Global warming of 1.5°C

(... in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty

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« The IPCC Special Report on 1.5°C warming ». European Parliament, Brussels, 8 November 2018
The Paris Agreement (COP21, December 2015)

Vision
« ...strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty »

Objectives

a) Holding the increase in the global average temperature:
- « to well below 2°C above pre-industrial levels »
- « pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change »

b) Adaptation and Mitigation
- « Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production »

c) Finances
- « Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. »
Why this SR15 report?

COP21 decided to invite the IPCC « to provide a special report in 2018 on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways » (Article 21 of 1/CP21)
Why this SR15 report?

COP21 « Notes with concern that the estimated aggregate GHG emission levels in 2025 and 2030 resulting from the INDCs:

- do not fall within least-cost 2 °C scenarios but rather lead to a projected level of 55 gigatonnes in 2030,
- and also notes that much greater emission reduction efforts will be required (…) in order to hold the increase in the global average temperature -- to below 2 °C above pre-industrial levels by reducing emissions to 40 gigatonnes
-- or to 1.5 °C above pre-industrial levels by reducing to a level to be identified in the [IPCC] special report » (Article 17 of 1/CP21)
Why this SR15 report?

After a scoping process, the IPCC Plenary (Bangkok, October 2016) decided to accept the COP21 invitation and to produce:

« An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty »
CO₂ Concentration, 28 May 2018
(Keeling curve)

Latest CO₂ reading
May 28, 2018


Latest CO₂ reading 411.98 ppm

Source: scripps.ucsd.edu/programs/keelingcurve/
Limiting warming becomes much more difficult when the peak happens later.

Source and details:
http://folk.uio.no/roberan/t/global_mitigation_curves.shtml
Global Warming of 1.5°C

An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.
The report in numbers

- 91 Authors from 40 Countries
- 133 Contributing authors
- 6000 Studies
- 1113 Reviewers
- 42,001 Comments
Where are we now?

Since preindustrial times, human activities have caused approximately 1.0°C of global warming.

• Already seeing consequences for people, nature and livelihoods

• At current rate, would reach 1.5°C between 2030 and 2052

• Past emissions alone do not commit the world to 1.5°C
Global Mean Temperature in °C relative to 1850 – 1900
Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset
Animated version available on http://openclimatedata.net/climate-spirals/temperature
Impacts of global warming 1.5°C

At 1.5°C compared to 2°C:

• Less extreme weather where people live, including extreme heat and rainfall

• By 2100, global mean sea level rise will be around 10 cm lower

• 10 million fewer people exposed to risk of rising seas
Since 1950, **extreme hot days and heavy precipitation** have become more common.

There is evidence that anthropogenic influences, including increasing atmospheric **greenhouse gas concentrations**, have changed these extremes.
More heavy precipitation and more droughts....

- Warmer world implies more evaporation, but soils will dry out as a result. So dry regions will get drier unless storm tracks shift in a lucky way. And for some, they are expected to shift in an unlucky way.

- At mid to low latitudes, wet regions get wetter, dry regions get drier.

- Warmer world implies more evaporation, so more water goes to the atmosphere where water is available on the ground (e.g., oceans). The atmosphere therefore will contain more water vapor available to rain out. And most places receive the majority of their moisture in heavy rain events, which draw moisture from a big area.
Impacts of global warming 1.5°C

At 1.5°C compared to 2°C:

• Lower impact on biodiversity and species

• Smaller reductions in yields of maize, rice, wheat

• Global population exposed to water shortages up to 50% less
Impacts of global warming 1.5°C

At 1.5°C compared to 2°C:

• Lower risk to fisheries & the livelihoods that depend on them

• Up to several hundred million fewer people exposed to climate-related risk and susceptible to poverty by 2050
How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

Impacts and risks associated with the Reasons for Concern (RFCs)

- **RFC1**: Unique and threatened systems
- **RFC2**: Extreme weather events
- **RFC3**: Distribution of impacts
- **RFC4**: Global aggregate impacts
- **RFC5**: Large scale singular events

**Purple** indicates very high risks of severe impacts/risks and the presence of significant irreversibility or the persistence of climate-related hazards, combined with limited ability to adapt due to the nature of the hazard or impacts/risks.

**Red** indicates severe and widespread impacts/risks.

**Yellow** indicates that impacts/risks are detectable and attributable to climate change with at least medium confidence.

