

In our Time Programme 55  
*Global Climate*

**Melvyn Bragg** : Hello, and happy new year to a new time. Last year the weather gave our planet a terrible beating, at least 16, 000 people lost their lives, as a result of storms. Fifteen million were left homeless, and about 10, 000 died when the world's worst cyclone swept across Eastern India, hurricane Floyd hit the US, typhoon Baht hit Japan, typhoon York hit Hong Kong and Macao, even Western Europe was hurricaned a few weeks ago. The climate it can be made to seem, is on the rampage, so are the effects of global warming that we've heard about already upon us? And if so how can we really hope to stop them?

With me to discuss what could be called "The new climate of fear" at the beginning of a new century is Sir John Houghton, co-chair of the UN Global Warming science committee the International Governmental Panel on Climate Change, and the environmentalist George Monbiot, Guardian journalist and visiting Professor at the Department of Philosophy at Bristol University.

George Monbiot, can you give us an overview of what you see happening with the climate in this next 100 years or so?

**George Monbiot** : This could be the most serious problem which civilisation, which life on Earth faces over the next century. We're seeing two potential sets of effects. The first would be progressive and largely predictable change, with for instance the drier parts of the world becoming drier still, some of the wetter parts of the world becoming wetter still, with potentially devastating consequences for the agriculture of those regions, and for the settled parts of those regions, where you could see many more of the sorts of events that you've just been talking about.

The second level of effects is the unpredictable, the big bang effects, which could come about through what's called "non-linear change" , and these could be potentially, as far reaching as a disruption of the gulf stream which keeps Western Europe warm, and we could end up paradoxically, with a significantly *colder* climate in Western Europe if some of the effects which have been predicted, do cut in, than we've got at the moment.

**Melvyn Bragg** : Now this is very much a received view, and you've been one of the people that have made it received by banging on, very effectively in the Guardian and in other places, I'm going to challenge this in a minute or two, but I just want to emphasise to the listeners, how apocalyptic your views are, by quoting from you a few months ago you said, "Perhaps the gravest calamity our species has ever encountered impact dwarfs that of any war, any plague, any famine, we've confronted so far, it makes genocide and ethnic cleansing look like side-shows at the circus of human suffering", I mean we're in the book of Revelations here, aren't we George?

**George Monbiot** : Well the Red Cross, for example, has now pointed out that, more people are being displaced by climate change than by the entire combined impact of conflict.

**Melvyn Bragg** : Environmental refugees, is that?

**George Monbiot** : Yes that's right. We're talking about tens of millions of people now, being displaced, this figure is likely to rise by the middle of the century, to some hundreds of millions of people, in terms of sheer human numbers, yes it dwarfs all of those factors.

**Melvyn Bragg** : Well, I'm going to come back to ask you how you can be so sure, when we can't be all that sure as to whether it's going to rain in Cumberland next week, but nevermind about that, for the moment that's a little bit trivial, but I think we should introduce a little bit of that at the moment. Sir John Houghton, do you go along with this?

**John Houghton** : Well I go along with it to a great extent, yes, because the science is very firm. We know that we're burning fossil fuels, at an accelerated rate, we're putting Carbon Dioxide into the atmosphere, the Carbon Dioxide content of the atmosphere is now 30% greater than it was before the Industrial Revolution. It's higher than it's been for millions of years on our planet. It's likely to rise to double the pre-industrial concentration and even beyond that during the next century, and that means that the rate of climate change that we're talking about is again much faster than the Earth has experienced for perhaps at least 10, 000 years and maybe longer, and it's this rate of change that

will make it very hard for us to adapt to it, which is a big problem, you know, trees like a certain sort of climate, and if they...if during the lifetime of the tree, the climate changes a lot then the tree will die back .

Humans find it hard to adjust, and of course if the sea level rises, by even a small amount, perhaps half a metre, then large populations will be displaced, and there will be substantial numbers of refugees, and I go along with the sort of numbers of perhaps an estimate of 150 million by the middle of next century, that's half the population of the US.

**Melvyn Bragg** : In the middle of this century, you mean?

**John Houghton** : By the middle of *this* century, indeed, this century, yes, I was realising we're in a new century now, and those numbers are quite **believable**, in terms of what we know about the science.

