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Date: Friday, April 11, 2014 11:06AM

Subject: Very concerned with EPD's approach to Waste

Management

History: ➤ This message has been forwarded.

Dear Panel Member

I am concerned with the proposed incinerator. As a resident of south Lantau I am concerned with the environmental impact on south Lantau and other outlying islands like Cheung Chau. Hong Kong in general has air pollution problems and I fear that the incinerator will have a further negative impact.

Regards,
Tim Gnaedig

From: CB1/LEGCO
To: &CCS[1]1
Cc: &SCS[1]1, &CS[1]1, &LGA[1]1, &CA[1]1

Date: Monday, April 14, 2014 09:16AM
Subject: Fw: Very concerned with EPD's approach to Waste Management

-----Forwarded by CB1/LEGCO on 04/14/2014 09:15AM -----

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Subject: Very concerned with EPD's approach to Waste Management

Dear Panel Member

I am concerned with the Environment Bureau's proposal for dealing with Hong Kong's waste problem which does not represent an integrated process for our waste – despite the IWMF name they have given it. This option will involve minimal waste sorting and mass incineration of unsorted waste. There will be no incentive to reduce waste or sort waste if it is all going to be dumped in the furnace for disposal, regardless of the damage this does to the environment, air quality and human health.

Other countries have implemented effective processes for waste reduction at source, have applied waste charging where appropriate, encourage practices for sorting of recyclables, are dealing effectively with recovered recyclables, before finally disposing of residual waste by landfill or thermal treatment. Hong Kong is lagging way behind Japan, Taiwan and other Asian countries in effectively dealing with its recyclable waste. We are in the situation we are in because of a failure to act responsibly to manage waste. Building a huge incinerator will only benefit the construction industry and the operator of the plant. The people of Hong Kong will not benefit from this.

We require a strategy for dealing with waste at source, and applying effective sorting and recovery of recyclables is the most responsible way of doing this.

The cost of the EPD proposal is excessive and wasteful – HK\$18 billion for a single incinerator, including huge land reclamation work and the destruction of natural habitats in an area of outstanding natural beauty. The money is not a problem for Hong Kong with its huge surplus, but should the Environment Bureau be allowed to be so wasteful of tax payers money if there are better alternatives?

The Environment Bureau proposal takes insufficient account of the Hong Kong AQO. There is no doubt that moving grate incineration emits toxic elements into the atmosphere. Therefore, all of Hong Kong will be at risk of deteriorating air quality and the resulting impacts on human health. Does the Medical Department have an opinion about the impacts of the Incinerator releasing dioxins into the atmosphere? How many premature deaths are acceptable as a

consequence of large scale moving-grate incineration?

Hong Kong people deserve a better approach to managing the waste problem and I sincerely hope that you will take the above points into consideration by exploring other options such as the Solena Fuels Solution whereby waste biomass such as un-recyclable urban waste, that would be otherwise sent to landfill, is effectively converted into carbon neutral fuel. This is a very interesting proposition and makes use of waste to create fuel that is used in the aviation and maritime industry. You may find more information on this website <http://www.solenafuels.com/index.php/our-solution>. This truly seems to be a much better, more effective way of managing waster without creating pollution from incineration.

I look forward to hearing the outcome of your decision on this matter.

Thank you.

Best regards

Choi Fong (Ms)

Lantau Island homeowner

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Date: Monday, April 14, 2014 10:44AM

Subject: EPD's Approach to Waste Management

History: → This message has been forwarded.

Dear Honorable Panel Members.

My family and I would like to express our concern at the EPD's approach to waste management and implore you to do everything possible on the 16th April to stop this unsustainable, environmentally disastrous and outrageously expensive plan to build an Super Incinerator using outdated and toxin producing (both air and ash waste) technology on reclaimed land in unspoilt ocean next to Shek Kwu Chau.

Just the rubbish and highly toxic fly ash that falls into the ocean from the proposed barges (no one can possibly ensure it will not, have you ever seen the mess at the paper recycling port at Chai Wan...shocking!) will destroy the waterways and beaches of Lantau and surrounding Islands.

We are sure you would know there are several far better Waste Management alternatives like completely integrated recycling plants and Plasma Arc incineration that will reduce Hong Kong's waste through proper recycling and non-toxic incineration. Sadly the EPD seems blind to all alternatives and determined to proceed no matter what with scant concern for the environment they are supposed to protect. Hong Kong has enough pollution and environmental problems without adding to them at a huge expense to the taxpayers who will then have to suffer from even more toxic pollution.

Please do your best for Hong Kong, it's people and environment and particularly that of the Outer Islands.

Thank You.

Yours Sincerely,
Steven Quilkey

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Cc: Living Islands Movement <info@livingislands.org.hk>, cb1@legco.gov.hk

Date: Monday, April 14, 2014 11:53AM

Subject: Crazy Bonfire-Incinerator and Money for Vested Interests

Dear Panel Member

Yesterday, I hiked up Sunset Peak on Lantau, with my family. Shek Kwu Chau was easily seen from places looking south; the giant incinerator with its 150m chimney would be very visible.

So please don't think this monstrosity will be hidden away, just because most people have no idea what Shek Kwu Chau looks like and maybe think it's far from the city.

By now, you have surely decided how to vote on Wednesday.

If against the government's plans for the Shek Kwu Chau incinerator plus three landfill expansions: great; seems you have been open to reason.

Otherwise: well, you surely know full well these are shameful plans, but there's a huge amount of money to be made by vested interests, which has led to the Env Bureau aiming to railroad these projects through, with plenty of lies, and a remarkable unwillingness to discuss alternatives.

Your mind is surely made up; but just in case you are still willing to think, maybe do right thing, a little info follows. Not new; and others sending much the same.

Lies like the technology will "completely destroy organic pollutants"
No, it certainly won't.

There's research, with published scientific papers, about health impacts such as cancers, premature birth, stunted growth of children near incinerators.

An Afval incinerator is among Europe's top 500 polluters.

Huge amounts of toxic ash will be created; dumping them in a landfill island will be stupid, burdening future generations.

But who cares about the future?

Some places around the world do; hence adoption of Zero Waste measures, plasma arc technology etc. Zhuhai aims to adopt plasma arc waste treatment, for instance.

Does it seem right to you to spend so much money on infrastructure for waste, but only peanuts on collecting separate waste, recycling, and reducing waste amounts in the first place? For jobs, recycling etc would employ a lot more people; and without harmful health impacts.

- which is something many Hongkongers will become more aware of.

You're a politician: you want votes. Supporting monstrous infrastructure hardly seems wise here, not in more than short term anyway.

As to money going way out of control, how about the food waste plant for Lantau, a ridiculous EIGHT TIMES the cost of similar sized plant for UK, where the site presents complex challenges.

Isn't your role on the Legco committee to scrutinise such wanton excesses, and not serve as a rubber stamp?

Ah well, enough already.

For my part, I am extremely disgusted with the government's waste strategy, and the fake "consultation" process.

I may be dismissed as some ignorant "NIMBY" greenie, yet I have a PhD in physical chemistry - a far stronger science background than many an "expert" involved in pushing for incinerator etc - and am involved in efforts to support conservation across Hong Kong.

