THE TEN MOST IMPORTANT SHORT-TERM STEPS TO LIMIT WARMING TO 1.5°C

November 2016
Limiting global temperature increase to 1.5°C requires major transformations that need to begin immediately. We provide insights on the ten most important steps that need to be taken in specific sectors in the short term—to 2020 and 2025—if the Paris Agreement temperature goal is to be met.

We used modelled scenarios to provide guidance on what needs to happen in each sector. The stringency of the 1.5°C limit significantly constrains the levels of freedom to spread emission reductions across sectors, countries and over time.

As a result of the limited carbon budget, combined with the inertia of energy, transport, industry technologies and systems, and the difficulty of reducing emissions in some sectors, global energy models find only limited pathways.

If a sector does less, in particular the energy, industry and transport sectors, it would leave a high-emissions legacy for several decades and would mean a failure to set in motion the system changes needed to achieve the required long-term transformation.

Efforts in all of these sectors that begin by 2020, and accelerate by 2025, will be needed to reach zero carbon dioxide emissions by mid-century, and zero greenhouse gas emissions overall roughly in the 2060s.

For all ten elements we show there are signs that the transition of this magnitude is possible: in some specific cases it’s already happening. Achieving these ten steps in the period to 2020 and 2025 would put the world on a pathway to limit global temperature increase to 1.5°C.

Global GHG Direct Emissions by Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>2010 Emissions (Gt-CO2eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power and heat</td>
<td>12.6</td>
</tr>
<tr>
<td>Buildings</td>
<td>3.0</td>
</tr>
<tr>
<td>Industry</td>
<td>8.9</td>
</tr>
<tr>
<td>Transport</td>
<td>6.9</td>
</tr>
<tr>
<td>Agriculture, forestry and land use</td>
<td>11.9</td>
</tr>
<tr>
<td>Other</td>
<td>6.3</td>
</tr>
</tbody>
</table>

and what can be done in the short term

- **Zero-e**: New buildings zero emissions after 2020
- **Low-e**: New industry low carbon after 2020
- **Low**: Renovate 3-5% of buildings p.a.
- **Sustain**: Sustain renewables growth
- **No new**: No new coal power plants
- **Last fossil**: Last fossil fuel car sold before 2015
- **Develop**: Develop 1.5°C vision for aviation & shipping
- **Best practice**: Best practice in agriculture
- **Zero deforestation**: Zero deforestation by 2020

Source: Own elaboration based on emissions data from IPCC AR5 WG3. Chapter 1.
NEW BUILDINGS: ALL NEW BUILDINGS FOSSIL-FREE AND NEAR ZERO ENERGY BY 2020

A 1.5°C pathway demands rapid and near complete phase-out of direct emissions from buildings by 2050. This implies a power system consisting entirely of renewables and other zero and low carbon sources. Of the carbon-free options, renewables are showing the most promise, and their current growth must be sustained until 2025. Rapid action is required to ensure our power systems are ready for them. Policymakers can set boundary conditions and design electricity markets in a way that allows integration of high shares of renewables.

AVIATION AND SHIPPING: DEVELOP AND AGREE ON A 1.5°C COMPATIBLE VISION

The aviation and shipping sector is lacking coordinated efforts and ambition to develop emission reduction targets and drive mitigation. In fact, there appears to be no overall vision on how the aviation and shipping sector could decarbonise to be in line with 1.5°C pathways, which essentially means zero CO\textsubscript{2} emissions in a few decades. However, there is significant untapped potential through increased efficiency, the use of biofuels and a reduction in travel demand. Therefore, to be in line with 1.5°C, both sectors should drive adoption of existing technologies as well as develop and agree on a 1.5°C-compatible vision.