**Melvyn Bragg** : Right now, you two have spent....devoted your lives to this subject and I haven't, but nevertheless, I've looked at...tried to find some evidence which contradicts this block view, which seems you've got your evidence, but there's other points of view , and ....'cause I'm worried about the evidence that you can know so much about what's going to happen in 100 years time, and I'm worried about the lack of robustness, in saying...well, you know, things have come and gone over the last few hundred years, thousand years, your statistics only go back a hundred years or so, so what are you measuring it against? So that as a historian worries me. I came across this article by Dennis Avery, who's no mean chap, and he says it sounds a lot like what you're talking about, but between 900AD and 1300AD just a few years ago, the Earth warmed by 4 - 7 degrees Fahrenheit, very close to your predictions of this 21st century, and things got *better*, it was one of the most favourable periods in human history, population expanded, food production expanded, there was a surplus of workers and energy, so the cathedrals and castles were built, colossal buildings were required, population actually boomed, technology flourished, real earnings in China reached their highest point, the Indian sub-continent prospered, the deserts retreated and so on, and so forth. So in *those* years, he says, and he says a lot more as well, that he has evidence that with warming over those years, things got massively better for masses of people, so in a sense....why....why? Is he completely wrong?

**John Houghton** : Well he's overstating the position as regarding the middle ages, because the amount of warming was certainly not 5 - 7 degrees, it was less than that. We're talking about a global average at the moment of two or three degrees Celsius, which is perhaps 5 -6 degrees Fahrenheit.....

**Melvyn Bragg** : But there's dispute over the next 100 years how much it is, because Matt Ridley again who's no slouch, says that "the IPCC cut it's estimate of Global Warming by a huge 33%, recently. Three years ago it predicted a 3 degree rise for 2100, plus or minus 1. 5 degrees . Now it says 2 degrees, plus or minus 1" . I'm trying to get at this sort of evidence.

**John Houghton** : Yeah, but Matt Ridley...just...erm...he..... depends on the assumptions you make, regarding the amount of emissions, and all sorts of things, and this change by less than 30% as far as our predictions are concerned, the predictions are essentially the same, in terms of the scientific basis on which they're based, in terms of our scientific understanding, those predictions have not significantly changed for about 15 years now, so they are.....

**Melvyn Bragg** : But can I ask you to.....? Sorry.

**John Houghton** : ....quite strongly based in fact.

**Melvyn Bragg** : So you are sure of two things. First of all that you can predict over the next years, the degrees of Global Warming to 1 or 2 degrees, and (A)...and (B) that these will necessarily have devastating effects, rather than, as in the middle ages, beneficial effects, your convinced of those two things?

**John Houghton** : Well, let's.....

**Melvyn Bragg** : Then we can move on. If you're both convinced, who am I to question?

**John Houghton** : Well, let's say what we're sure about. I mean some parts of the world will in fact, of course,

under a warmer world be better off. If you live in North Siberia, if you are a farmer in a marginal tundra region, then you will have a longer growing period, you will be able to grow different crops and so on. Northern Europe will become, probably agriculture in Northern Europe may well benefit from Global Warming, for instance, and certain parts of Canada. The Far East will tend to die back for the first 100 years or so, because the climate is changing, but then....

**Melvyn Bragg** : But the climate changes massively in tropical forests anyway.

**John Houghton** : .....then they would possibly improve, but that's a question of adaptation, which can be achieved, over a long enough period. So some parts of the world will be better off, but some parts of the world will be hit very badly, and it's the parts which will be hit very badly, which we're mostly concerned about, and that is parts that will be flooded, because of the sea level rise, Bangladesh will be very badly hit for instance, Southern China will be very badly hit.....

**Melvyn Bragg** : But this is no new thing. Parts of the world have been susceptible to floods for centuries and what....people have built dykes against them, and we have now more warnings, so is this such terrible thing?

**John Houghton** : No but you can't build dykes around Bangladesh, it's impossible, it's completely impossible....

**Melvyn Bragg** : Are you certain of that?

**John Houghton** : ....I mean a lot of Bangladesh will be flooded. We're talking about a sea level rise which is very much more than we've had for thousands of years.

