

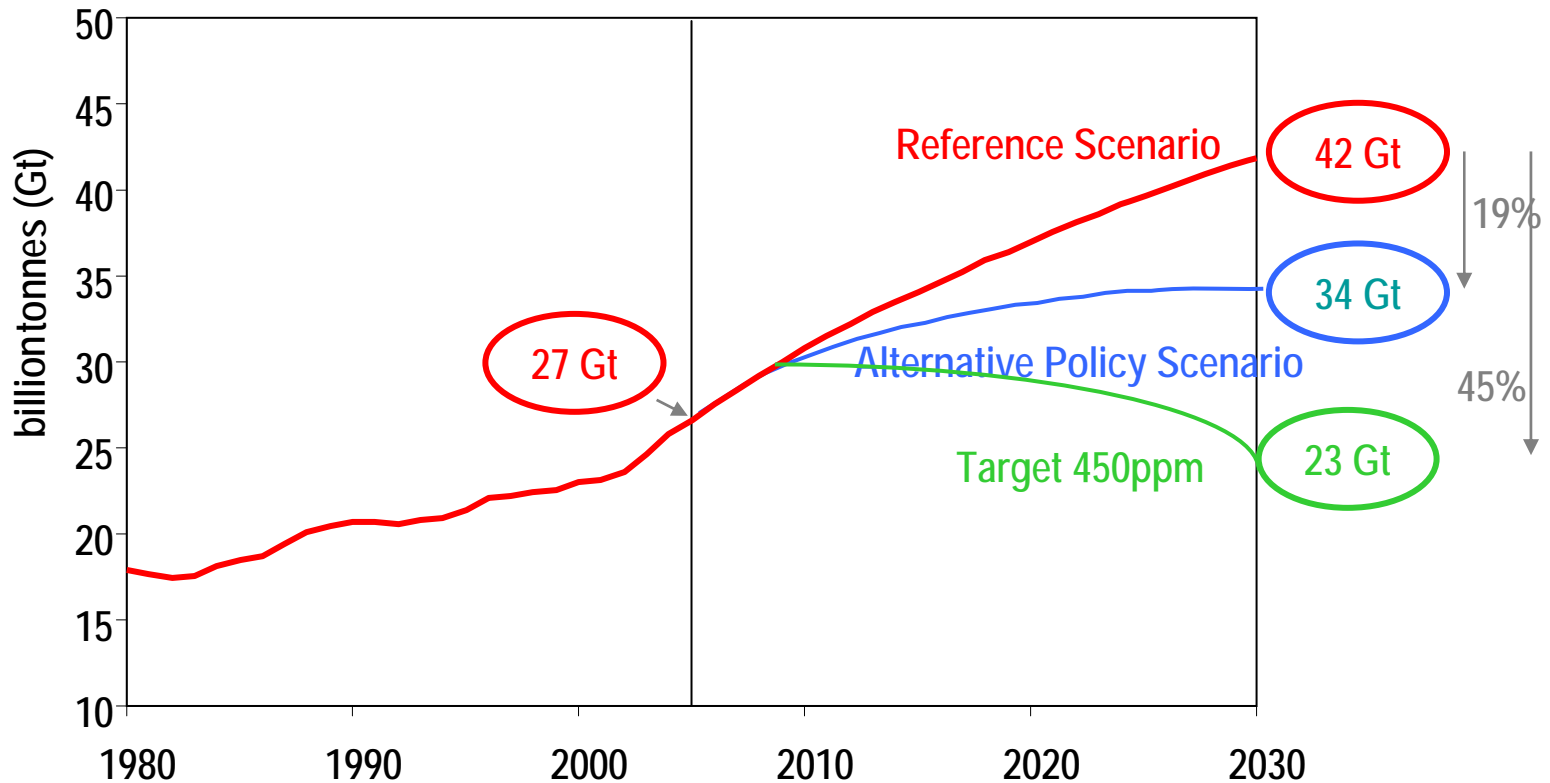
The Way Forward to Copenhagen

Some Factors to Consider

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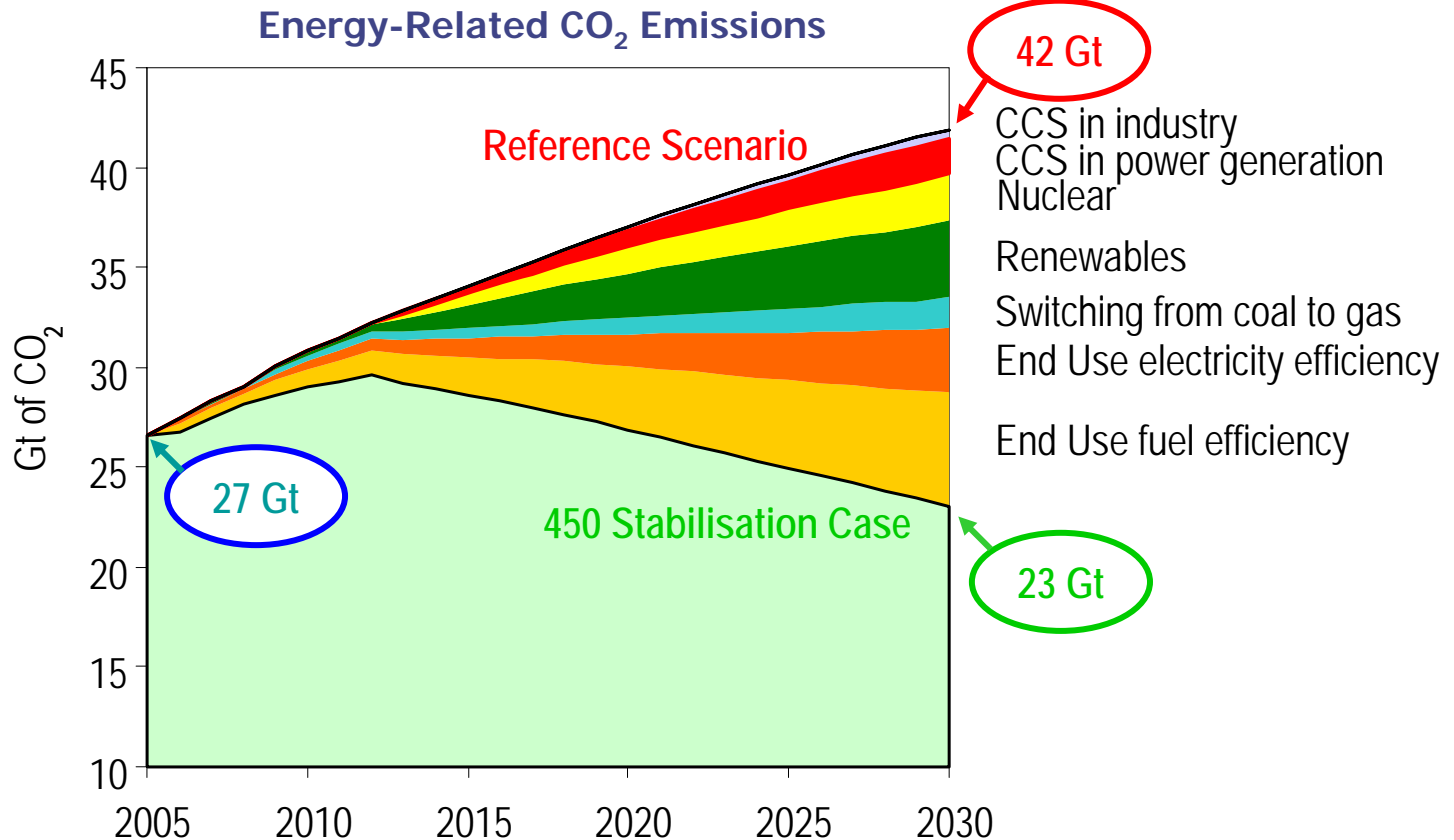
Tokyo
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Global Energy-Related CO₂ Emissions



In Alternative scenario, global emissions grow less than half as fast as in the Reference Scenario, stabilising in the 2020s. To reach 450ppm global emissions need to begin declining in coming few years.

CO₂ Emissions - 450 Stabilisation Case



By 2030, emissions are reduced to some 23 Gt, a reduction of 19 Gt compared with the Reference Scenario

1. Meeting basic energy needs of the poorest is a moral and social imperative

Recommendations

- Place priority on **rapidly achieving much greater access of the world's poor to clean, affordable, high-quality fuels and electricity**. The challenge of expanding access to modern forms of energy revolves primarily around issues of social equity and distribution.

Actions

- United Nations and the World Bank should take the initiative to draw up **a plan for eliminating the energy poverty of the world's poor**. As a first step, governments and NGOs can assist by supplying data on the extent of the problem in their countries.
- The private sector and the S&T community can help promote the **transfer of appropriate technologies**. The private sector can, in addition, help by making appropriate investments. The media should make the general public aware of the enormity of the problem.