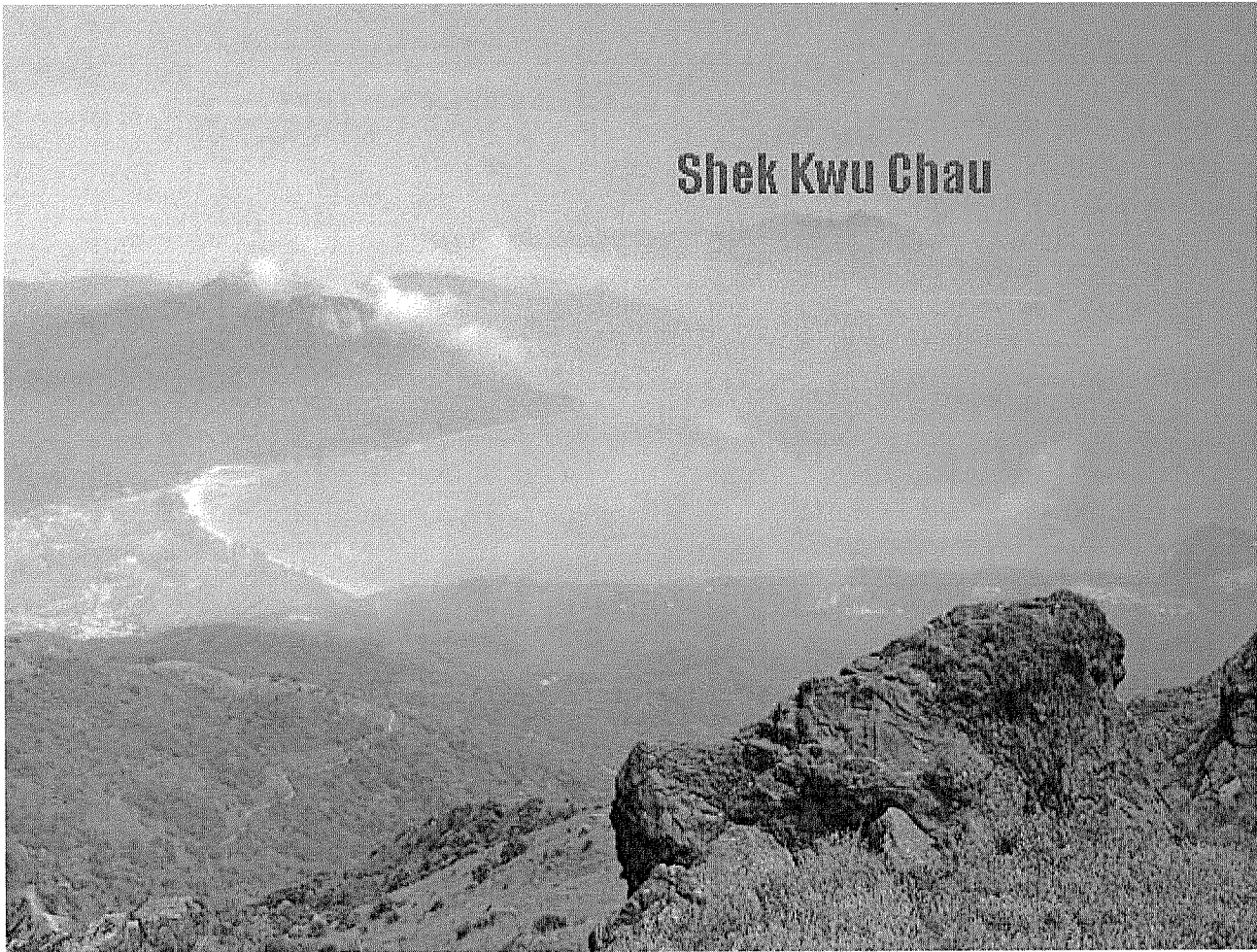
How about you?

Do you have kids?

Might you someday hike up Sunset Peak; and if there's a giant incinerator will you proudly say "I helped get that built"?
- or will you say "I helped keep this area beautiful, and pushed for far wiser waste reduction and treatment" ??

Best regards.

Dr Martin Williams



Dr Martin Williams. Writing. Photography. Multimedia.

- *Recognised as an Outstanding Earth Champion by the Earth Champions Foundation*
Cheung Chau, Hong Kong;

www.drmartinwilliams.com

www.hkoutdoors.com



IPCCreport
James Middleton to: panel_ea

15/04/2014 13:18

1 attachment



IPCCreport.pdf

Dear Hon Members of the Panel on Environmental Affairs

Herewith pls find our submission to the Public Works Subcommittee on a matter of extreme interest to this Panel also.

Kind Regards,
James Middleton
Chairman
Clear the Air NGO



Legco Finance Committee
Public Works Subcommittee
15th April 2014

Dear Hon Legco Members,

The IPCC **Intergovernmental Panel on Climate Change** has just issued its report on Climate Change and what Governments must change in order to stop global warming effects. The full report is downloadable here:

http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf

The massive climate damaging effect of the worldwide emissions of CO₂ are clarified within the report. The IPCC message is quite clear: the world must use more nuclear sources and gas instead of coal for power generation and must reduce CO₂ emissions drastically.

As well as highly toxic emissions to air, a waste incineration plant emits 1 tonne of CO₂ greenhouse gas for every 1 tonne of MSW that it burns (as well as leaving 30% by weight of toxic ash that needs treatment and landfilling). This disaster would add more than 1 million tonnes of CO₂ to the atmosphere per year.

Allowing Government to build this backward technology goes contrary to the advice of the hundreds of world experts and scientists and 200 Governments that have backed the IPCC report.

This Panel should be guided by the combined advice of the world experts towards recycling and away from burning of biomass MSW.

http://www.ipcc-nggip.iges.or.jp/public/gp/bgp/5_3_Waste_Incineration.pdf

CONCLUSIONS

The incineration of municipal waste involves the generation of climate-relevant emissions. These are mainly emissions of CO₂, but also of N₂O, NO_x, NH₃, and organic C, measured as total carbon. CH₄ is not generated in waste incineration during normal operation. It only arises in particular, exceptional, cases and to a small extent (from waste remaining in the waste bunker), so that in quantitative terms CH₄ is not to be regarded as climate-relevant.

In waste incineration plants, CO₂ constitutes the chief climate-relevant emission and is considerably higher, by not less than 10₂, than the other climate-relevant emissions.

In Germany the incineration of 1 Mg of municipal waste in MSW incinerators is associated with the production/release of about 0.7 to 1.2 Mg of carbon dioxide (CO₂ output).

<http://www.bloomberg.com/news/print/2014-04-03/air-pollutants-from-biomass-burning-exceeds-coal.html>

Bloomberg

Air Pollutants From Biomass Burning Exceeds Coal

By Andrew Childers - Apr 3, 2014

Website: www.cleartheair.org.hk Tel 26930136 Fax 26027153



Bloomberg BNA — Facilities burning biomass emit more air pollutants, including carbon dioxide, per megawatt-hour than those that burn coal, according to a Partnership for Policy Integrity report. The April 2 report, "Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal," examined 88 Clean Air Act permits issued to industrial sources that burn biomass.

It found that sources burning biomass emit 50 percent more carbon dioxide per megawatt of electricity generated than coal-burning sources.

Download the report here: (37 Mb)

<http://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf>

Additionally, the report stated that **even the cleanest-operating biomass facilities emit 150 percent more nitrogen oxides, 600 percent more volatile organic compounds, 190 percent more particulate matter and 125 percent more carbon monoxide than coal on a per megawatt-hour basis.**

The report calls for the Environmental Protection Agency to set more stringent air pollution standards for burning biomass to generate electricity.

"Compounding the problem, bioenergy facilities take advantage of gaping loopholes in the Clean Air Act and lax regulation by the EPA and state permitting agencies, which allow them to emit even more pollution," the report said. "Electricity generation that worsens air pollution and climate change is not what the public expects for its scarce renewable energy dollars." Half of the 88 facilities analyzed had avoided prevention of significant deterioration entirely by obtaining synthetic minor permits. Those permits establish emissions restrictions to keep sources below the level that would require more extensive pollution controls.

Carbon Neutrality Defended

The report questions the forestry industry's assertion that burning biomass is effectively carbon-neutral because those emissions would be released eventually once the plant matter decomposed. The report argued that decaying plant matter would release its emissions much more slowly than burning biomass. However, the forestry industry defended biomass as a carbon-neutral fuel source.

The EPA has begun to permit greenhouse gas emissions from sources burning biomass after the U.S. Court of Appeals for the District of Columbia Circuit in 2013 vacated a rule that had temporarily exempted them from the permitting requirements.

For more about Bloomberg BNA, click [here](#).

Visit www.bloomberg.com/sustainability for the latest from Bloomberg News about energy, natural resources and global business.

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Yours sincerely,

James Middleton

Chairman
Clear the Air NGO

<http://www.theguardian.com/environment/2014/apr/12/ipcc-report-world-must-switch-clean-sources-energy>

IPCC report: world must urgently switch to clean sources of energy

Website: www.cleartheair.org.hk Tel 26930136 Fax 26027153

UN panel's third report explains how global dependence on fossil fuels must end in order to avoid catastrophic climate change

- [The Guardian](#), Saturday 12 April 2014



An open-cast coal mine and power station near Grevenbroich, Germany. After concluding that global warming is almost certainly man-made and poses a grave threat to humanity, the UN-sponsored expert panel on climate change is moving on to the next phase: what to do about it. Photograph: Martin Meissner/AP

Clean energy will have to at least treble in output and dominate world energy supplies by 2050 in order to avoid catastrophic climate change, a UN report is set to conclude on Sunday.

The report produced by hundreds of experts and backed by almost 200 world governments, will detail the dramatic transformation required of the entire globe's power system, including ending centuries of coal, oil and gas supremacy. Currently fossil fuels provide more than 80% of all energy but the urgent need to cut planet-warming carbon emissions means this must fall to as little as a third of present levels in coming decades, according to a leaked draft of the Intergovernmental Panel on Climate Change (IPCC) report seen by the Guardian.

There is heavy emphasis on renewable energy, such as wind and solar power, and cutting energy waste, which together need hundreds of billions of dollars of investment a year. But despite the scale of the challenge, the draft report is upbeat: "Since [2007], many renewable energy technologies have substantially advanced in terms of performance and cost and a growing number have achieved technical and economic maturity, making renewable energy a fast growing category in energy supply," the report says.