**White** indicates that no impacts are detectable and attributable to climate change.

Source: IPCC Special Report on Global Warming of 1.5°C
## Half a Degree of Warming Makes a Big Difference: Explaining IPCC’s 1.5°C Special Report

<table>
<thead>
<tr>
<th></th>
<th>1.5°C</th>
<th>2°C</th>
<th>2°C Impacts</th>
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</thead>
<tbody>
<tr>
<td><strong>Extreme Heat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global population</td>
<td>14%</td>
<td>37%</td>
<td>2.6x WORSE</td>
</tr>
<tr>
<td>exposed to severe</td>
<td>every five years</td>
<td></td>
<td></td>
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<tr>
<td>heat at least once</td>
<td></td>
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<tr>
<td>every five years</td>
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<tr>
<td><strong>Sea-Ice-Free Arctic</strong></td>
<td></td>
<td></td>
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<tr>
<td>Number of ice-free</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>summers</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Sea Level Rise</strong></td>
<td>0.40</td>
<td>0.46</td>
<td>.06M MORE</td>
</tr>
<tr>
<td>Amount of sea level</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>rise by 2100</td>
<td>Meters</td>
<td>Meters</td>
<td></td>
</tr>
<tr>
<td><strong>Species Loss:</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Vertebrates</strong></td>
<td>4%</td>
<td>8%</td>
<td>2x WORSE</td>
</tr>
<tr>
<td>Vertebrates that lose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at least half of their range</td>
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<tr>
<td><strong>Species Loss:</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Plants</strong></td>
<td>8%</td>
<td>16%</td>
<td>2x WORSE</td>
</tr>
<tr>
<td>Plants that lose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at least half of their range</td>
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<td></td>
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<tr>
<td><strong>Species Loss:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insects</strong></td>
<td>6%</td>
<td>18%</td>
<td>3x WORSE</td>
</tr>
<tr>
<td>Insects that lose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at least half of their range</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responsibility for content: WRI
Emission Pathways and System Transitions Consistent with 1.5°C Global Warming
Greenhouse gas emissions pathways

- To limit warming to 1.5°C, CO₂ emissions fall by about 45% by 2030 (from 2010 levels)
  - Compared to 20% for 2°C
- To limit warming to 1.5°C, CO₂ emissions would need to reach ‘net zero’ around 2050
  - Compared to around 2075 for 2°C
- Reducing non-CO₂ emissions would have direct and immediate health benefits
Global emissions pathway characteristics

General characteristics of the evolution of anthropogenic net emissions of CO₂, and total emissions of methane, black carbon, and nitrous oxide in model pathways that limit global warming to 1.5°C with no or limited overshoot. Net emissions are defined as anthropogenic emissions reduced by anthropogenic removals. Reductions in net emissions can be achieved through different portfolios of mitigation measures illustrated in Figure SPM3B.

**Global total net CO₂ emissions**

In pathways limiting global warming to 1.5°C with no or limited overshoot as well as in pathways with a high overshoot, CO₂ emissions are reduced to net zero globally around 2050.

**Non-CO₂ emissions relative to 2010**

Emissions of non-CO₂ forcers are also reduced or limited in pathways limiting global warming to 1.5°C with no or limited overshoot, but they do not reach zero globally.

- **Methane emissions**
- **Black carbon emissions**
- **Nitrous oxide emissions**

Source: IPCC Special Report on Global Warming of 1.5°C
Cumulative emissions of CO₂ and future non-CO₂ radiative forcing determine the probability of limiting warming to 1.5°C

a) Observed global temperature change and modeled responses to stylized anthropogenic emission and forcing pathways

Global warming relative to 1850-1900 (°C)

- Observed monthly global mean surface temperature
- Estimated anthropogenic warming to date and likely range
- Likely range of modeled responses to stylized pathways
- Global CO₂ emissions reach net zero in 2055 while net non-CO₂ radiative forcing is reduced after 2030 (grey in b, c & d)
- Faster CO₂ reductions (blue in b & c) result in a higher probability of limiting warming to 1.5°C
- No reduction of net non-CO₂ radiative forcing (purple in d) results in a lower probability of limiting warming to 1.5°C

b) Stylized net global CO₂ emission pathways

Billion tonnes CO₂ per year (GtCO₂/yr)

- CO₂ emissions decline from 2020 to reach net zero in 2055 or 2040

Faster immediate CO₂ emission reductions limit cumulative CO₂ emissions shown in panel (c).

