters. So that is quite stunning.

Importantly, the report also evaluates a low-emissions scenario. In the IPCC vocabulary it's called RCP2.6, and in this scenario, which is mostly consistent with the Paris Agreement, the sea level rise in 2300 can be limited to 1 meter. So, it really shows, and that is true for every variable—for warming, acidification, and so on—the changes can be dramatically lowered if mitigation and adaptation are consistent with the Paris Agreement. So that is one of the aspects that I think stands out in SROCC.

Another one, because your question was also about what became apparent in the last 10 years. Ocean acidification is an area that has taken a lot of importance in the last 10 years. There have been lots of new papers and projections and impacts. It is one of the new aspects in this report, too.

**Our Shared Seas:** Thank you for highlighting those top-level findings; we know a lot of our readers will be interested to hear your perspective given your high-level view of the whole report. When we look forward, how do you hope the global community will provide a policy response to the Special Report? From your perspective, what would you say would be an ideal outcome from the upcoming COP 25 also known as the “Blue COP” and lastly is there anything specific that you're hoping to see from that meeting?

**Dr. Gattuso:** Yes, I was at COP21 when the Paris Agreement was approved and in the ocean community there was a lot of excitement to have the ocean specifically mentioned in the text of the agreement. It was quite

interesting to see some colleagues jumping up and down when new drafts of the agreement were released (several times a day sometimes), and the ocean was mentioned in one and not in the next draft and then was mentioned again. They felt that it was very important to have the ocean included in this agreement.

Personally, I do not fully agree with that. Whether the ocean is mentioned or not in the climate negotiations is not the main point. The main point is to stick to vastly reduced greenhouse gas emissions. If we manage to follow the objectives of the Paris Agreement to limit to 1.5 or 2 degrees above pre-industrial temperatures, it will be beneficial for the ocean, whether the ocean is mentioned in the agreement or not. But certainly, as an oceanographer, I'm quite interested to see the ocean taken into consideration in these high-level negotiations, and I'm very pleased that COP25 has been dubbed the "Blue COP." Organizers want to have a focus on the ocean in the December meeting, so that is very good news.

What I would like to see at this meeting is that the SROCCC report is taken onboard; that government delegates in the negotiations consider the ocean and also the impacts that climate change has not only on the ocean by itself, but for all the services it provides to humanity—in terms of food security, climate regulation, etc. So, taking into consideration that the ocean is important.

In the UNFCCC context, heads of the meeting at COP21 were invited to provide what was called nationally determined contributions (NDCs)—that is the contribution that their country could provide in terms of mitigation and adaptation. And every five years those NDCs need to be revised upwards, to become more ambitious. The next round of NDCs will be in 2020 and it is very important that the ocean is pushed into the policy world at the upcoming COP in late 2019 and that the NDCs use the opportunities offered by the ocean in terms of mitigation and adaptation. So, I'd like to see the ocean reflected in the NDCs next year.

And for that it's very important to have the ocean prominent at this COP in 2019 to make sure that it will be considered in 2020. And in fact with colleagues from several countries, we are preparing a four-page policy brief that we will release in November 2019, providing the background information on how the ocean matters and could be included in the NDCs. So, this COP is a very important step in terms of fulfilling the Paris Agreement.

**Our Shared Seas:** Great, well we'll be eager to keep our eyes out for that policy brief. And we'll be sure to circulate it with our readers once it's available. So, if we transition to solution sets, you have published multiple articles in recent years about ocean-based solutions to address climate change. While there are inherently tradeoffs and limitations of most options, are there particular approaches that you'd highlight as representing the most promising mitigation measures? Among these measures can you share with us why you see them as priorities relative to other options?

**Dr. Gattuso:** Yes, we published a paper on ocean-based solutions in October 2018 and then we also turned it into a policy brief at the time. One can also mention the report from the High Level Panel for a Sustainable Ocean Economy which also published a report on ocean-based solutions just last week. So combined, there is a lot of information that is available for policymakers to include ocean-based solutions into the UNFCCC process.

In our study, which was partly reflected in the SROCCC, we looked at 13 potential measures. Note that we don't call them 'solutions' because some of them are not desirable solutions or measures. And we looked at four categories of measures.

The first one is an obvious one: addressing the causes of climate change, that is the increase in greenhouse gases. So, there are two ways to look at this: mitigation can be either by reducing the sources of greenhouse gases or by increasing the sinks of greenhouse gases. And it is the balance between those two that is important in terms of climate and policy. Among those measures to address the causes of climate change, there is obviously marine renewable energy, marine bio-energy with carbon capture and storage, restore and increase coastal vegetation, which is a carbon dioxide sink, and also measures to stimulate the storage of carbon dioxide in the ocean, such as ocean fertilization for example.