**George Monbiot** : I mean....

**Melvyn Bragg** : And you're certain of that?

**John Houghton** : We're as certain as we can be about that, yes. I mean 1 in 1, that sort of number, I mean it's a good certainty.

**Melvyn Bragg** : Right, George Monbiot, you've been aching to comment!

**George Monbiot** : One of the key ironies here is that the parts of the world that are most likely to be hit, are the parts of the world that are already most vulnerable to particularly famine. They are sub-Saharan Africa and the Indian sub-continent. Sub-Saharan Africa because it's likely to get warmer and drier, in the areas which are already warm and dry, which will make life very difficult for the farmers there, which will have a massive impact on food production, and the Indian sub-continent, partly because of monsoonal flooding coming from the sea, but also because many of the centres of civilisation and the centres of agricultural production are the valleys of the great rivers, the Ganges, the Brahmaputra and the Indus, which are fed from the Himalayas, and fed on the whole from the melting of snow and glaciers. Now....in those mountains at the moment, the glaciers are retreating very rapidly, and what we're likely to see is that for the first half of this century, they'll be an increase in flooding in those areas, with potentially devastating consequences for the people living in them. In the second half, we'll see a decrease in the amount of water flowing through those rivers, again, with potentially devastating consequences, for agricultural production, and this is the central irony, these two areas are not only the most vulnerable to climate change, they're also the places in which per head of population, people produce least Carbon Dioxide. In other words we in the developed world are creating this problem, they in the developing world are picking up the bill.

**Melvyn Bragg** : Mmmm, but you...well er...I'm still worried about the evidence for this, the evidence that you....what evidence can you tell us Professor Houghton, that in the next century....'cause all this is to do with man-made pollution isn't it? That the worry is that this is the Greenhouse Effect, it's all to do with us emitting too much CO<sub>2</sub>, and that sort of thing, can you give us your evidence, for the...why the accumulation of this is going to have such a devastating effect? Because people use extra CO<sub>2</sub> as fertiliser don't they? To bring crops on?

**John Houghton** : Yes, indeed, if you want to grow big tomatoes....

**Melvyn Bragg** : So I'm a bit baffled by this..yes....

**John Houghton** : ...you put a bottle of CO<sub>2</sub> in your greenhouse and it will give you bigger tomatoes, and there is a CO<sub>2</sub> fertilisation effect which will to some extent, a small extent, produce greater crops and all this is in the...IPCC, you know the Inter governmental Panel on Climate Change, we're a big body, we try to use all the scientists in the world who know anything about it, whether they believe in devastation

**Melvyn Bragg** : Sure.

**John Houghton** : ..... whether they believe in devastation or not. This is..... so we're talking of thousands of scientists world wide, who've been working on the science of the problem, on the impacts of the problem, and indeed on the economics of the problem, and all the evidence we have points very strongly to the fact that the damage which will occur will be very much greater than the benefits, and I mean the world won't come to an end . It isn't....

**Melvyn Bragg** : Well can you give us some fix on what the emissions of CO<sub>2</sub> are going to do to the atmosphere over the next 50-100 years that are going to make these..... bring about these devastating apocalyptic effects that George has been outlining?

**John Houghton** : Well the two biggest, negative impacts are the rise of sea level by about half a metre, or maybe a metre, but it's the sort of range.....

**Melvyn Bragg** : But this will be caused by what?

**John Houghton** : ....this is caused by...

**Melvyn Bragg** : By us? By pollution?

**John Houghton** : ....this is...no..... this is caused by the fact that the Earth is getting warmer, only by 1 or 2 degrees, but the ocean then....the ocean water expands because it's heated, it's the normal thermal expansion which makes the....it wants a bigger volume, so the sea level rises, and that sea level will continue to rise actually, as the ocean gradually warms over perhaps a 1000 years, all the way to the bottom, so it's....and it's going to rise by the order of...and our conservative estimate is half a metre a century. Now half a metre is going to create some problems for the UK, but we can buy our way out of those, you'll have to raise the Thames barrier and do things on the East coast, and so on, but in places like Bangladesh, Southern China, Nile Delta of Egypt, all the islands of the Indian Ocean and the Pacific Ocean, many of them will disappear. You're talking of millions, hundreds of millions who will be very severely affected by it, some that's one effect.

