

TOP TAKEAWAYS FROM THE 2014 IPCC AR5 REPORTS ON ADAPTATION & MITIGATION

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IMPACTS, ADAPTATION, & VULNERABILITY

On March 31st, the IPCC released *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. See the [Summary for Policy Makers \(SPM\)](#).

Buried deep in the SPM is arguably a shout-out for the efforts of 4CP-like organizations:

“Organizations bridging science and decision-making, including climate services, play an important role in the communication, transfer, and development of climate-related knowledge, including translation, engagement and knowledge exchange.”

What's the primary driver of climate change?

1. “Human interference with the climate system is occurring, and climate change poses risks for human and natural systems.”

- “Within this century,... medium- to high-emission scenarios pose high risk of abrupt and irreversible regional-scale change...”
- “Increasing magnitudes of warming increase the likelihood of severe, pervasive, and irreversible impacts.”

What are the impacts of climate change?

2. “...changes in climate have caused impacts on natural and human systems on all continents and across the oceans.”

- “... changing precipitation or melting snow and ice are altering hydrological systems...”
- “... ocean acidification poses substantial risks to marine ecosystems...”

- “Many terrestrial, freshwater, and marine species have shifted their geographical ranges, seasonal activities, migration patterns, abundances...”
- “A large fraction of both terrestrial and freshwater species faces increased extinction risk...”
- “... negative impacts... on crop yields have been more common than positive impacts.”
- “People who are... marginalized are especially vulnerable to climate change;” Also, “Climate-related hazards exacerbate other stressors.”
- “All aspects of food security are potentially affected...”
- “Many global risks of climate change are concentrated in urban areas.”
- “Major future rural impacts are expected... water availability..., food security..., agricultural incomes...,” and these will “... disproportionately affect the welfare of the poor in rural areas...”
- “... projected to increase displacement of people...” which “... can indirectly increase risk of violent conflicts...”

What are the risks and some ways to manage them?

3. Risk management approaches must be used for decision making.

- Near term choices on both adaptation and mitigation will seriously affect future risks.
- First Step - Must reduce vulnerability to current weather extremes.
- “Adaption is place and context specific...”; “Adaptation is becoming embedded in some planning processes...”; “Adaption experience is accumulating...”
- Disaster risk management..., Early warning and forecasting..., Public health measures..., Coastal and water resources management..., Planning for sea-level rise and water availability..., Protection of energy and public infrastructures..., Resilient crop varieties...
- Societal values and risk perceptions will drive planning and implementation.
- “Existing and emerging economic instruments can foster adaption by providing incentives...”
- “... gap between global adaption needs and funds available...”

Adaptation is under way, so what now?

4. Adaptation limits will be exceeded without effective mitigation.

- “... risks... can be reduced by limiting the rate and magnitude of change.”
- “Delaying mitigation actions may reduce options for climate-resilient pathways in the future.”

MITIGATION OF CLIMATE CHANGE

On April 13th, the IPCC released *Climate Change 2014: Mitigation of Climate Change*. See the [Summary for Policy Makers \(SPM\)](#).

How bad is the GHG problem?

1. The GHG problem continues to get worse.

- About half of all human emission have occurred since 1970.
- Decade of 2000 to 2010 had highest cumulative emissions in human history DESPITE reduction due to 2007-2008 economic slowdown.
- Emissions reached 49 Gt of CO₂ equivalent in 2010, with a 2.2% annual growth rate.
- Population and economic growth are the primary drivers.

What are some approaches to mitigation?

2. Mitigation pathways:

- Mitigation efforts in place today are insufficient. Baseline scenarios (aka “business as usual”) will lead to 450 ppm by 2030 and 750-1300 ppm of CO₂ equivalent by 2100, with a temperature rise from 3.7 to 4.8° C above pre-industrial levels.
- Social and political factors must be at the forefront to achieve mitigation.
- Sustainable development can be achieved through multiple scenarios with wide range of “technological, socioeconomic, and institutional trajectories.”
- Over 900 mitigation scenarios have been evaluated with CO₂ equivalent concentrations ranging from 430 to over 720 ppm by 2100.
- To have a likely (> 66 %) chance of staying below a 2° C increase, scenario analyses shows that CO₂ equivalent concentrations must stay below 450 ppm by 2100, requiring:

“Substantial cuts in anthropogenic GHG by mid-century through large-scale changes in energy systems and potentially land use.”