It also highlights that the benefits of clean energy, particularly in reducing deadly air pollution and providing secure energy supplies, "outweigh the adverse side effects". The IPCC report is the last part of a trilogy compiled by thousands of the world's most eminent scientists which gives the most definitive account of climate change to date. The first report, released in September, showed climate change was "unequivocally" caused by human activity and prompted Ban Ki-moon, the UN secretary general, to say: "The heat is on. Now we must act."

The second, published in March, warned that the impact of global warming, from extreme weather to reduced food production, posed a grave threat to humanity and could lead to wars and mass migration. The International



Energy Agency said the IPCC's work showed "the urgent need of enabling a global transition to clean energy systems".

The report will address how to avert the worst dangers by cutting carbon emissions, which have been rising despite the global recession of 2007-08.

Nuclear power is cited among the low-carbon energy sources needed, but the draft report warns it "has been declining since 1993" and faces concerns about "safety, nuclear weapon proliferation risks, waste management security as well as financial and regulatory risks". Another way to produce low-carbon energy is to burn fossil fuels but capture and bury the carbon emissions. The IPCC experts note that, unlike renewable energy, this technology "has not yet been applied at a large, commercial scale".

The draft report concludes that increasing carbon emissions are due to rising coal use, along with increasing demand for energy from the world's growing population. But it notes that policies implemented to cut carbon emissions will also cut the value of fossil fuel reserves, particularly for coal. It also says increased use of gas could cut emissions in the "short term", if it replaces coal.

China's vast coal burning represents a huge challenge but a new analysis from Greenpeace, published on Friday, suggests it may have reached a turning point. "The range of coal caps and anti-smog measures put in place by the Chinese authorities could see the country cut its carbon emissions by more than twice the UK's annual footprint by 2020, making it possible for global carbon levels to peak before climate change spirals out of control," said Li Shuo, Greenpeace East Asia's climate and energy campaigner.

On Thursday, Nobel peace prize winner Archbishop Desmond Tutu called in the Guardian for an anti-apartheid-style campaign against fossil fuel companies. "It is clear that [the companies] are not simply going to give up; they stand to make too much money," he wrote.

Over half a trillion dollars a year are spent subsidising fossil fuels – six times more than spent supporting renewable energy – and US president Barack Obama and other leaders have pledged to phase these out. The draft IPCC report states this could be done without harming the poor: "Many countries have reformed their tax and budget systems to reduce fuel subsidies, that actually accrue to the relatively wealthy, and used other mechanisms that are more targeted to the poor."

The draft report runs counter to some of the UK's key energy policies. It states that decarbonising electricity is key to cost-effective cuts in emissions, but the coalition government voted down a plan to do this by 2030. The report also warns that building high-carbon energy infrastructure developments will lock societies into high emissions and may be "difficult or very costly to change", but UK ministers are strongly pushing shale gas exploration. The UK's carbon plan includes significant burning of biofuels and biomass (usually wood), which is supposed to be carbon neutral. But the IPCC report says scientific debate about whether biofuels cut emissions "remains unresolved" and that without policy safeguards "large scale bioenergy deployment could increase emissions".

Friends of the Earth's executive director, Andy Atkins, said: "We can only avoid catastrophic climate change if we reduce our dependency on fossil fuels – we're already on track for four degrees warming, which will be impossible for human society to adapt to. We have the technology to prevent dangerous climate change. What we lack is the political will of our leaders to strongly champion renewable power and energy efficiency." Li said: "We stand at a fork in road. One way leads to more dependence on dwindling fossil fuels that are wrecking our climate and damaging our health; the other to a world powered by a booming clean energy sector that is already driving growth and creating jobs. The sooner we act, the cheaper it will be."

<http://www.theguardian.com/environment/2014/apr/13/un-climate-change-report-on-how-to-cut-emissions-live-coverage>

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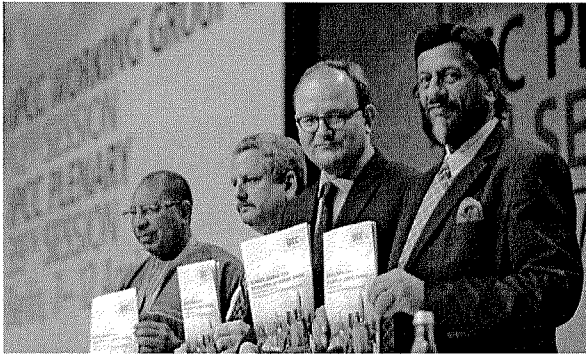


UN climate change report on how to cut emissions – live coverage

Join our live coverage as the [Intergovernmental Panel on Climate Change](#) releases its report on reducing global greenhouse gas emissions



- - [Karl Mathiesen](#)
 - [theguardian.com](#), Sunday 13 April 2014 14.33 BST



IPCC Working Group III co-chairs Youba Sokona, Ramon Pichs-Madruga, Ottmar Edenhofer and chairman Rajendra Pachauri (L-R) attend a news conference to present Working Group III's summary for policymakers at The Intergovernmental Panel on Climate Change (IPCC) in Berlin. Photograph: Stefanie Loos/Reuters

9.29am BST

Climate change report released today

Hello and welcome to our coverage of the release of the [Intergovernmental Panel on Climate Change's \(IPCC\)](#) roadmap for avoiding catastrophic global warming.

Today's report, *Mitigation of Climate Change*, is the third installment in the UN climate body's fifth assessment report (AR5). The first two sections have asserted that climate change is "unequivocally" caused by humans and will cause destruction and massive social upheaval if nothing is done to cut emissions. The third part, which will be released this morning at a press conference in Berlin, attempts to plot the course for the emissions reductions that will avoid the worst effects of climate change. Leaked versions of the report allow for a rare and slender ray of hope. The message from the panel is: where there's a will, there's a way. But it will take an energy revolution which utterly change the way in which we power the planet.

The Guardian's head of environment, **Damian Carrington**, is in Berlin covering the release. He wrote yesterday the report would conclude that clean (particularly renewable) energy output must at least treble in order to provide enough energy to supplant the world's reliance on fossil fuels.

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The report, produced by hundreds of experts and backed by almost 200 world governments, will detail the dramatic transformation required of the entire globe's power system, **including ending centuries of coal, oil and gas supremacy.**

Currently fossil fuels provide more than 80% of all energy but the urgent need to cut planet-warming carbon emissions means this must fall to as little as a third of present levels in coming decades, according to a leaked draft of the Intergovernmental Panel on Climate Change (IPCC) report seen by the Guardian.

There is heavy emphasis on renewable energy, such as wind and solar power, and cutting energy waste, which together need hundreds of billions of dollars of investment a year.

Stay with me over the coming hours as I report on the press conference (starting at 11am Central European Time) and the reaction to this landmark document.

Updated at 9.31am BST

9.43am BST

What is the IPCC?

The Intergovernmental Panel on Climate Change (IPCC) is the UN organ charged with providing assessment on climate change. It was established in 1988 "to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts", its website says.

Currently 195 nations, most of the world's population, are members of the IPCC. Through their membership, nations acknowledge the validity the Panel's findings, making it an important basis for policy.

The body does not conduct research itself, rather it compiles and reviews the latest work of thousands of scientists and delivers it to the global community. Its work is seen as the most comprehensive and authoritative source of knowledge about climate change.

What are AR5 and the working groups?

According to the IPCC, one of its main responsibilities is "the preparation of comprehensive Assessment Reports about the state of scientific, technical and socio-economic knowledge on climate change, its causes, potential impacts and response strategies".

Its fifth assessment report (AR5) is being released in four installments (of which today is the third). The IPCC has commissioned three "working groups" to create the first three parts. The fourth is a synthesis report.

Each working group focussed on a unique aspect of climate change.

- Working group I, The Science of Climate Change, assessed the current state of climate science. I found that human emissions were fundamentally responsible for observed warming of the climate.
- Working group II, Impacts, Adaptation and Vulnerability, looked at the how climate change would impact the world's environment and societies. It warned that the results of unchecked emissions would be catastrophic.

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- Working group III, Mitigation of Climate Change, is charged with assessing the alternatives for global emissions reduction. Leaked drafts indicate the IPCC will call for an enormous global effort to shift the production of energy away from fossil fuels.

Updated at 9.53am BST

9.47am BST

The Guardian's **Damian Carrington** is at the press conference in Berlin. If you'd like to watch it, it will be streamed on the IPCC's site at 11am local time.

9.51am BST

While we are waiting for the flood of news reports, commentary and the press conference itself, here are some key quotes from a leaked version of the report's final draft.

"The upward trend in global fossil fuel related CO2 emissions is robust across databases and despite uncertainties (high confidence)."