2. Concerted efforts to improve energy efficiency and reduce carbon intensity

Recommendations

- Introduce meaningful price signals for avoided GHG emissions.
- Enhance the diffusion of technological innovation.
- Align incentives with long-run sustainability objectives and costs.
- Implement mandatory minimum efficiency standards for appliances and equipment and inform consumers of benefits through labeling.

Actions

- The private sector and the general public should insist that governments issue **clear carbon price signals**. Governments should agree on realistic price signals for carbon emissions, and make these key to further actions on reducing emissions.
- Governments, as advised by private sector and S&T community, should develop and **implement policies/regulations to achieve greater energy efficiency** for a great variety of processes, services, and products.
- The S&T community should step up its efforts to research and **develop new, low-energy and low-carbon technologies**.

3. Carbon capture/storage can play a major role in CO₂ emissions reduction.

Recommendations

- **Accelerate the development/deployment of advanced coal technologies.** Without policy interventions the vast majority of the coal-fired power plants constructed in the next two decades will be 'conventional' pulverized coal plants.
- **Aggressively pursue efforts to commercialize carbon capture and storage.** Price signals, on the order of US\$100–150 per avoided metric ton of carbon equivalent, will be required to induce the widespread adoption of carbon capture and storage.
- **Explore potential retrofit technologies for post-combustion carbon capture** suitable for the large and rapidly growing population of existing pulverized coal plants.

Actions

- The private sector and the S&T community should further **investigate carbon capture and sequestration and develop adequate technologies for demonstration.**
- **Governments should facilitate the development of these technologies** by making available funds and test sites.
- The **general public needs to be thoroughly informed** about the advantages of carbon sequestration and about the relative manageability of associated risks. The media can assist with this.

4. Competition for oil & natural gas could exacerbate geopolitical tensions

Recommendations

- **Introduce policies and regulations that promote reduced energy consumption in the transport sector** by improving the energy efficiency of automobiles.
- **Develop alternatives to petroleum for transport**, including biomass fuels, plug-in hybrids, and advanced alternatives such as H₂ fuel cells.
- **Implement policies to ensure that the development of petroleum alternatives is pursued in a manner that is compatible with other sustainability objectives.** Current methods for liquefying coal and extracting oil from unconventional sources generate substantially high levels of carbon dioxide and other pollutant emissions.

Actions

- **Governments should introduce (further) policies and regulations aimed at reducing energy consumption and developing oil alternatives for transport.** The private sector and the S&T community should continue developing technologies to that end.

5. Nuclear power can make a major contribution only if concerns are addressed

Recommendations

- **Replace the current fleet of aging reactors with plants that incorporate improved intrinsic (passive) safety features.**
- **Understand the impact of long-term aging on nuclear reactor systems** (e.g., neutron damage to materials) and provide for the safe/economic decommissioning of existing plants.
- **Develop safe, retrievable waste management solutions** based on dry cask storage as LT disposal options are explored.
- **Address the risk that civilian nuclear materials and knowledge will be diverted to weapons applications** through continued research on proliferation-resistant uranium enrichment.

Actions

- UN should commission a transparent **re-examination of issues that surround nuclear power** and their potential solutions.
- The private sector/S&T community should continue **research and development efforts targeted at improving reactor safety and developing safe waste management solutions.**
- Governments should **facilitate the replacement of the current fleet of aging reactors with safer plants** and enhance efforts to remedy shortcomings in international governance mechanisms.

6. Renewable energies offer immense opportunities for innovation.

Recommendations

- **Ensure that the environmental benefits of renewable resources will be systematically recognized in the marketplace.** Provide subsidies and other forms of public support for the early deployment of new renewable technologies.
- **Focus R&D on more transformational technologies,** such as new classes of solar cells that can be made with thin-film, continuous fabrication processes.
- **Assess and mitigate any negative environmental impacts associated with the large-scale deployment of renewable energy technologies.**

Actions

- Governments should **facilitate the use of renewable energy** resources through adequate policies and subsidies.
- Governments should **promote R&D in renewable energy** technologies through significantly more public funding.
- The private sector should seek **develop opportunities in the growing renewable energy markets.**

7. Biofuels hold great promise for addressing climate-change and security

Recommendations

- **Conduct intensive research into the new biofuels options**, such as ligno-cellulose conversion, direct microbial production of butanol or other forms of biofuels that may be superior to ethanol.
- Implement strict regulations to insure that the cultivation of **biofuels feedstocks accords with sustainable agricultural practices** and promotes biodiversity and habitat protection.
- **Develop improved biofuels feedstocks** through genetic selection and/or molecular engineering, including drought resistant and self-fertilizing plants that require minimal tillage and fertilizer or chemical inputs.
- **Develop advanced bio-refineries** that use biomass feedstocks.