Source: IPCC Special Report on Global Warming of 1.5°C

c) Cumulative net CO₂ emissions

Billion tonnes CO₂ (GtCO₂)

- Cumulative CO₂ emissions in pathways reaching net zero in 2055 and 2040

Maximum temperature rise is determined by cumulative net CO₂ emissions and net non-CO₂ radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.

d) Non-CO₂ radiative forcing pathways

Watts per square metre (W/m²)

- Non-CO₂ radiative forcing reduced after 2030 or not reduced after 2030
Greenhouse gas emissions pathways

- Limiting warming to 1.5°C would require changes on an unprecedented scale
  - Deep emissions cuts in all sectors
  - A range of technologies
  - Behavioural changes
  - Increase investment in low carbon options
Greenhouse gas emissions pathways

• Progress in renewables would need to mirrored in other sectors

• We would need to start taking carbon dioxide out of the atmosphere (Afforestation or other techniques)

• Implications for food security, ecosystems and biodiversity
Greenhouse gas emissions pathways

- National pledges are not enough to limit warming to 1.5°C

- Avoiding warming of more than 1.5°C would require carbon dioxide emissions to decline substantially before 2030
Comparison of global emission levels in 2025 and 2030 resulting from the implementation of the intended nationally determined contributions

UNFCCC, Aggregate effect of the intended nationally determined contributions: an update http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf
Four illustrative model pathways in the IPCC SR15:

Breakdown of contributions to global net CO₂ emissions in four illustrative model pathways

- **Fossil fuel and industry**
- **AFOLU**
- **BECCS**

**P1**: A scenario in which social, business, and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A down-sized energy system enables rapid decarbonisation of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

**P2**: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

**P3**: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

**P4**: A resource and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.
Four illustrative model pathways in the IPCC SR15:

<table>
<thead>
<tr>
<th>Global indicators</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>Interquartile range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pathway classification</strong></td>
<td>No or low overshoot</td>
<td>No or low overshoot</td>
<td>No or low overshoot</td>
<td>High overshoot</td>
<td>No or low overshoot</td>
</tr>
<tr>
<td><strong>CO₂ emission change in 2030 (% rel to 2010)</strong></td>
<td>-58</td>
<td>-47</td>
<td>-41</td>
<td>4</td>
<td>(-59,-40)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-93</td>
<td>-95</td>
<td>-91</td>
<td>-97</td>
<td>(-104,-91)</td>
</tr>
<tr>
<td><em><em>Kyoto-GHG emissions</em> in 2030 (% rel to 2010)</em>*</td>
<td>-50</td>
<td>-49</td>
<td>-35</td>
<td>-2</td>
<td>(-55,-38)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-82</td>
<td>-89</td>
<td>-78</td>
<td>-80</td>
<td>(-93,-81)</td>
</tr>
<tr>
<td><strong>Final energy demand</strong> <strong>↓ in 2030 (% rel to 2010)</strong></td>
<td>-15</td>
<td>-5</td>
<td>17</td>
<td>39</td>
<td>(-12,7)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-32</td>
<td>2</td>
<td>21</td>
<td>44</td>
<td>(-11,22)</td>
</tr>
<tr>
<td><strong>Renewable share in electricity in 2030 (%)</strong></td>
<td>60</td>
<td>58</td>
<td>48</td>
<td>25</td>
<td>(47,65)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (%)</strong></td>
<td>77</td>
<td>81</td>
<td>63</td>
<td>70</td>
<td>(69,87)</td>
</tr>
<tr>
<td><strong>Primary energy from coal in 2030 (% rel to 2010)</strong></td>
<td>-78</td>
<td>-61</td>
<td>-75</td>
<td>-59</td>
<td>(-78,-59)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-97</td>
<td>-77</td>
<td>-73</td>
<td>-97</td>
<td>(-95,-74)</td>
</tr>
<tr>
<td><strong>from oil in 2030 (% rel to 2010)</strong></td>
<td>-37</td>
<td>-13</td>
<td>-3</td>
<td>86</td>
<td>(-34,3)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-87</td>
<td>-50</td>
<td>-81</td>
<td>-32</td>
<td>(-78,-31)</td>
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<td><strong>from gas in 2030 (% rel to 2010)</strong></td>
<td>-25</td>
<td>-20</td>
<td>33</td>
<td>37</td>
<td>(-26,21)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-74</td>
<td>-53</td>
<td>21</td>
<td>-48</td>
<td>(-56,6)</td>
</tr>
<tr>
<td><strong>from nuclear in 2030 (% rel to 2010)</strong></td>
<td>59</td>
<td>83</td>
<td>98</td>
<td>106</td>
<td>(44,102)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>150</td>
<td>98</td>
<td>501</td>
<td>468</td>
<td>(91,190)</td>
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<tr>
<td><strong>from biomass in 2030 (% rel to 2010)</strong></td>
<td>-11</td>
<td>0</td>
<td>36</td>
<td>-1</td>
<td>(29,80)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-16</td>
<td>49</td>
<td>121</td>
<td>418</td>
<td>(123,261)</td>
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<tr>
<td><strong>from non-biomass renewables in 2030 (% rel to 2010)</strong></td>
<td>430</td>
<td>470</td>
<td>315</td>
<td>110</td>
<td>(243,438)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>832</td>
<td>1327</td>
<td>878</td>
<td>1137</td>
<td>(575,1300)</td>
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<tr>
<td><strong>Cumulative CCS until 2100 (GtCO₂)</strong></td>
<td>0</td>
<td>348</td>
<td>687</td>
<td>1218</td>
<td>(550,1017)</td>
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<tr>
<td><strong>↓ of which BECCS (GtCO₂)</strong></td>
<td>0</td>
<td>151</td>
<td>414</td>
<td>1191</td>
<td>(364,662)</td>
</tr>
<tr>
<td><strong>Land area of bioenergy crops in 2050 (million hectare)</strong></td>
<td>22</td>
<td>93</td>
<td>283</td>
<td>724</td>
<td>(151,320)</td>
</tr>
<tr>
<td><strong>Agricultural CH₄ emissions in 2030 (% rel to 2010)</strong></td>
<td>-24</td>
<td>-48</td>
<td>1</td>
<td>14</td>
<td>(-30,-11)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>-33</td>
<td>-69</td>
<td>-23</td>
<td>2</td>
<td>(-46,-23)</td>
</tr>
<tr>
<td><strong>Agricultural N₂O emissions in 2030 (% rel to 2010)</strong></td>
<td>5</td>
<td>-26</td>
<td>15</td>
<td>3</td>
<td>(-21,4)</td>
</tr>
<tr>
<td><strong>↓ in 2050 (% rel to 2010)</strong></td>
<td>6</td>
<td>-26</td>
<td>0</td>
<td>39</td>
<td>(-26,1)</td>
</tr>
</tbody>
</table>

*Kyoto-gas emissions are based on SAR GWP-100
**Changes in energy demand are associated with improvements in energy efficiency and behaviour change.

**NOTE:** Indicators have been selected to show global trends identified by the Chapter 2 assessment. National and sectoral characteristics can differ substantially from the global trends shown above.

Source: IPCC Special Report on Global Warming of 1.5°C
For 3 illustrative model pathways that limit warming with no or limited overshoot

<table>
<thead>
<tr>
<th>(% rel to 2010)</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ (2030/2050)</td>
<td>-58 / -93</td>
<td>-47 / -95</td>
<td>-41 / -91</td>
</tr>
<tr>
<td>Final energy demand (2030/2050)</td>
<td>-15 / -32</td>
<td>-5 / +2</td>
<td>+17 / +21</td>
</tr>
<tr>
<td>Primary energy from coal (2030/2050)</td>
<td>-78/-97</td>
<td>-61/-77</td>
<td>-75/-73</td>
</tr>
<tr>
<td>Primary energy from non-biomass renewables (2030/2050)</td>
<td>+430/+832</td>
<td>+470/+1327</td>
<td>+315/+878</td>
</tr>
</tbody>
</table>

IPCC SR15 Fig SPM 3b
Strengthening the Global Response in the Context of Sustainable Development and Efforts to Eradicate Poverty
Climate change and people

• Close links to United Nations Sustainable Development Goals (SDGs)

• Mix of measures to adapt to climate change and reduce emissions can have benefits for SDGs

• National and sub-national authorities, civil society, the private sector, indigenous peoples and local communities can support ambitious action

• International cooperation is a critical part of limiting warming to 1.5°C
If well designed, measures to prevent climate change could offer so many opportunities:

• Co-benefits in reduced pollution, health improvement, employment, gender equality, food security, reduced poverty, energy independence...