"Economic and population growth continue to be the two main drivers for increases in global fossil fuel CO2 emissions over 2000-2010, outpacing the decline in energy intensity"

"Without explicit efforts to reduce GHG emissions, the fundamental drivers of emissions growth are expected to persist despite major improvements in energy supply and end-use technologies"

"The majority of scenarios reaching [safe] atmospheric concentration levels are characterized by a tripling to nearly a quadrupling of the share of zero- and low-carbon energy supply from renewables, nuclear energy and fossil energy with CCS by the year 2050 relative to 2010 [about 17%]."

"The next two decades present a window of opportunity for urban mitigation as most of the world's urban areas and their infrastructure have yet to be constructed." [The Guardian's **Suzanne Goldenburg** reported on this on Friday - At-risk cities hold solutions to climate change: UN report].

"Reduction of subsidies to fossil fuels can achieve significant emission reductions at negative social cost (robust evidence, high agreement)."

Updated at 9.56am BST

10.12am BST

The press conference has begun

The press conference begins with the opening statement from chairman of the IPCC, **Dr Rajendra K Pachauri**.

He says effective mitigation will not be achieved if the world acts independently. The global response "requires an unprecedented level of international cooperation".



If we want to limit temperature increase to 2c by the end of this century, there would have to be large cuts in emissions. Tripling to nearly quadrupling of zero to low co2 energy supply will almost get us there.

"A high speed mitigation train would need to leave the station very soon and all of the world will have to get on board."

10.15am BST

Youba Sokona, co-chair of working group III says the report is a roadmap "designed to safely navigate through shallow water and above steep cliffs".

He says the report provides a detailed comprehensive map of the future and is therefore highly important as a basis for policy making.

Updated at 10.16am BST

10.15am BST

The Guardian's head of environment, Damian Carrington, is in Berlin covering the conference. He says the IPCC has concluded that "catastrophic climate change can be averted without sacrificing living standards".

The authoritative report, produced by 1250 international experts and approved by 194 governments, dismisses fears that slashing carbon emissions would wreck the world economy. It is the final part of a trilogy that has already shown that climate change is "unequivocally" caused by humans and that, unchecked, it poses a grave threat to people and could lead to wars and mass migration.

Diverting hundred of billions of dollars from fossil fuels into renewable energy and cutting energy waste would shave just 0.06% off expected annual economic growth rates of 1.3%-3%, the Intergovernmental Panel on Climate Change (IPCC) report concluded.

"It is actually affordable to do it and people are not going to have to sacrifice their aspirations about improved standards of living," said Professor Jim Skea, an energy expert at Imperial College London and co-chair of the IPCC report team. "It is not a hair-shirt change of lifestyle at all that is being envisaged and there is space for poorer countries to develop too," Skea told the Guardian.

10.22am BST

235 authors from 58 countries have contributed to the report says co-chair **Ramon Pichs-Madruga**.

Co-chair **Ottmar Edenhofer** is presenting the report's key findings.

He shows the graph I posted earlier saying the last decade has seen a growth in the rate of emissions - despite efforts to reduce them. CO2 emissions have more than doubled since 1970. This is driven by economic and population growth.

Updated at 10.24am BST

10.31am BST

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Edenhofer says the business-as-usual scenario will lead to 3.7C to 4.8C rise in temperature before 2100.

If we are to stay within 2C," we need to bring the mitigation train on track". This would involve a fundamental upscale of low and zero carbon emission energy sources. It would also strongly depend on the removal of CO2 from the atmosphere.

Putting off mitigation action will make it more difficult to achieve less than 2C warming later. It will lead to greater reductions requirements and greater costs.

Reaching 450ppm of carbon in the atmosphere by 2011, which is considered to be a safe level of carbon, will only lead to a reduction in global consumption growth by 0.06% per year.

10.37am BST

Edenhofer says: "We need a new investment flow in particular sectors. In particular energy, renewables and in some parts of the world, nuclear."

This is a global commons problem, he says: "Effective mitigation will not be achieved if individual agents, countries, firms, individuals, advance their interests independently of others."

"This report shows there are some steps to resolve this issue... It provides hope, modest hope."

Updated at 10.46am BST

10.44am BST

Edenhofer is asked by the BBC what his major message is and why we should feel hopeful.

"My first message is, emissions are still increasing and they are increasing with an increasing growth rate."

While the report is not policy prescriptive, he says: "We need an international carbon price and inter-nation cooperation.

On hope, he says: "We are not saying this is a free lunch, but climate policy could be a lunch worthwhile to buy."

10.58am BST

11.00am BST

There is a question on the main points of contention. Pachauri says it saying the strength of the IPCC process comes from the interaction between the policy and scientific communities.

Damian Carrington from the Guardian asks about the 0.06% cost mentioned in the report - is it affordable?

Edenhofer says we cannot say in the report if it affordable or not. You have to carry out a cost-benefit analysis, which is difficult because of the uncertainties around the impacts, the ethical considerations and the risks. But what we can say is that these cost numbers are within the range of other economic policies. He says it is up to the



public and decision makers to decide if it is affordable or not. But he would say: "It does not cost the world to save the planet."

Pachauri says the question of affordability is very difficult to answer because it is difficult to assess the cost of a human life or the benefit of avoiding climate change.

11.10am BST

Edenhofer: "The IPCC has not said that carbon capture and storage is without cost and without uncertainties - such as uncertainties over the global storage capacity."

You can get you copy of the report [here](#).

11.15am BST

Edenhofer is asked why the report avoided recommending particular reductions for particular countries.

He says the IPCC felt it would be inappropriate to prescribe specific allocations to countries because the goals can be achieved under many different burden sharing scenarios. He said it would be up to countries to find the most effective and just way to achieve emissions reductions.

Pachauri says the cost estimates are consistent with the AR4 report.

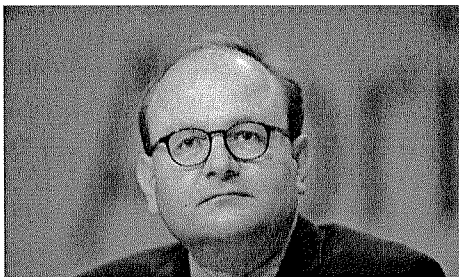
11.20am BST

Edenhofer is asked which scenarios required a carbon price.

"The carbon price was not an assumption, it was a result of some of the scenarios." Meaning some of the scenarios required a carbon price to achieve their results.

Q: What happens if some major polluters do not take action, should the rest of the world carry on?

Pachauri says this is the role of the UNFCCC negotiating process. It is not the role of the IPCC to take the failure to act into consideration.



IPCC Working Group III co-chair Ottmar Edenhofer. Photograph: Stefanie Loos/Reuters

Updated at 11.35am BST



11.24am BST

The press conference has now ended but stay with us as we gather reaction from climate scientists, policy makers and the media.

Pachauri was asked twice which areas of contention lead to materials being left out of the 29 page summary for policy makers published today. Twice he has dodged the question. But Damian Carrington said today:

Objections from rich nations saw the complete removal of a section stating that hundred of billions of dollars a year would have to be paid by developed countries to developing countries, to ensure they grow their cities and economies in a non-polluting way.

Other objections, from major fossil fuel producing nations including Saudi Arabia, led to the weakening of statements that ending the huge subsidies paid for oil, gas and coal would help reduce emissions. But the final document retained the conclusion that policies to cut carbon could devalue fossil fuels reserves.

Updated at 11.29am BST

11.29am BST

Who is responsible for carbon emissions?

AP reporter Karl Ritter has done some number crunching from the report on the key issue of past and present responsibility for emissions. This will be a major factor in discussions between nations at the UN climate conference in Paris in 2015, which will seek to establish who's responsibility it will be to pay for the transition to a low carbon world.

Current emissions

At the time of the IPCC's previous climate assessment, in 2007, the U.S. was the world's top carbon polluter. It has since been overtaken by China, which now accounts for one-quarter of global emissions because of its rapidly expanding economy. The U.S. is No. 2 with 17 percent, followed by India (6.6 percent), Russia (5.1 percent) and Japan (3.7 percent).

Historical emissions

If you count back to when the Industrial Revolution started in the 18th century, the U.S. is the undisputed No. 1, accounting for nearly 28 percent of the world's cumulative emissions from energy and industry. China's share is 9.9 percent, Russia's 6.9 percent, Britain's 5.9 percent and Germany's 5.6 percent. Western countries rank high because they have been burning coal and oil for much longer than the rest of the world.

Per capita

Putting emissions in proportion to population size also puts Western countries - and oil and gas-rich Gulf states - at the top of the table. In per capita emissions, Australians, Canadians and Americans exceed 20 tons of carbon per year - more than twice as much as the Chinese. "Overall, per-capita emissions in the highly industrialized countries ... remain, on average, about five times higher than those of the lowest income countries," the draft report says.