Actions

- **S&T community and the private sector should greatly augment their RD&D efforts** toward more efficient, environmentally sustainable technologies and processes for the production of modern biofuels.
- Governments can help by stepping up **public research and development funding** and by adapting existing subsidy and fiscal policies so as to favor the use of biofuels especially in the transport sector.

8. New energy carriers, energy storage & transmission infrastructure could reduce costs and create new energy supply options.

Recommendations

- **Continue long-term research and development into potential new energy carriers for the future.** H₂ can be directly combusted or used to power a fuel cell and has a variety of potential applications—including as an energy source for generating electricity or in other stationary applications and as an alternative to petroleum fuels for aviation and road transport.
- **Develop energy storage technologies**, physical and chemical (e.g. batteries, hydrogen) that could significantly improve the market prospects of intermittent wind and solar power.
- **Pursue continued improvements and cost reductions in technologies for transmitting electricity over long distances.** High voltage and direct-current transmission lines could be decisive in making remote areas accessible for renewable energy development and improving grid reliability.

Actions

- The S&T community, together with the private sector, should have **focus on research and development** in this area
- **Governments can assist by increasing public funding for research** and development and by facilitating needed infrastructure investment

9. Science & technology community has a critical role in creating sustainable solutions

Recommendations

- **Increased funding for public investments** in sustainable energy R&D, and incentives to increase private investments.
- **Greater coordination of technology internationally**, and efforts to focus universities/research institutions on sustainability.
- Stimulate efforts to **identify specific changes in institutions, regulations, market incentives, and policy** that would most effectively advance sustainable energy solutions.
- Create an increased **focus on energy-relevant awareness, education, and training** across all professional fields with a role to play in the sustainable energy transition.

Actions

- The S&T community must **better coordinate internationally energy research and development efforts**.
- Governments must make **public funding available to attract more scientists and engineers** to sustainable energy problems.
- The why and how of **energy research and development should be made transparent to the general public to build support** for the significant and sustained investments that will be needed to address long-term sustainability needs.

