CLIMATE CHANGE 2014
Mitigation of Climate Change

Key Insights from IPCC's AR5 and beyond

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Our Common Future under Climate Change - CFCC
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Working Group III contribution to the IPCC Fifth Assessment Report
GHG emissions growth between 2000 and 2010 has been larger than in the previous three decades.
GHG emissions rise with growth in GDP and population.

Based on Figure 1.7
The long-standing trend of decarbonization has reversed.
A renaissance of coal drives the global carbonization.

Steckel, Edenhofer and Jakob, in press
Renaissance of coal is majorly driven by poor, fast growing countries

- Non Annex I countries have increased their coal share in the energy mix faster than foreseen in available baseline scenarios

- Carbonization by coal is not limited to China, but applies structurally to poor, fast growing countries
Will the next wave of carbonization be triggered by Africa?

Six Sub-Saharan African countries are among the top 10 fastest growing emitters globally. Until now, their carbonization is majorly driven by natural gas and oil.

BUT: Coal is getting increasing attention, also in countries w/o own reserves!

<table>
<thead>
<tr>
<th>Country</th>
<th>Average Emission Growth 2000 – 2011</th>
<th>Global rank</th>
<th>Due to changes in carbon intensity only</th>
<th>New mining activities planned</th>
<th>New coal power plants under construction/planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congo, Rep.</td>
<td>17.5%</td>
<td>1</td>
<td>9.2%</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Benin</td>
<td>11.2%</td>
<td>3</td>
<td>6.8%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Angola</td>
<td>10.9%</td>
<td>4</td>
<td>5.2%</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Tanzania</td>
<td>9.5%</td>
<td>7</td>
<td>5.2%</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sudan</td>
<td>9.0%</td>
<td>9</td>
<td>7.4%</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Mozambique</td>
<td>8.4%</td>
<td>10</td>
<td>5.2%</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Calculations by MCC based on IEA data
Risks from climate change depend on cumulative CO$_2$ emissions...

Based on SYR Figure SPM.10
...which in turn depend on annual GHG emissions over the next decades.

Mitigation involves some level of co-benefits and of risks due to adverse side-effects, but these risks do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change.
Baseline scenarios suggest rising GHG emissions in all sectors, except for CO$_2$ emissions from the land-use sector.

Based on Figure TS.15
Mitigation requires changes throughout the economy. Systemic approaches are expected to be most effective.

Based on Figure TS.17
Mitigation efforts in one sector determine efforts in others.

Based on Figure TS.17

450 ppm CO$_2$ eq without Carbon Dioxide Capture and Storage

- **Land Use (net)**
- **Electricity**
- **Transport**
- **Buildings**
- **Industry**
- **Non–CO$_2$**

**Direct GHG Emissions [GtCO$_2$ eq/yr]**

- **2030**
- **2050**
- **2100**

**Max**
**75th Percentile**
**Median**
**25th Percentile**
**Min**
Many scenarios make it at least *about as likely as not* that warming will remain below 2°C relative to pre-industrial levels.

Based on Figures 6.32 and 7.16
Still, between 2030 and 2050, emissions would have to be reduced at an unprecedented rate...
...implying a rapid scale-up of low-carbon energy.
Delaying emissions reductions increases the difficulty and narrows the options for mitigation.

Based on Figures 6.32 and 7.16
Delaying emissions reductions increases the difficulty and narrows the options for mitigation.

Based on Figures 6.32 and 7.16
Delaying emissions reductions increases the difficulty and narrows the options for mitigation.

Current Cancún Pledges imply increased mitigation challenges for limiting warming to 2°C relative to pre-industrial levels.
Technological limitations can increase mitigation costs.

Based on Figure 6.24
What are the consequences for international energy and climate policy?
The climate problem at a glance

Resources and reserves to remain underground until 2100 (median values compared to BAU, AR5 Database)

<table>
<thead>
<tr>
<th>Until 2100</th>
<th>With CCS [%]</th>
<th>No CCS [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>70</td>
<td>89</td>
</tr>
<tr>
<td>Oil</td>
<td>35</td>
<td>63</td>
</tr>
<tr>
<td>Gas</td>
<td>32</td>
<td>64</td>
</tr>
</tbody>
</table>

Source: Bauer et al. (2014); Jakob, Hilaire (2015)
Climate Policy and Poverty reduction - A contradiction?

- Water availability
- Sanitation
- Telecommunication
- Access to electricity
Removing fossil fuel subsidies can finance access to basic infrastructure in many countries.

Source: Jakob et al., in press
Carbon pricing revenues to close infrastructure gaps

Revenues invested 2015-2030, 450ppm goal, full technological availability, C&C allocation of emission permits

Source: Jakob et al., in press