• Opportunities to shift the tax burden away from labour, incentivise, and fund sustainable development and just transitiona

@JPvanYpersele
Synergies: Combustion of fossil fuels, wood, and biomass also cause air pollution, which kills 7 million people per year (including 500 000 in Europe) (World Health Organization, 2018)

Opportunity: Addressing the causes of climate change can also improve air quality and wellbeing

@JPvanYpersele
Children are particularly sensitive to air pollution

Photo: Indiatoday.in, 6-12-2017
Indicative linkages between mitigation options and sustainable development using SDGs (The linkages do not show costs and benefits)

Mitigation options deployed in each sector can be associated with potential positive effects (synergies) or negative effects (trade-offs) with the Sustainable Development Goals (SDGs). The degree to which this potential is realized will depend on the selected portfolio of mitigation options, mitigation policy design, and local circumstances and context. Particularly in the energy-demand sector, the potential for synergies is larger than for trade-offs. The bars group individually assessed options by level of confidence and take into account the relative strength of the assessed mitigation-SDG connections.

Length shows strength of connection

The overall size of the coloured bars depict the relative for synergies and trade-offs between the sectoral mitigation options and the SDGs.

Shades show level of confidence

The shades depict the level of confidence of the assessed potential for Trade-offs/Synergies.

Very High

Low

Energy-supply

SDG1: No Poverty
SDG2: Zero Hunger
SDG3: Good Health and Well-being
SDG4: Quality Education
SDG5: Gender Equality

Trade-offs

Energy-demand

Trade-offs

Land

Trade-offs

Synergies
Indicative linkages between mitigation options and sustainable development using SDGs (The linkages do not show costs and benefits)

Mitigation options deployed in each sector can be associated with potential positive effects (synergies) or negative effects (trade-offs) with the Sustainable Development Goals (SDGs). The degree to which this potential is realized will depend on the selected portfolio of mitigation options, mitigation policy design, and local circumstances and context. Particularly in the energy-demand sector, the potential for synergies is larger than for trade-offs. The bars group individually assessed options by level of confidence and take into account the relative strength of the assessed mitigation-SDG connections.

Length shows strength of connection

The overall size of the coloured bars depict the relative size of synergies and trade-offs between the sectoral mitigation options and the SDGs.

Shades show level of confidence

The shades depict the level of confidence of the assessed potential for Trade-offs/Synergies.

Source: IPCC Special Report on Global Warming of 1.5°C
Tentative and personal conclusions

1.5°C matters: reducing the warming, even by tenths of a °C, can make large differences for impacts, as many of these are non-linear, that is they worsen faster with warming than the warming itself.

The probability of extremes (heat waves, drought, floods, extreme sea level) is significantly lower in a 1.5°C world than in a 2°C world.

1.5°C is much safer than 2°C in terms of long-term sea-level rise associated to ice-sheet processes, particularly for low-lying regions.

@JPvanYpersele
Tentative and personal conclusions

1.5°C lower impacts will make adaptation less costly than in 2°C world, even if there is a temporary overshoot above 1.5°C

It is very ambitious to reduce net CO2 emissions fast enough (i.e. 2050) to ZERO for a 1.5°C long-term average temperature above pre-industrial objective.

There are many possible co-benefits in fighting climate change, and they would help to achieve several SDGs.

What is needed is the political, economic, citizen’s will!

The slower radical changes in emission patterns take place, the more we may need uncertain or risky technologies, such as large use of carbon dioxide removal from the atmosphere (possibly at the expense of food security and biodiversity).

“Yes, we can!”, says the IPCC

@JPvanYpersele
Percentage points difference between ESR targets and projected emissions in 2030.
To go further:

- [www.ipcc.ch](http://www.ipcc.ch): IPCC
- [www.realclimate.org](http://www.realclimate.org): answers to the merchants of doubt arguments
- [www.skepticalscience.com](http://www.skepticalscience.com): same
- [www.plateforme-wallonne-giec.be](http://www.plateforme-wallonne-giec.be): IPCC-related in French, Newsletter, latest on SR15

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