The other big effect, the other major negative impact is on the water supplies. Now, if you have a warmer world, you have more energy in the atmosphere. You have a bigger...you know, more energetic overturning of the atmosphere as it goes on, you have water..air that goes higher, gets drier, so you get more floods and you get more droughts, more intense floods, more frequent floods, more intense droughts, more frequent droughts. Now floods and droughts are the biggest disasters that the world knows by far , in terms of economic damage, in terms of deaths, in terms of misery. Now if you increase the frequency and the intensity of floods and droughts, and that is very bad news, particularly for many developing countries. Again in a place like the UK, we can buy our way out of it, we can move water from one place to another, we can find things to do . North America the same, Europe the same, but if you go to countries in the sub tropics, which will be very badly hit by this, where large numbers of people live then you're going to get very large numbers of people who want to go and live somewhere else.

And that's not possible, in our modern world.

**Melvyn Bragg** : George Monbiot, are you absolutely convinced...? Well obviously you are, but can you give us your reasoning why all this is going to happen because of man-made pollution? It seems to me we've got a large planet, a lot of it is oceans , that doesn't...pollution come off that, a lot of it has not got factories on, and pollution doesn't come off that, you could say in this particular part of the world in which we live, Western Europe there was far more pollution in the 18th and 19th century than there is today, stuff piling into the sky, you just have to look

across London now, you couldn't look across London 100 years ago, but you can look across London now, and so it goes on and on and on. Are you convinced....and given the way that the Earth changes anyway and there's things coming in from out...dum, dum, dum dum, are you convinced that it's this man-made pollution which you seem to be....this is the single cause...this is going to cause all this tremendous damage you're talking about?

**George Monbiot** : Well there've been some increasingly sophisticated computer models produced charting both the production of Carbon Dioxide and the production of sulphate aerosols, which are another environmental pollutant but which have a corrective effect, they actually reduce the amount of Global Warming, because they create a sort of screen effectively in the atmosphere and when you plot those...the increases in concentration of those gases against world temperature over the course of this century, you see that the two lines are very closely correlated indeed, the statistical probability that those would be correlated without their being a link between environmental pollution caused by humans and world temperatures is very very low indeed, we're talking less than 2%.

So the chances are very high indeed, that the temperature changes we are already observing, and the temperature changes we are likely to observe over the next 100 years are directly and immediately related to human caused environmental pollution.

**John Houghton** : The new thing to say actually, the important thing to say is that Carbon Dioxide from burning fossil fuels, Carbon Dioxide has a long lifetime in the atmosphere, of the order of 100 years, so the Carbon Dioxide that I burn in my house, because I'm burning gas or in my motor car or whatever it maybe, that Carbon Dioxide goes into the atmosphere it spreads around the whole atmosphere and pollutes the world . It's global pollution. Now global pollution is a rather new thing. The only other example we know of that is the ozone layer being destroyed by Chlorine compounds, again which humans put up. We didn't have global pollution 100 years ago.

**George Monbiot** : And this is very hard for us to get our heads round. I mean we have to begin to recognise that we turn on our kettle in Birmingham we're helping to flood Bangladesh this requires a step change in human consciousness. We've got to start to see the world and our impact on the world, our engagement with the world, in terms completely different from those that we've used before.

**John Houghton** : And global pollution needs global solutions, of course, it means all countries have to get together and say "Well some of us might actually be better off, but mostly we're going to be worse off", and because we're now a global village and the world is one community in very many ways, then we have to find global solutions to it and we have to work our way through it.

**Melvyn Bragg** : Well if we had all this pollution, as we did have, knocking about in the 18th and 19th century and you say the CO<sub>2</sub> goes in the air, and hangs around for 100 years, we....shouldn't we have seen more bad effects in the 20th century than we've seen...? No?

**John Houghton** : No, because the amount of Carbon Dioxide we burnt in....100 years ago was very small compared with what we're burning today. We're talking of ..... in fact the amount of Carbon Dioxide in the atmosphere didn't really start to go up until about 1950, when we really started to burn worldwide that is, coals, oil and gas in a big way. We've also cut down forests and wood in forests decay and when wood decays you get Carbon Dioxide too.

So that's helped to add to the total burden of Carbon Dioxide in the atmosphere. So it's only a relatively recent thing, over the last 20 or 30 years.