COAL POWER: NO NEW COAL PLANTS, REDUCE EMISSIONS FROM COAL POWER BY AT LEAST 30% BY 2025

To close the gap between current ambition and what is needed for 1.5°C, while simultaneously limiting stranded assets, no new coal-fired power plant can be built. There must be consistent efforts to reduce emissions from current coal-fired power plants—by at least 30% by 2025—through, for example early plant retirement or reducing the running time of existing power plants. By 2030, emissions from coal plants should be down by 65%. Fossil fuels often incur externalities, imposing negative effects (such as health-related and environmental damages) on unrelated third parties, and these need to be included in the price of energy. Fossil fuel subsidies should also be phased out (by the very latest) by 2030. The G20 has an opportunity in 2017 to act on both fronts: to follow the G7 in its commitment to end fossil fuel subsidies by 2025 and to introduce carbon pricing to address external costs.

ROAD TRANSPORT: LAST FOSSIL FUEL CAR SOLD BEFORE 2035

The sales of electric vehicles, which can be zero-emission if powered by non-fossil electricity, have skyrocketed in recent years in several countries. While they still represent only a small share of overall car stock, zero-emissions vehicles would have to constitute 100% of newly-sold vehicles worldwide before 2035 to be compatible with a 1.5°C vision. At the same time, strong modal shifts, as well as efforts to decrease emissions from freight transport, are needed to decarbonise the entire sector.

ELECTRICITY: SUSTAIN THE GROWTH RATE OF RENEWABLES AND OTHER ZERO AND LOW CARBON POWER UNTIL 2025 TO REACH 100% BY 2050

All 1.5°C pathways foresee a fully decarbonised power system by 2050. This implies a power system consisting entirely of renewables and other zero and low carbon sources. Of the carbon-free options, renewables are showing the most promise, and their current growth must be sustained until 2025. Rapid action is required to ensure our power systems are ready for them. Policymakers can set boundary conditions and design electricity markets in a way that allows integration of high shares of renewables.

NEW BUILDINGS: ALL NEW BUILDINGS FOSSIL-FREE AND NEAR ZERO ENERGY BY 2020

A 1.5°C pathway demands rapid and near complete phase-out of direct emissions from buildings by 2050. It is easier and cheaper to build efficient buildings than to retrofit later. There is significant potential, especially for rapidly growing economies, to construct future-proof building stock now, but action is too slow. Policies can catalyse change through setting minimum building standards, extending obligations from public buildings to the whole economy, and through providing low-interest loans.

BUILDING RENOVATION: INCREASE RATES FROM <1% IN 2015 TO 5% BY 2020

A 1.5°C pathway demands rapid and near complete phase-out of emissions from buildings. Long lifetimes mean that only standards for new buildings—as described in the previous point—are not sufficient: existing stock also needs to be retrofitted. To transform the entire current standing building stock before 2050, we need to more than triple our current retrofit rates within five years. Governments can help through offering cheap loans and setting retrofit obligations.

THE TEN MOST IMPORTANT SHORT-TERM STEPS TO LIMIT WARMING TO 1.5°C
CO₂ REMOVAL: BEGIN RESEARCH AND PLANNING FOR NEGATIVE EMISSIONS

In large part due to insufficient emissions reductions realised to date, negative CO₂ emissions will unfortunately be necessary at scale from mid-century to limit warming to 2°C, and even more for 1.5°C. As explained in all other sections of this report, early and rapid action now across the full range of mitigation options, and to protect and enhance natural ecosystems so that they can retain and store more carbon, are all needed to minimise the need for negative CO₂ emissions. If action to reduce CO₂ emissions slows in the near future, this will increase the need for negative CO₂ emissions technologies, but at this point it cannot be eliminated. Even the most rapid action plausible—to reduce CO₂ emissions to zero before 2050 and to significantly reduce other GHGs—will unfortunately not eliminate the need for sizeable negative CO₂ emissions after mid-century.

AUTHORS

NewClimate Institute
Takeshi Kuramochi
Niklas Höhne
Markus Hagemann
Sebastian Sterl

Ecofys
Tarik El-Laboudy
Goher Ur Rehman Mir
Lindee Wong
Karlien Wouters
Yvonne Deng
Kornelis Blok

Climate Analytics
Bill Hare
Michiel Schaeffer
Jasmin Cantzler
Marcia Rocha
Delphine Deryng
Joeri Rogelj
Jan Sindt
Paola Yanguas Parra

This work was funded by the ClimateWorks Foundation