Consumption

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The main way of counting emissions is by looking at where they are released. But some say you get a better picture of what's driving emissions by looking at consumption patterns. As the IPCC puts it: "A ton of steel produced in China but exported to the United States results in emissions in China when the fundamental demand for the steel originated in the U.S." Accounting for emissions based on where a product is consumed rather than where it's manufactured still puts China at the top, but with a narrower gap to the U.S. China accounts for 21.9 percent of global consumption emissions, while the U.S. accounts for 18.1 percent.

By sector

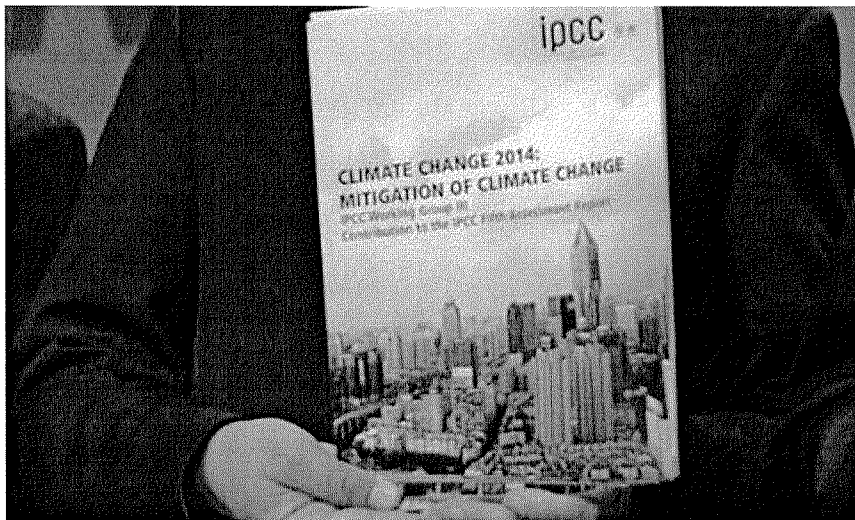
Energy production is the biggest source of emissions, representing about one-third of the world total. Of the fossil fuels, coal generates the highest emissions, followed by oil and then natural gas. Agriculture, forestry and other land use accounts for 24 percent of total emissions. Other big sectors include transport (13 percent) and buildings (7 percent).

Future

The IPCC gives a range of trajectories for global emissions, but doesn't break them down by country. However, it notes that nearly all growth in emissions is expected to occur in developing countries, as their populations grow and they try to catch up economically with the industrialized world. Developing countries say that's why they shouldn't have to face as strict emissions targets in a new treaty as industrialized nations. The latter say at least the biggest developing nations, including China, India and Brazil, must also make significant cuts. Both sides will likely point to selected statistics and projections in the IPCC report.

Updated at 11.29am BST

11.36am BST



The IPCC report. Photograph:

Stefanie Loos/Reuters

11.43am BST



As reaction begins to flow in, the Guardian's reporters have already published a series of articles analysing various aspects of the report.

Damian Carrington says: [IPCC climate change report: averting catastrophe is eminently affordable](#)

Catastrophic climate change can be averted without sacrificing living standards, according to a landmark UN report published on Sunday. It concludes the transformation required to a world of clean energy and the ditching of dirty fossil fuels is eminently affordable.

Robin McKie and **Toby Helm** said in the Observer: [UN urges huge increase in green energy to avert climate disaster](#)

[David Cameron's](#) commitment to the green agenda will come under the fiercest scrutiny yet this week when top climate-change experts will warn that only greater use of renewable [energy](#) – including windfarms – can prevent a global catastrophe.

Guardian US environment correspondent **Suzanne Goldenberg** looked at the role cities would have to play in reducing emissions: [At-risk cities hold solutions to climate change: UN report](#)

It is already taking shape as the 21st century urban nightmare: a big storm hits a city like Shanghai, Mumbai, Miami or New York, knocking out power supply and waste treatment plants, washing out entire neighbourhoods and marooning the survivors in a toxic and foul-smelling swamp.

Now the world's leading scientists are suggesting that those same [cities](#) in harm's way could help drive solutions to [climate change](#).

[11.48am BST](#)

Green groups reaction - "The age of renewable energy starts now"

This report is being heralded as vindication for many green groups because the UN panel has found that the renewable agenda supported almost unequivocally by the environment movement is the road to climate redemption. They are queuing up to ram home the message.

Kaisa Kosonen, senior political advisor for [Greenpeace International](#), said:

"Renewable energy is unstoppable. It's becoming bigger, better and cheaper every day. Dirty energy industries are sure to put up a fight but it's only a question of time before public pressure and economics dictate that they either change or go out of business. The 21st century will be the 'age of renewables'."

Samantha Smith, leader of the [WWF's](#) Global Climate & Energy Initiative said:

"The IPCC report makes clear that acting on emissions now is affordable, but delaying further increases the costs. The energy sector is by far the largest emitter of greenhouse gases and, therefore, is the key battleground of change.

"We know more effort is needed, and quickly. Delaying new mitigation efforts will make it much harder to transition the world's energy systems to a sustainable, equitable and low-emissions future."



Friends of the Earth executive director Andy Atkins said:

"Bold international action to cut our use of fossil fuels is urgently required to steer the planet away from catastrophic climate change.

"If we're to avoid levels of climate change that will be impossible to adapt to, governments must stand up to the fossil fuel industry and plug in to the huge potential of clean renewable power.

"Rich nations must take the lead by rapidly weaning themselves off coal, gas and oil and funding low-carbon growth in poorer countries.

"The IPCC report is clear: we already have the technologies to make the journey to safe, clean energy. But the clock is ticking, we must act now."

Li Shuo, climate and energy campaigner at Greenpeace China, said:

"China could break the deadlock in UN climate talks by presenting an ambitious new target with binding emission cuts. If China leads, the US and the EU will have no excuse for not being more progressive. The test of whether governments are willing to act on the IPCC's findings or turn their backs on public concern will come during next year's climate treaty talks in Paris."

Karsten Smid, climate and energy campaigner at Greenpeace Germany, said Germany, which plans to cut carbon emissions by 40% by 2020, was setting the pace in the new age:

"Germany's energy revolution is a practical reality and an example to the world. Clean energy owns the future. Politicians and investors need to catch up."

Jennifer Morgan, World Resources Institute's climate and energy program director and a review editor on the report said:

"We have the tools—now we need to use them. The report shows that by phasing out fossil fuels and significantly ramping up investments in renewable energy, we can reduce climate risks. At the same time, these actions would deliver benefits like cleaner air, new jobs, and more reliable domestic energy sources.

"World leaders can take decisive actions, like limiting power plant emissions in the United States to capping coal use in China. In the lead up to the UN climate summit in September, government officials can announce concrete steps to shape a low-carbon future. Governments can deliver strong commitments that will lead to an ambitious, universal climate agreement by 2015."

WWF's Samantha Smith on the key findings of the report.

Updated at 12.22pm BST

11.58am BST

Transport Environment says the IPCC confirmed today that transport will become the largest source of CO2 emissions by 2050 in a business-as-usual scenario, making it a key area for policy considerations. Transport accounted for 27% of final energy use in 2010 and could double by 2050 due to demand growth in emerging economies.

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A TE spokesperson said:

"Thanks to EU regulations CO₂ emissions from new cars are now falling, but the progress on trucks and vans is glacial. The IPCC report stresses the urgency of taking new initiatives to tackle vehicle emissions, but the European Commission's response is to repeatedly delay promised strategies to regulate car and van emissions after 2020 and to start addressing soaring emissions from trucks."

12.14pm BST

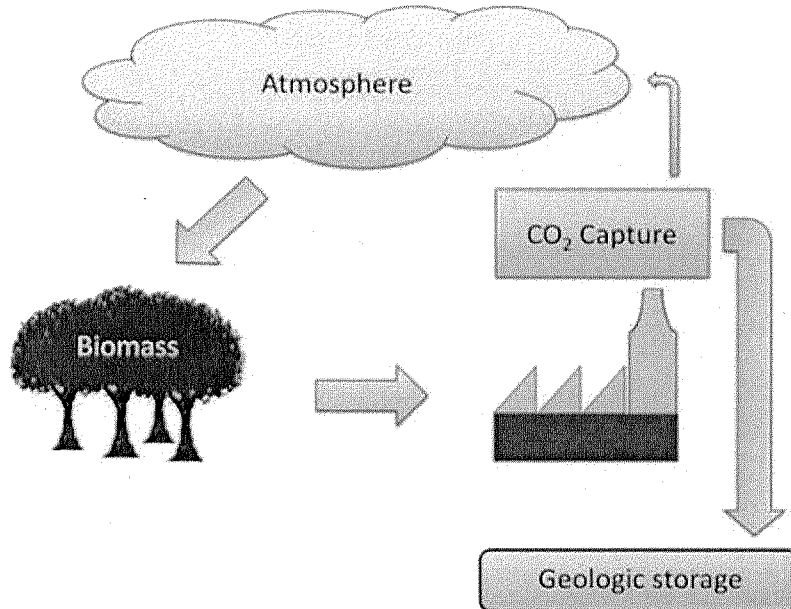
Carbon capture and storage is one of the more divisive aspects of today's report and generated some discussion in the last week because the leaked final draft contained the lines:

"Carbon capture and storage (CCS) technologies could reduce the life-cycle GHG emissions of fossil power plants (medium evidence, medium agreement)."