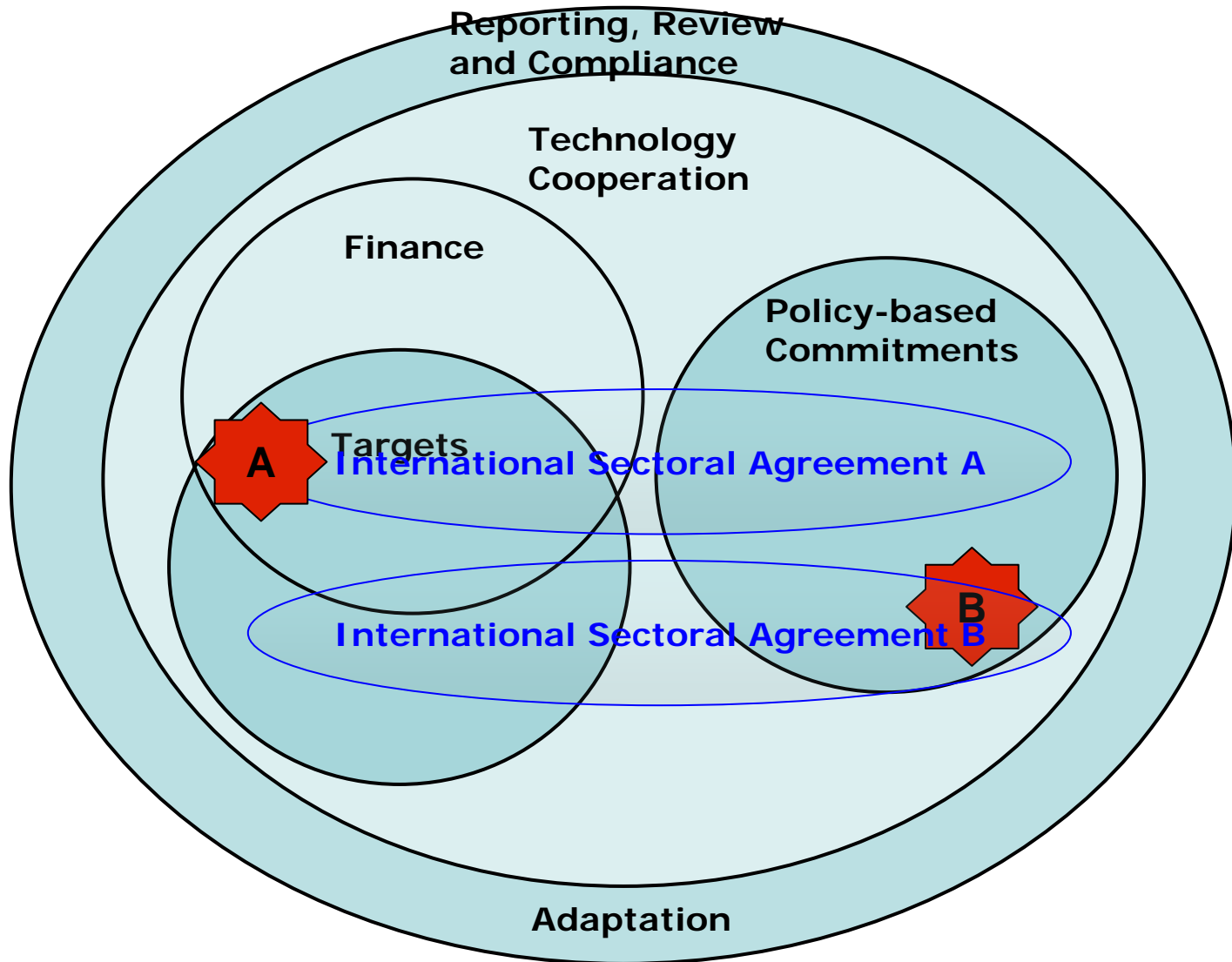
Integrated Multi-Track Framework

Possible Tracks

- Emission targets and timetables
- Nationally defined policies, e.g. efficiency standards and renewable energy targets.
- International sectoral agreements
- Science and technology cooperation
- Agreements to facilitate access to technology
- Measures to facilitate adaptation planning
- Financial mechanisms to provide support for adaptation, capacity building and technology deployment.

Integrated Multi-Track Climate Framework

Illustration



Why do we need integration?

- Stronger reciprocity and effort
- Greater economic efficiency
- Greater coordination

Integrated Multi-Track Framework

Examples

- Multilateral trade regime (GATT)
- European Union
- Multilateral environmental agreements
- Law of the Sea

Model 1: Individualized Commitments

- **Countries agree to negotiate a new protocol** under the UNFCCC.
- **Countries negotiate general provisions regarding the negotiating process** (for example, how commitments are to be proposed and what they must contain), as well as reporting, review and compliance.
- **Each country puts forward its “offer” of the commitments it is willing to undertake** (for example, involving emissions targets, sectoral policies, technology cooperation, financial assistance, or adaptation approaches).
- **Countries adjust their offers based on what others are offering.** This process continues until each is satisfied with the overall package of commitment offers.
- When all of the participating states are satisfied with the overall package of commitments, **these commitments are memorialized in a schedule on a country-by-country basis.**
- **Every five years, a new round of negotiations is undertaken.**

Model 2: Parallel Agreements

- **Countries agree to negotiate a new protocol**, consisting of a general agreement and annexes on: Track A: Targets and timetables; Track B: Sectoral policies; Track C: Technology cooperation; Track D: Adaptation measures and Track E: Financial assistance
- The general articles include: An **overall aim to reduce global emissions by a specified amount for a given commitment period**; a process by which countries can revise their national commitments; a review process to evaluate whether a country has achieved the commitments it has made under the tracks in which it is participating.
- **All countries participate in the negotiation of the general provisions of the agreement and the Track D and E annexes.**
- **Countries are permitted to elect whether to participate in the negotiations on Tracks A, B, or C.**
- **Agreements can be reached sequentially.** Agreement under one track is not contingent on agreement under other tracks.

Model 3: Integrated Commitments

- **States adopt a negotiating mandate with the goal of a comprehensive package of commitments. The mandate identifies different commitment tracks and specifies which countries or groups of countries are to negotiate within each track.**
- **Each track is defined by a different commitment type** (i.e., targets and timetables, policy commitments, sectoral standards, etc.). Within each track, commitments can be further differentiated.
- **Countries agree on common metrics for assessing and comparing the levels of effort being proposed under different tracks**, and adjust their proposals based on what others have offered.
- **Commitments under all tracks are adopted as a package.**
- **The agreement also includes common provisions applying to all countries**, including: Reporting requirements; Compliance and enforcement mechanisms; Criteria for graduating from one commitment track to another commitment track and a process for periodically negotiating new commitments.