“More rapid improvements in energy efficiency” and “behavioral changes... to reduce demand” are key mitigation strategies.

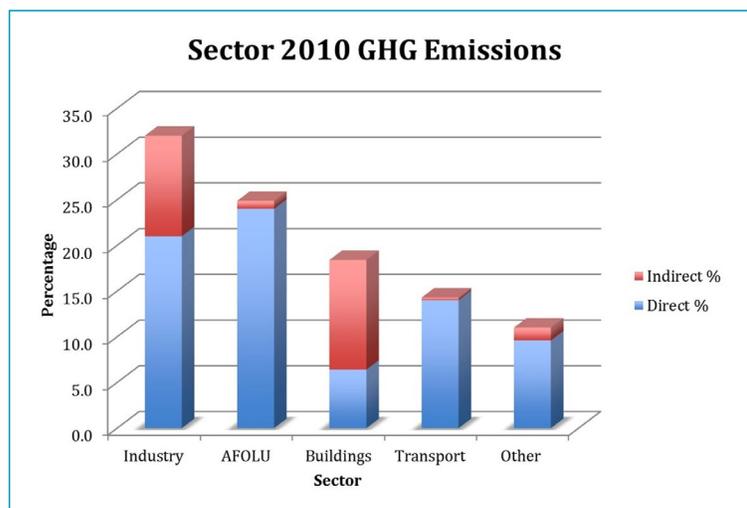
“Large scale changes in the energy supply sector” – 3x to 4x increase in share of renewables, nuclear, and fossil energy with CCS or bioenergy with CCS

Wide range of changes in land use – bioenergy production, reforestation, and reduced deforestation.

- Achieving lower CO₂ concentrations requires faster changes.
- “Delaying mitigation efforts beyond those in place today through 2030... substantially increase the difficulty... and narrow the range of options.”
- Cancun Pledges are insufficient – they will only keep temperature rises below 3° C.
- To hold the surface temperature increase to < 1.5° C, mitigation pathways must limit CO₂ concentrations to 430 ppm in 2100.

What sectors are most responsible for total GHG emissions?

3. GHG Emissions by Sector:



Industry Sector (32% of GHG Emissions)

- “Wide-scale upgrading, replacement and deployment of best available technologies...”
- GHG emission efficiency..., Efficiency of material use..., Recycling, re-use of materials..., more intensive use of products ... Reduction of HFC emissions ... Cooperation across ...companies – sharing of infrastructure, info and waste heat utilization.

AFOLU (Agriculture, Forestry, & Other Land Use) Sector (25%)

- Agriculture – cropland management, grazing land management, restoration of organic soils
- Demand side – changes in diet and reduction of losses in food chain supply.
- Bioenergy – Critical, but many issues to address.

Buildings Sector (18%)

- Energy demand growth – wealth, lifestyle change, urbanization
- “Very low energy building codes,” retrofits, and efficiency standards for appliances
- Lifestyle, culture and behavior
- Have considerable and diverse co-benefits in addition to cost savings.
- Need policy interventions to overcome barriers.

Transport Sector (14%)

- Technical measures – energy efficiency and vehicle performance... switch to low-carbon (methane-based) fuels... low carbon electricity coupled with electric rail and vehicles... hydrogen fuels... liquid and gaseous biofuels...
- New infrastructure – “... high speed rail... reduce short haul air...”; “Established infrastructure may limit options for modal shift...”
- Urban redevelopment – “Integrated urban planning, transit-oriented development, more compact urban form that supports cycling and walking...”

And what are the costs of mitigation?

4. Mitigation Costs

- “Estimates of the aggregate economic costs of mitigation vary widely and are highly sensitive to model design and assumptions as well as the specification of scenarios, including the characterization of technologies and the timing of mitigation.”
- Holding down CO₂ concentration increases will cause a small loss in global consumption over the remainder of the century.
- Annualized reduction of economic growth by 0.04 to 0.14% from baseline levels of 1.6 to 3%/yr.
- Availability of technologies plus delayed action drives mitigation costs upwards.
- A “wide range of possible side-effects as well as co-benefits and spillovers... have not been well-quantified.”
- Costs will vary between countries
- “In globally cost-effective scenarios, the majority of mitigation efforts takes place in countries with the highest future emissions...”
- “Mitigation policy could devalue fossil fuel assets...”