"Combining bioenergy and CCS (BECCS) could result in net removal of CO₂ from the atmosphere (limited evidence, medium agreement)."

"Bioenergy could play a critical role in stabilizing climate change...The scientific debate about the marginal emissions of most bioenergy pathways, in particular around land-mediated equilibrium effects (such as indirect land use change), remains unresolved (medium evidence, low agreement). The potential, costs and risks of BECCS are subject to considerable scientific uncertainty (low evidence, medium agreement)."

The technology is currently not developed, leading to large uncertainty about its potential to contribute to emissions reduction. It involves catching carbon dioxide as it is produced by an industrial process and storing it indefinitely underground. When used in bioenergy production, such as the burning of wood, this has the advantage of actually removing CO₂ from the atmosphere.



The bio-energy with carbon

capture and storage (Beccs) carbon cycle circuit breaker. Photograph: BBC

But many green groups don't like the technology. Almut Ernting, co-director of bio-energy watchdog Biofuelwatch told the Guardian this week:

"The technology is the dangerous spawn of two very bad ideas: it brings together the false premises and injustices of the bio-energy debacle with the risky, costly and unproven notion that we can bury carbon dioxide out of sight. That hardly seems a hopeful formula for calming the climate crisis. Such techno-fix fantasies will be welcomed by oil companies because they distract attention from the obvious solution of cutting fossil fuel use."

Neil Edwards, reader in Earth Systems Science at the Open University, said today:

"Such transformative changes remain eminently possible, but concerted action is needed. In particular, BECCS (bio-energy with carbon capture and storage) is a critical component of most strong mitigation scenarios, allowing negative effective emissions, but is still not demonstrated at large scale."

Stuart Haszeldine, Professor of carbon capture and storage at the University of Edinburgh, said:

"Extraction and combustion of fossil carbon can only continue if that easy energy is matched, tonne for tonne, by the recapture and storage of carbon. It doesn't matter if that is by Carbon Capture and Storage (CCS), by Bio Energy Capture and Storage (BECCS), by direct air capture, or by enhanced mineral weathering – all of these will be needed."

Dr Hannah Chalmers, lecturer in power plant engineering and carbon capture at the University of Edinburgh, said:

"The scientists of the IPCC have produced an excellent overview of the importance of developing and deploying a broad range of low carbon technologies. The UK has well-advanced plans to accelerate the deployment of carbon



capture and storage (CCS) as part of its wide-ranging reforms of the UK electricity market. This report confirms that this support is timely and has an important role to play in global CO2 emissions mitigation efforts.

"The increased emphasis given to the likely role of 'negative' emissions technologies that draw CO2 from the atmosphere is important. They could be essential to allow climate change mitigation to be delivered in ways that are acceptable to society. Some technologies are available today, but there is scope for improvement and also scientific breakthroughs in this area. Members of the UK CCS Research Centre are among the scientists currently working hard to ensure that priority technologies and effective strategies for using them are rapidly developed and implemented."

Updated at 1.19pm BST

12.14pm BST

Last-minute objections from rich countries scrapped a proposed section, which called for hundreds of billions of dollars every year to be paid to developing countries by developed countries, says the Guardian's **Damian Carrington**. This funding would have helped countries to develop their cities and economies without massive increases in carbon emissions.

Chukwumerije Okereke, an author on the report told the BBC this was a result of the "marginalisation" of developing country views in the IPCC process. He said that poorer nations were underrepresented on the panel. Around 30% of authors for the report came from the developing world.

"The argument has been shifting away from the view that the developed countries, who have been mainly responsible for the problem, should take leadership in solving it, to this centre-ground view that we are all in it together and we all have to do our share.

"In effect, this is shifting the burden onto the developing countries and is holding them down from developing; quite frankly this is reinforcing historical patterns of injustice and domination."

In response to the report, green groups called for climate justice. Oxfam's climate expert Jan.Kowalzig said:

"Emissions are rising fastest in emerging economies and in the interest of their poorest citizens on the front line of climate change, they must play a bigger role than in the past. But rich countries cannot simply pass the buck - they must do their fair share by both slashing their emissions faster and finally providing the financial support for climate action in poor countries they have promised."

"If we fail to act on climate change, the chance of eradicating hunger from our world may be lost forever. This report shows cutting emissions sufficiently comes at little cost, so we have no excuse for letting that happen.

Christian Aid's senior climate change advisor, Mohamed Adow, said:

"The world's poorest nations are in need of economic development. But they need to be helped to leapfrog dirty energy and develop in a way which won't entrench their poverty by making climate change worse. With technological and financial help they can harness their natural, clean, energy resources and improve the lives of millions."

12.19pm BST

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During the press conference, Damian Carrington asked co-chair Edenhofer about shale gas' role in the future of energy production.

Updated at 12.19pm BST

12.32pm BST

US political reaction

World leaders are declining to comment directly, passing the honour to their energy or science advisors. Assistant to the US president for science and technology **John P. Holdren** said:

The facts are clear—the more we and other countries do to curb climate change *and* prepare for the climate-change impacts that can no longer be avoided, the less suffering will be inflicted on our communities and on our children and grandchildren.

The IPCC's new report highlights in stark reality the magnitude and urgency of the climate challenge. It shows, even more compellingly than previous studies, that the longer society waits to implement strong measures to cut greenhouse-gas emissions, the more costly and difficult it will become to limit climate change to less than catastrophic levels.

The Obama Administration is committed to leading efforts to address this global challenge, both by example and by persuasion. And through the concrete steps laid out in President Obama's Climate Action Plan, real progress is already being made.

Democratic **U.S. Senator Barbara Boxer**, chairman of the Senate Environment and Public Works Committee echoed Holdren's statement:

"The newest IPCC report shows a wide range of options to cut carbon pollution, including the use cost-effective clean energy. The longer we wait to act, the harder and more expensive it will be."

Updated at 12.35pm BST

12.34pm BST

UK political reaction

Meanwhile, in the UK, energy secretary **Ed Davey** has told Sky News:

The UN climate change report is a stark warning that the world is "looking down the precipice".

He said it showed the UK should be "should be doing absolutely everything", although he argued the coalition has already "done more on the green economy than any predecessor" because it has doubled renewable electricity.

However, Davey acknowledged there were tensions within the coalition over green energy, including "a current discussion about onshore wind", which the Conservatives want to cap. Any cap on onshore wind could undermine the fight against climate change and end up increasing bills.



"The danger of that is you wouldn't be tackling climate change as effectively as you could, and actually you'd end up putting up people's bills because onshore wind is the cheapest," he said.

Updated at 1.58pm BST

12.35pm BST

EU political reaction

EU commissioner **Connie Hedegaard** said:

"The report is clear: there really is no plan B for climate change. There is only plan A: collective action to reduce emissions now. And since we need first movers to set a plan into motion, we in Europe will adopt an ambitious 2030 target later this year. Now the question is: when will YOU, the big emitters, do the same? The more you wait, the more it will cost. The more you wait, the more difficult it will become."

12.57pm BST

The IPCC report says divestment from fossil fuels is one path for reducing their consumption.

In an article for the Guardian last week, **Archbishop Desmond Tutu** wrote:

"We live in a world dominated by greed. We have allowed the interests of capital to outweigh the interests of human beings and our Earth. It is clear [the companies] are not simply going to give up; they stand to make too much money."

"People of conscience need to break their ties with corporations financing the injustice of climate change. We can, for instance, boycott events, sports teams and media programming sponsored by fossil-fuel energy companies."

On divestment, Jamie Henn, 350.org strategy and communications director said:

"The report makes it clear that in order to meet their agreed goal of keeping global warming below 2°C, governments need to get serious about leaving fossil fuels in the ground. That means stopping carbon-intensive infrastructure projects, like the Keystone XL pipeline, and shifting investments out of the fossil fuel industry and into solutions."