**George Monbiot** : Melvyn there's some key evidence from some ice cores taken in the Antarctic going back 420, 000 years, and what those show is that Carbon Dioxide and Methane levels, Methane is another greenhouse gas, those are now higher than they've been at any time in that last 420, 000 years.

They also show that the onset of the warming which brought the ice ages that we've had over the last 100, 000 years, over the last half a million years, that the onset of the warming that brought those to an end, was also attended by raised levels of Carbon Dioxide and Methane. So what you're really seeing is that every way you approach this, whichever angle you come in from, the evidence stacks up, one set of evidence on top of the other sets of evidence, until it seems a compelling conclusive picture, man made pollution is leading to Global Warming.

**John Houghton :** There's also another modern thing which is important to realise, is that we're actually much more vulnerable as a world to climate variation. Now climate variability has always been with us, there's always been storms, there've always been droughts, always been floods to some extent, and people have had to live with those, and of course 100 years ago, 200 years ago, 500 years ago, people could move if they didn't like the climate, they could move somewhere else. In the middle ages the Vikings of course, moved from or the time a little later actually when it got colder...

**Melvyn Bragg :** Around the middle ages.

**John Houghton :** ....in Scandinavia , that's right they moved over to...

**Melvyn Bragg :** They moved for other reasons, they moved for loot, but nevermind!

**John Houghton :** ..... (laughs) but they also..... but they also moved because of the climate actually, and so they could move and there was no problem, and they could take over...go and live somewhere else, and until very recently people have been able to go and live other places if the climate's that bad.

**Melvyn Bragg :** I don't think that's true, I mean in the ...when there was the sort of, great freeze in this country say 16th, 17th...when it was very, very cold, most people in this country couldn't just put their knapsacks on and march somewhere else, they were stuck where they were.

**John Houghton :** They didn't need to because there was enough food around, they could grow...you know it wasn't that bad, you know, it wasn't a complete flood or a complete drought, we're talking of...we don't know in this country I think, what you know, the really devastating effects of enormous droughts and enormous floods in the way that Africa has experienced over the last 200 years.

**George Monbiot :** And of course we're seeing people trying to move, which is why we've got this massive phenomenon now of environmental refugees. They're not finding it very easy, but they're doing their best, because in many cases they are desperate. There is simply no way they can keep farming land which has become unsuitable for farming principally because in many parts of the world it's now too dry.

**Melvyn Bragg :** Now I want to ask two questions, one is to do with, as you work so close to it, both of you, you in your scientific capacity, you in your journalistic capacity, what sort of schedule you see for these unrolling catastrophes, and secondly what people in a position to do something about it, are doing about it? So first of all, here we are in the 21st century, you've talked about this century, well we're in it, right, you talked about in 50 years time, which is a snap of the fingers, these...some terrible things are going to happen. So what are we going to see in the next few years on your plan, given....if you're right, and if you're figures are right, what are we going to see?

**John Houghton :** We're going to see a gradual rise in sea level, we're going to see....

**Melvyn Bragg :** Which we're going to see in 20 years time or 10 years time?

**John Houghton :** We will gradually see it, 20-30 years time, we will really see it, for real in a way that we don't see it at the moment, probably. We will see more disasters...

**Melvyn Bragg :** Will that...

**John Houghton :** ...of the floods and droughts kind and so on, and gradually things will get more severe in terms of climate disasters, certainly as far as the developing world is concerned, we will gradually see that occurring. What can we do about it?

**Melvyn Bragg :** Yes.

**John Houghton :** There's a great deal we can do about it actually , because we're terribly inefficient in our use of energy. We burn fossil fuels without really thinking about it, they're so cheap, we don't care about it, and we could

become very much more efficient, we could reduce our use of these things, and we could become more efficient, and we could become...have economic gain in fact from many of the things that we could do. There is a lot of you know win-win situations to be found out there.

**Melvyn Bragg** : Solar energy, wind energy?

**John Houghton** : And then there are other forms of energy, like solar, like wind and so on, which we can....

**Melvyn Bragg** : Which we're not investing in, in this country?

**John Houghton** : ...which we're not investing in, in the way we should be investing in it. We invested 10 times as much in energy research 10-15 years ago than we do now, and yet we need far more new sources now. So we're not doing many of the right things. We're talking about it, but we're not doing it.