The second group after addressing the causes of climate change is supporting biological and ecological adaptation. Under this grouping we have pollution reduction, conservation—that's MPAs, and a few others such as assisted evolution, restoration and enhancement of marine ecosystems and finally there is enhancing societal adaptation. The latter includes measures such as infrastructure-based adaptation to deal with sea level rise, for example.

And the fourth group is about solar radiation management, which includes two measures: cloud brightening—increasing clouds over the ocean to emit solar radiation reaching the ocean's surface and contributing to warming—and also the ocean surface albedo enhancement. The latter includes putting foam at the ocean's surface to reduce again the penetration of solar radiation into the ocean. I want to say that we assessed most of the measures that are described in the literature. We do not endorse all of them. Subsequently, in the policy brief we are preparing for November 2019, we will assign those measures into different groups, like which measures are 'decisive'—meaning that they have high effectiveness and few disbenefits; measures that are 'low regret,' referring to measures that are not so effective to limit climate change but have a lot of co-benefits.

Then there are measures which are either uncertain because they are only at the concept stage and we don't really know whether they are so effective and also the level of disbenefits. Lastly there are measures which we find risky because they have many drawbacks. If you want, I can provide examples in each group.

**Our Shared Seas: Sure, that would be wonderful, thank you.**

**Dr. Gattuso:** One of the 'decisive' measures is the large-scale increase in the use of marine renewable energy—that is offshore wind energy and also energy provided by tides—and those two are very effective. The technology is here and is already being deployed, so there is no impediment to a large-scale increase in the use of marine renewable energy. There are two other ways to use marine renewable energy: this is energy coming from ocean currents and also from ocean waves. These latter approaches, from an engineering perspective, are not ready yet. But overall, marine renewable energy is clearly a decisive measure.

Among the low-regret measures, there is for example the conservation and restoration of coastal vegetation, that is mangroves, seagrass beds and salt marshes. The reason is that those ecosystems, coastal ecosystems, which are sometimes called "blue carbon" ecosystems, use carbon dioxide for photosynthesis and store carbon on the ocean floor along the coast. They are very efficient carbon stores. But they do not qualify as decisive measures because their effectiveness to limit carbon dioxide in the atmosphere is relatively small. It is estimated

that restoration of coastal vegetation could represent only 0.5 percent of the current carbon dioxide emissions, so it's a relatively modest contribution. But it has a lot of co-benefits because those ecosystems not only store carbon dioxide, but they harbor significant biodiversity, so restoring them contributes to maintaining biodiversity. They are also very efficient to protect coastlines from erosion and storms. And also, they contribute to food security because a lot of fish reproduce and live in those ecosystems. So coastal populations can use those fish for food. That is why we refer to blue carbon systems as 'low regret.' There is no reason not to do it, even though the effectiveness to limit climate change and its impacts are very limited.

Finally, one last example of a risky measure, that in our view cannot be recommended--and here I'm not talking about the Special Report because it did not look at many of the measures that I mentioned. It also did not look at solar radiation management. The reason is that these will be covered in great detail in the IPCC's upcoming Sixth Assessment Report, due to be published in 2021 and 2022.

In our [2018] study, we found that solar radiation management was risky and also it addresses the symptoms of climate change, that is ocean warming. It does not address the underlying causes of climate change. On top of that, those methods with the objective of limiting ocean warming do nothing in terms of ocean acidification. Because technically about 20 percent of carbon dioxide emissions will end up in the ocean. So even if solar radiation management is implemented, it will not benefit the ocean from the perspective of limiting ocean acidification.

**Our Shared Seas: Among the most promising measures that you've identified just now, what would you say are key barriers or opportunities for implementation? Secondly, are there additional investments or commitments needed to increase the rate of adoption for these measures? Perhaps you could comment specifically on one to two measures or characterize the field more broadly.**

Yes, so we can take as the first example, marine renewable energy. There, there are no barriers and it's quite the opposite. There are many opportunities to develop a very strong economy, sometimes dubbed the "blue economy." This is a fantastic business opportunity to develop those sources of energy and to deploy systems to harness wind energy in a way that's very beneficial and very useful to implement right away. There is no impediment.

Among the low-regret measures, we have, as I said earlier, restoration of vegetation in coastal ecosystems: mangroves, seagrasses and salt marshes. Here most of the techniques are well known. We know how to restore mangroves, for example. The problem is competition for other uses of the space.

The problem is that mangroves, seagrass beds and also salt marshes are being decimated, destroyed to allow for coastal development. For example, in southeast Asia, mangroves are often cut and disappear because the space is used to develop the coastline to build or to make facilities for shrimp aquaculture, for example. So, the competition—that's a barrier—the competition for space and for other uses. That is a very difficult problem to solve for many countries.