350.org European Divestment Coordinator Tim Ratcliffe said:

"Investors now have scientific evidence that if you put your money into fossil fuels you are complicit in wrecking our future. We know that 80% of fossil fuels need to stay underground in order to avoid a climate catastrophe. The fossil fuel industry however is spending billions every year to find yet new reserves, spread misinformation about climate change, corrupt political progress and block clean energy solutions. ExxonMobil, for example, recently spelled out that they are determined to burn through all the carbon they have and can get hold of."

Updated at 12.59pm BST

1.00pm BST



The IPCC has launched its [press release](#):

"Climate policies in line with the two degrees Celsius goal need to aim for substantial emission reductions," working group III co-chair Ottmar Edenhofer said. "There is a clear message from science: To avoid dangerous interference with the climate system, we need to move away from business as usual."

1.19pm BST

Scientific reaction

The Science Media Centre has put together a wrap of the reaction from climate scientists and those working in the mitigation field.

Dr Dan Osborn, independent consultant and former chair of the evaluation panel for the [AVOID](#) research programme, said:

"This report illustrates the challenges the world faces on mitigation but it could be good news for those businesses and countries willing to lead the way on all kinds of low-carbon technologies. Burning oil and gas will be frowned on by future generations because this resource is valuable for other purposes. The sooner we start on mitigation the lower adaptation costs will be. Relying on a non-existent Plan B is not a wise option. Time to act is limited. The world must not put its head in the sand. Global action is needed to reduce emissions whilst there is still time."

Dr Neil Edwards, reader in earth systems science at the Open University, said:

"The WG3 SPM highlights a number of key issues: Firstly, where we are in terms of mitigation and where we need to be (to have a good chance of respecting the 2C limit) are still a long way apart. The changes needed to bridge the gap include transformative, non-incremental changes, particularly of the energy system and behaviour in areas such as energy efficiency, modes of mobility, and potentially diet changes. Such transformative changes remain eminently possible, but concerted action is needed."

William Powrie, dean of the Faculty of Engineering and the Environment, University of Southampton, said:

"Behaviour change and economic instruments will be as important as technological innovation; all should be viewed as opportunities rather than threats. Action must be swift, decisive and above all global. The report leaves no doubt that we really are in the last chance saloon as far as addressing climate change is concerned."

Prof Stephen Long, from the Department of Crop Sciences at the University of Illinois, wrote a long and interesting critique of the report's findings in relation to land use. I have published the full version [here](#).

"In 'approaches to climate change mitigation' the report espouses high ideals to which we can all agree, and that no policymaker would dare deny. However, these ideals are far from achieved in today's business-as-usual operations. The danger here is that we will be, and as evidenced by much legislation around biofuels and bioenergy between AR4 and AR5, holding new mitigation options to higher standards than business-as-usual. Such statements also encourage development of policies around imagined rather than proven issues. The result is obvious, maintain business-as-usual – it is so much easier.

"The section on 'Agriculture, Forestry and Other Land Uses (AFOLU)' clearly failed to see the elephant in the room. Output of primary foodstuffs such as grain and seed needs to increase 70% by 2050 to keep pace with demand. We are failing to increase yields per unit land area to achieve this goal. If we do not address this problem first, then the

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result is obvious: we will spill over on to less productive and less sustainable land which will prevent or even reverse other mitigation options of afforestation, bioenergy, and soil improvement."

Prof Godfrey Boyle, emeritus professor of renewable energy at the Open University and reviewer for parts of the WG3 report, said:

"In the light of this enthusiastic IPCC endorsement [of renewables], it is disappointing that the European Commission's recent policy proposals for growth in renewables are unambitious and unspecific. Post-2020, the EU will abandon its existing country-specific renewable targets, aiming instead for a modest Europe-wide target of 27% of energy from renewables by 2030. So instead of setting a leading example to the world by moving rapidly towards a low carbon future, the developed nations of Europe are in danger of falling well short of the IPCC's latest standards."

Dr Jeremy Leggett, associate fellow at Oxford University's Environmental Change Institute, said:

"It is useful to see so many experts agree that the electricity sector can be completely decarbonised as a major contribution to keeping global warming below unacceptable danger levels, but many of us on the front lines of renewable energy would say that the IPCC has underestimated the speed with which our technologies, in concert with energy efficiency, can displace fossil fuels in the years ahead.

"Similarly, growing numbers of financial analysts would say that the IPCC has given inadequate consideration to the soaring capital expenditures of carbon-fuel companies, and the extent to which that constraint can help drive capital to the declining-cost technologies that dominate the renewables family."

Dr Shaun Fitzgerald of Girton College, Cambridge University, said:

"The report states, 'Cutting emissions from electricity production to near zero is a common feature of ambitious mitigation scenarios. But using energy efficiently is also important.' What is intriguing is that the energy efficiency argument is often the second point, perhaps the after-thought. The world of energy is a set of scales - demand and supply. It is obvious that by cutting demand, or at least stemming the growth in demand, the issue of how to supply CO2 friendly power is made easier."

Prof Tim Benton, UK champion for global food security and professor of population ecology at the University of Leeds, said:

"Agriculture and forestry are responsible for about a quarter of all GHG emissions and there is significant scope to reduce this. Perhaps the most important route is via reducing deforestation – which is occurring widely for production of palm oil and soy – and increasing afforestation.

"Farming can become more 'climate smart' by, for example, increasing carbon storage in soils and this may have a range of other benefits for sustainability and resilience. Changing our diets, especially eating less meat, may have significant impacts, as will reducing our wastage of food."

Mike Hulme, professor climate and culture at King's College London said:

"This WG3 report draws attention to a range of methods for removing CO2 from the atmosphere, including afforestation, carbon capture and storage (CCS) and other means for removing CO2 from the atmosphere (CDR). It is good to see these methods analysed alongside policy measures to change the energy supply mix, since the former may have value in the future in a broad policy portfolio. The SPM makes no mention of unwelcome and



risky technologies to reduce incoming sunlight through solar climate engineering - and this is a good thing. Such solar radiation management (SRM) technologies offer only chimerical solutions to the inadequate policy goal of limiting global warming to no more than 2 deg Celsius."

Updated at 3.08pm BST

1.21pm BST

Damian Carrington, the Guardian's head of environment, has sent this dispatch from Berlin, where the mood sounds positively jovial - a sharp contrast to the usual feeling of impending armageddon that has accompanied AR5's previous installments.

Behind the scenes most of the IPCC people I have spoken too are pretty positive about the report and the final summary. As ever, politics intervened in the final draft with, for example, a line stating that 70% of carbon emissions comes from just 10 big countries being deleted.

Any hint of attributing blame for climate change is intensely sensitive, because the international negotiations to tackle the problem will ultimately have to decide who will cut emissions, by how much and who will pay. The IPCC people say they have set out the choices and now the politicians will have to make the choices about fairness.

Saudi Arabia, I'm told, played its customary role in objecting to any negative mention of fossil fuels, and the final language in the summary was weakened as a result. But all the statements remain in the main report.

Perhaps the reason the IPCC people are fairly upbeat is that they have had some sleep. Unlike previous IPCC report press conferences, this one was delayed a day, meaning time for recovery from the all-night negotiating sessions.

One IPCC author, Reyer Gerlagh, an economist at the University of Tilburg in the Netherlands, put the 0.06% annual cost of tackling climate change in perspective for me, by considering how accurately economic growth can be measured: "You could almost say that statistically, you can't measure 0.06%."

Updated at 1.26pm BST

1.35pm BST

PricewaterhouseCoopers have released an analysis of the report.

Dr Celine Herweijer, partner on sustainability and climate change, said the "Working Group 3 report on mitigation explains how to avoid the crash. But it also suggests that the brakes are not working".

"Fundamentally, the latest IPCC reports show that not only are the costs to act affordable if we do so early, but that we all lose if we fail to respond adequately. Uncertainties due to a handful of nascent economic models are not excuses for inaction. Policy-makers and business leaders have a mandate to act under the weight of the evidence at hand. This evidence suggests urgent and bold action is a must at the national and international level."

"The IPCC has provided some estimates on the global scale of the costs, both for reducing emissions (WG3) and for the impacts of climate change (WG2). Unfortunately they cannot be compared and used as a decision to act. What is certain is that the costs to act only become more expensive the longer we wait."

On carbon regulation and competitiveness, PwC climate policy economist, Lit Ping Low, said:

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"There is a pre-conception that carbon regulations impose undue costs on industry. But across all sectors, businesses are often faced with all sorts of regulations so carbon regulation is not exceptional. Indeed, for some companies and industries, particularly those with medium energy intensities, carbon costs are considered relatively immaterial compared to other costs, but a price signal can still drive tangible carbon reduction actions. The important thing for businesses is to have transparency, clarity and fairness in the costs they face."