**Melvyn Bragg** : Are other countries investing in energy research?

**George Monbiot** : There's really very little going on, and this is a major tragedy. Part of the problem is this great institutional inertia that the...big business has made its investments, be those investments in oil rigs in car manufacturing plants, producing a certain kind of car engine, and it wants to stick to those investments and has fought very hard to ensure that significant change does not take place, and we've seen some very powerful well organised lobbies twisting governments arms behind their backs and saying "You will not make substantial changes will you?" and the governments have said "Fine we won't". We need to break that, we need to break through that barrier, and see far, far more ambitious targets for Carbon Dioxide reduction than we have at the moment.

**Melvyn Bragg** : We now have climate conventions, and the most recent one was at Kyoto with a lot of publicity in 1997 , but the biggest...the engine of the world at the moment, the USA, will not ratify that, what does that say to both of you?

**George Monbiot** : It says effectively that we're going to stick with the carbon inequality which we've built up over the last 50-100 years, whereby....

**Melvyn Bragg** : What does that mean, for listeners who might not have encountered carbon inequality?

**George Monbiot** : That means that the rich countries using a great deal of fossil fuels are effectively causing enormous problems for the poor countries who are using very few fossil fuels, that we're not heading towards a situation whereby we say "Right, there's a certain amount of carbon we can use, a sustainable use of carbon worldwide, let's divide that up, so that eventually we head towards a situation whereby everyone in the world gets an equal allocation and is able to use an equal amount". Thanks to the intransigence of blocks like the US, and to a lesser extent some European countries, we're finding it very hard to move towards that contraction of world carbon use, and that convergence of the amount of carbon allocated per person, which is the only fair eventual solution.

**John Houghton** : But this isn't lying on beds of nails you see Melvyn. In fact it's...in fact the world would be a better place in other ways too . If we cut our energy use, by becoming much more efficient , if we cut our other pollutants too, by burning less fossil fuels, we could have nicer homes, we could have more comfortable homes, we could have better transports, we could live in a much nicer world, and in fact, you know we could grow economically much better actually, if we...

**Melvyn Bragg** : So I suppose...

**John Houghton** : ....and some industries are seeing this as an opportunity, rather than a threat, and that's very good actually.

**George Monbiot** : And there are fantastic opportunities for job creation. I mean some estimates suggest that a 30% cut in Carbon Dioxide, thanks to a transfer to new technology, in Britain, could create half a million jobs.

**Melvyn Bragg** : But as we come to the end of this first programme of new whatsit and whatsit an whatsit

(laughter), I mean having started as a sceptic, I can end as candid, if the immediate future looks so rosy without all this, why aren't we getting on doing it?

**John Houghton** : Because there are lots of vested interests, we're very conservative, politicians are too timid, and if we really grasped it , and said "Let's do it, let's do it well, and let's have a better world", we could get on with it and make a real success of it.

**Melvyn Bragg** : George, do you see anybody taking the lead in this? I mean any...any, with the greatest respect to you two, any sort of substantial political body taking the lead in this?

**George Monbiot** : Well there have been some positive moves, and the British government has been reasonably good, it's been better than most governments. I think what we've got to see really, is a large citizen's movement, worldwide, it's beginning to happen, we've seen people become a lot more confident in their attempts to challenge government positions, we saw that at Seattle for example, in November, the WTO talks. We need to put on governments the same sort of pressure that the industrial lobbies have been putting on them, but driving them the other way, saying "We've got to sort out this problem, and sort it out now".

**Melvyn Bragg** : Finally, can I ask again, to come back to my Devil's Advocate position at the top of the programme, about 30 years ago, a lot of scientists were tremendously worried about an imminent ice age where did that go?

**John Houghton** : Oh a few scientists who didn't know too much were worried about an imminent ice age. I mean there will be an ice age eventually, given a few thousand years. We'll probably head for another ice age But that's way down stream.

**Melvyn Bragg** : (chortles) Down stream?! (John laughs) Alright, well thank you both very much. I hope listeners enjoyed that as much as I did, and next week In Our Time will be looking at the future once more as I discuss Information Technology and its long term effects. Thanks very much for that, and thanks for listening. Good morning.