I forgot to mention earlier that it's very important to conserve those blue carbon ecosystems also because they have stored huge amounts of carbon in the past centuries to millennia. And once they are degraded, this carbon in the soil, in the sediment is exposed to bacteria and other organisms which use this carbon and release carbon dioxide. When a mangrove is cut, not only does it not perform its carbon dioxide storage activities, but

the carbon dioxide that was stored in previous centuries to millennia is then release. What used to be a carbon sink then becomes a carbon source, contributing to the release of greenhouse gases. It's a very good reason to conserve and protect those ecosystems besides restoring them.

So, these are two examples where there are barriers or opportunities.

**Our Shared Seas: You also mentioned marine protected areas as a low-regret option for climate change. Can you talk about why marine protected areas, specifically, are a low-regret option and what opportunities there are for countries to use them as a climate adaptation measure?**

**Dr. Gattuso:** Yes, absolutely. In our study, we assessed marine protected areas because, there is evidence in the literature that organisms and ecosystems in marine protected areas are more resilient to climate change. You know, because the ocean and organisms and ecosystems are subject to a large range of drivers, sometimes called stressors. Climate change is one but there is also pollution, overexploitation, the use of those ecosystems for tourism, etc. When you limit those additional stressors in a protected area, those systems are more resilient to climate change.

But it has limits, and a good example of these limits is the Great Barrier Reef, which is arguably the best marine protected area in the world. For a long time, several decades at least, the Great Barrier Reef has been protected. There is a Great Barrier Reef Marine Park Authority, which has zoned the reef in various categories. Some reefs are completely off limits and cannot be visited even for scientific research. The level of protection is very high in some areas, but it hasn't buffered the reef from bleaching. (Bleaching is when corals lose algae that live inside their tissues which are essential for their well-being and as a food source.)

And when corals bleach as a result of warming—if the high temperature stress is too long—they will die in the end. And on the Great Barrier Reef, there have been two major bleaching events in 2016 and 2017, which led to the mortality in many areas of up to 50 percent of the corals. So that shows the limit of marine protected areas; if nothing is done on climate change, marine protected areas are not going to save the ocean. Still, marine protected areas are a good way, combined with other measures, to try to limit the impacts of climate change.

**Our Shared Seas: It seems to be a theme that the measures need to be combined together to work effectively.**

**Dr. Gattuso:** There is not one magic bullet solution to limit climate change and its impacts on the ocean. Obviously the main one, and it's absolutely critical, is mitigation, which means decreasing the amount of carbon dioxide that is released in the atmosphere. Besides that, there are much smaller measures, such as the conservation and restoration of blue carbon ecosystems, the development of marine protected areas, and the restoration of coral reefs. All those solutions combined with mitigation are a great way to limit climate change and its impacts on the ocean.

**Our Shared Seas: Thank you for that characterization. Would you have any advice for philanthropic institutions that are interested in addressing the impacts of climate change on the ocean? Do you think that philanthropy can help move the needle on this issue in some way?**

**Dr. Gattuso:** Absolutely. In fact, the public doesn't always realize that there are many actors beyond government to solve the issue of climate change. While governments are of course important actors, there are also regions, states, cities, and of course every one of us with a role to play. Philanthropic institutions also have a big role to play, and they already play an important role. For example, the two papers you mentioned earlier were supported by two initiatives—the Ocean 2015 Initiative and the Ocean Solutions Initiative that I led. And those were besides my salary because I am a public servant—the workshops and all the work that was done to produce those studies—was supported by foundations, including the Prince Albert II of Monaco Foundation, the Veolia foundation, and the BNP Paribas foundation. So already today, and I know there are many other examples in your country [the United States] as I know you have many more foundations than we do.

Some philanthropic institutions are competing with one another. I think it will be much more beneficial to set goals and maybe assign roles to institutions, but I'm not sure whether coordination can be performed in this area. But yes, absolutely. They are a tremendous actor, and their role could be greatly increased.

**Our Shared Seas:** To wrap up, thank you so much for sharing your time and insights with our community today. We know you're on quite a literal whirlwind tour following the launch of the Special Report, so we greatly appreciate your generous sharing of your time. And most importantly, we appreciate all your research on behalf of our blue planet. We wish you the best of luck going forward and we're excited to share this interview with our community for the next launch of Our Shared Seas.

**Dr. Gattuso:** Ok, thank you very much for the opportunity. I want to say that not only it is important to produce reports and that these reports are embraced by policymakers, but it's also equally important to disseminate the findings to the public, so that the public can understand what is happening and can take climate change and the ocean into consideration when politics are discussed. Thank you very much for the opportunity.