On emissions reduction, Jonathan Grant, director of sustainability and climate change, said:

"Delayed action on climate change and reducing our emissions tends to involve a substantially more difficult pathway from 2030 onwards, or have a larger reliance on carbon dioxide removal (CDR) technologies which are today in their infancy (i.e. bioenergy with CCS or even geoengineering). PwC's Low Carbon Economy Index (LCEI) estimated that we could limit emissions to around 30 GtCO₂e by 2030 through reducing carbon intensity by 6% a year, every year. This has never been achieved globally and even in 2012 our analysis questioned the viability of the 2 degree target without a radical economic and policy transformation."

"A key message from the IPCC is that energy efficiency improvements and the switch from coal to gas would not be sufficient to deliver the scale of changes required. Indeed, our LCEI analysis shows that globally, almost all of the recent changes in carbon intensity can be attributed to improvements in energy efficiency, suggesting that other measures are yet to be adopted more widely. Nevertheless progress is still visible particularly for renewable energy, and more technologies are approaching technical and economic maturity to be deployed at scale. The challenge is about the rate of that deployment. Three G20 countries achieved more than 25% growth in renewable energy consumption in 2012, another 10 countries achieved between 10% and 25% growth."

Updated at 1.40pm BST

1.38pm BST

The Prince of Wales's Corporate Leaders Group, a coalition of companies, including Acciona, Coca-Cola Enterprises, EDF Energy, Shell, Tesco and Unilever, said today the report was welcomed by the corporate community:

"This latest report from the IPCC is the one that many businesses have been waiting most eagerly to read – here is the latest scientific analysis of the solutions that we can employ to limit the stock of atmospheric greenhouse gases and the consequent climate change. The report contains some stark home truths about the scale of the challenge and the progress we're making to date. Rather than slowing and declining, greenhouse gas emissions are rising at a faster rate than ever before and no country has plans in place that are sufficient to keep warming below the globally agreed limit of 2°C.

"Many leading businesses are well aware of the need for a collective wake up call. The Trillion Tonne Communiqué, already signed by over 90 companies from 5 continents, and with fast-growing support, calls for an increase in the pace and scale of action. Specifically, the signatories urge policy makers to take a number of significant actions in line with the science of the IPCC, including setting a timeline for phasing out greenhouse gas emissions before the end of the century, designing a credible strategy to transform the energy system, and creating a plan to manage reliance on fossil fuels, especially coal."

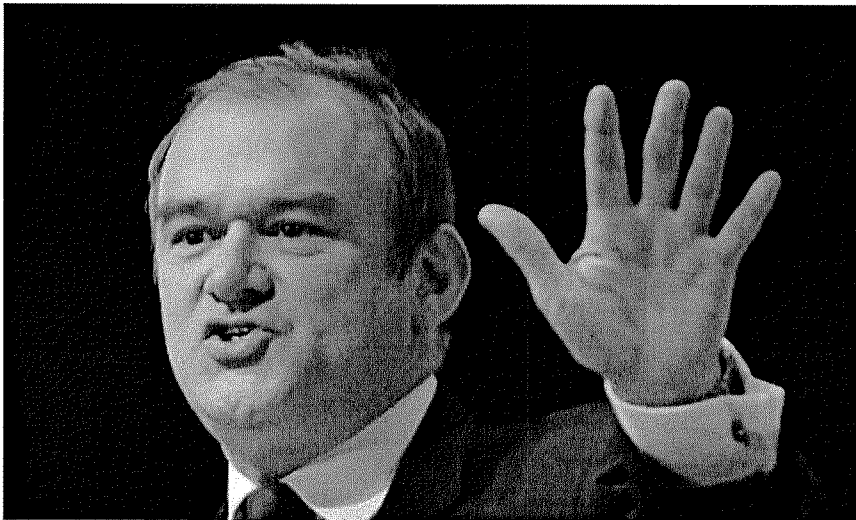
1.43pm BST

UK energy secretary Ed Davey has released a statement.



"The risk is too great to stop here. We need a worldwide, large-scale change to our energy system if we are to limit the effects of climate change.

"I call for international leaders to work together with enforced vigour to reduce carbon emissions and secure an ambitious legally binding global agreement in 2015".



Ed Davey says 'we need a worldwide, large-scale change' to avoid catastrophic climate change. Photograph: Danny Lawson/PA

Updated at 1.44pm BST

1.48pm BST

The World Resources Institute has released a handy analysis of today's report: 6 Things You Need to Know About Reducing Emissions. I'll list the headlines here but they have more detail on their site.

- 1) Without Explicit Action, We Could See More than 4°C of Warming.
- 2) Limiting Warming to 2°C Is Still Possible.
- 3) Staying Within the Carbon Budget Requires Immediate Action.
- 4) We'll Need to Phase Out Emissions Entirely in the Long-Term.
- 5) We'll Need Action from All Regions of the World.
- 6) Shifting to a Low-Emissions Pathway Requires a Large-Scale Transformation.

1.54pm BST

More reaction

US Secretary of State **John Kerry** said:

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"Unless we act dramatically and quickly, science tells us our climate and our way of life are literally in jeopardy. Denial of the science is malpractice. There are those who say we can't afford to act. But waiting is truly unaffordable. The costs of inaction are catastrophic."

Sir Brian Hoskins, director of the Grantham Institute for Climate Change, Imperial College London, said:

"The science shows us that we need substantial and sustained reductions in greenhouse gas emissions if we are to limit the risks posed by climate change... Potential competitiveness issues, affecting a small number of very energy intensive industries, can be handled. We should stop wringing our hands and just get on with it."

Professor Lord Stern of the London School of Economics, who wrote an authoritative economic analysis of climate change in 2006, said:

"The transition to sustainable low-carbon economic development and growth is an opportunity not just to avoid potentially catastrophic climate risks, but also to reap other benefits from cleaner and more efficient technologies, such as reductions in local air pollution. If we embark on such a transition, we are likely to discover new technologies and ways of organising production, consumption and cities that would bring costs down radically."

Stephanie Pfeifer, chief executive of the Institutional Investors Group on Climate Change, representing 88 of Europe's largest investors worth €7.5 trillion:

"At the UN summit in September, world leaders can agree the basis for a global climate deal which signals a serious, long-term commitment to a climate framework which supports low-carbon investment. Acting now to put the world on a low-carbon growth path is achievable, economically beneficial, and will help economies avoid the substantial adaptation costs and large uncertainties faced in the event of severe climate change."

2.19pm BST

Summary

- **The IPCC report, *Mitigating Climate Change*, was released today.** It detailed the path by which the worst effects of climate change can be avoided and global warming, including how the world can avoid breaching the 2C limit agreed by world leaders in Copenhagen in 2009.
- **The report is from the last of three IPCC working groups**, the first two looked at the the state of climate science and the impacts of unchecked climate change.
- It was **produced by 1250 international experts** and approved by 194 governments.
- The report found that **carbon emissions were still growing** and the rate of growth was increasing.
- However mitigating the effects of climate change would **only limit global consumption growth by 0.06%** - a relatively tiny amount.
- If we want to limit temperature increase to 2c by the end of this century, there would have to be large cuts in emissions, said IPCC chair **Rajendra K Pachauri**. Tripling to nearly quardurling of zero to low co2 energy supply will almost get us there.
- **A business-as-usual scenario** will lead to 3.7C to 4.8C rise in temperature before 2100.
- Working group III co-chair **Ottmar Edenhofer** said the report contained "**hope, modest hope**" and that "**it does not cost the world to save the planet**".
- **Renewable energy** was seen as the major energy production platform in a sustainable future.
- **Carbon capture and storage, nuclear, bioenergy and shale gas** were mentioned alongside renewables as necessary contributors to the global energy mix.

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- **Last-minute objections from rich countries** scrapped a proposed section, which called for hundreds of billions of dollars every year to be paid to developing countries by developed countries.

Reaction

- US Secretary of State John Kerry said: "Unless we act dramatically and quickly, science tells us our climate and our way of life are literally in jeopardy. Denial of the science is malpractice. There are those who say we can't afford to act. But waiting is truly unaffordable. The costs of inaction are catastrophic."
- UK energy secretary Ed Davey said: "The risk is too great to stop here. We need a worldwide, large-scale change to our energy system if we are to limit the effects of climate change."
- Green groups pushed home the message that renewable energy would be the major platform of future energy generation in a low carbon world.
- Pricewaterhouse Coopers said: The "report on mitigation explains how to avoid the crash. But it also suggests that the brakes are not working".
- Some scientists agreed with the IPCC finding the carbon capture and storage may have a role to play in mitigating climate change.
- Lord Deben, chair of the UK's independent Committee on Climate Change said: "How can we expect poor countries to join in the battle against climate change unless we accept that we owe our wealth partly to pollution."
- World Resources Institute said that without action, we could see more than 4C of warming, but that 2C was possible with immediate action.