R. K. Pachauri points to two important reference points for continuing discussions on development: the concept of sustainable development as a process that integrates political, social, economic and environmental dimensions; and the acceptance of the evidence that the world’s climate is changing. These two highly interrelated issues are at the root of mitigation and adaptation approaches that, applied together, can reduce risks – for instance, in human health and crop productivity – while enhancing people’s capacity to deal with the consequences of climate change.

Addressing climate change means simultaneously addressing several challenges at once: for example, macroeconomic and other non-climate policies, including development policies can significantly affect emissions, adaptive capacity and vulnerability. A wide variety of policies and instruments are available today to help governments create incentives to tackle climate change, such as integrating climate policies into wider development plans, defining regulations and standards, introducing taxes and charges, setting financial incentives and supporting research and development.

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Since July 2009, Dr Pachauri has also been Director of the Yale Climate and Energy Institute. He is active in several international forums dealing with the subject of climate change and its policy dimensions. He was awarded the second-highest civilian award in India, the Padma Vibhushan, in January 2008 by the President of India, and received the Officier de La Légion d’Honneur from the Government of France in 2006. He has been conferred with The Order of the Rising Sun, Gold and Silver Star by His Majesty Akihito, Emperor of Japan; the Commander of the Order of the White Rose of Finland by the Prime Minister of Finland; and the Commander of the Order of Leopold II by the King of the Belgians.
The OECD Development Assistance Committee (DAC) has a remarkable record of providing intellectual clarity and guiding international thought in the field of development. It is of great significance that the DAC is celebrating its 50th anniversary. In the period of 50 years since the inception of this body, the context within which development is pursued in diverse parts of the world has changed greatly, as have the drivers that will determine future directions.

Firstly, the concept of sustainable development has had a profound impact on redefining the directions that the world should take as it moves along the path of development. This concept was proffered by the World Commission on Environment and Development, chaired by Gro Harlem Brundtland, and was further explored at the United Nations (UN) Conference on Environment and Development held in Rio in 1992. There, sustainable development was articulated as a process of change in which exploitation of resources, allocation of investments, orientation of technological development and institutional change are all harmonised, enhancing both current and future potential to meet human needs and aspirations. In this way, the Rio Summit made it explicit that sustainable development integrates the political, social, economic and environmental dimensions of development.

The second – and perhaps even more profound – change that has taken place worldwide is one that has major implications for the structure and process of development: the acceptance of the scientific reality that the Earth’s climate is changing. The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) clearly states that “warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level”. The AR4 also stated that “most of the observed increase in global average temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations”. Here, the term “very likely” is based on an estimate that carries a probability of over 90% in the certainty of this observation.

Sustainable development and climate change

Sustainable development has a strong nexus with the reality of climate change: while it can reduce vulnerability to climate change, climate change could, inversely, impede the abilities of nations to find sustainable development pathways.

The observed and potential impacts of climate change were appraised in considerable detail and regional specificity in the AR4. The report concluded that it is very likely that climate change can slow the pace of progress toward sustainable development either directly through increased exposure to adverse impacts or indirectly through the erosion of the capacity to adapt. Furthermore, the AR4 found that climate change will interact at all levels with other global environmental and natural resource concerns, including pollution of water, soil and air, health hazards, disaster risk such as flooding and drought, and deforestation. In addition, their combined impacts may be compounded in the future in the absence of integrated mitigation and adaptation measures.
Over the next half century, this process could impede the achievement of internationally agreed development goals (Table 7.1).

**Table 7.1. Potential impacts of climate change on the Millennium Development Goals**

<table>
<thead>
<tr>
<th>Millennium Development Goal</th>
<th>Examples of links with climate change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eradicate extreme poverty and hunger (Goal 1)</strong></td>
<td>Climate change is projected to reduce many poor people’s assets, such as health, access to water, homes and infrastructure. Changes in natural systems and resources, infrastructure and labour productivity are expected to alter the path and rate of economic growth, reducing income opportunities. Climate change is also projected to negatively affect regional food security, in particular in Africa.</td>
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<tr>
<td><strong>Promote gender equality and empower women (Goal 3)</strong></td>
<td>Especially in the developing world, women are disproportionately involved in natural resource-dependent activities such as agriculture – an activity particularly vulnerable to climate change. Women’s traditional roles as primary users and managers of natural resources, caregivers and labourers engaged in unpaid labour (such as subsistence farming) make them dependent on the resources that are most at risk from climate change.</td>
</tr>
<tr>
<td><strong>Health-related goals:</strong></td>
<td>Climate change is expected to produce increases in mortality and illnesses associated with heat waves. It may also increase the prevalence of some vector-borne diseases (such as malaria and dengue fever) and vulnerability to water, food or contagious diseases (such as cholera and dysentery). Children and pregnant women are particularly susceptible to vector- and water-borne diseases and anaemia resulting from malaria is responsible for a quarter of maternal mortality. As a result of climate change, the quantity and quality of drinking water is expected to decline. Malnutrition and food insecurity – a significant source of ill-health among children – are projected to increase as a result of lowered productivity, particularly in sub-Saharan Africa and many other low-latitude areas.</td>
</tr>
<tr>
<td><strong>Ensure environmental sustainability (Goal 7)</strong></td>
<td>Climate change is likely to alter the quality and productivity of natural resources and ecosystems, some of which may be irreversibly damaged. These changes may also decrease biological diversity and compound existing environmental degradation.</td>
</tr>
</tbody>
</table>

Source: Adapted from OECD 2009.
On the other hand, making development more sustainable can enhance the capacity of different societies to mitigate and adapt to the consequences of climate change. Moreover, reducing sensitivities through adaptation and limiting exposure through mitigation can reduce vulnerability to climate change. At present, however, few plans for promoting sustainability have specifically built in means of either adapting to climate change or promoting adaptive capacity. And while changes in development paths can make a major contribution to mitigation, considerable resources will also be needed to overcome the multiple barriers that exist.

The AR4 projected, for example, that increases in various phenomena may affect the health status of millions of people. Indeed, extreme weather events can result in malnutrition, deaths, diseases and injury; growth in concentrations of ground-level ozone in urban areas related to climate change can provoke cardio-respiratory diseases; and the spatial distribution of some infectious diseases can be altered. Though climate change is expected to bring some benefits in temperate areas, overall it is expected that these benefits will be outweighed by the negative health effects of rising temperatures, especially in developing countries. Education, health care, public health initiatives, infrastructure and economic development, which directly shape the health of populations, will be critical.

In terms of crop productivity, at middle- to high latitudes some crops are projected to see their yields increase slightly for local mean temperature increases of up to 1-2°C; yet these gains are expected to decrease with greater rises in temperature. At lower latitudes, however – especially in seasonally dry and tropical regions – increases in temperatures of the same scale are expected to lower crop productivity, exacerbating the risk of hunger. Globally, increases in local average temperature between 1°C and 3°C are expected to boost food production, while rises above this range are projected to have negative effects. Some regions are likely to see a decline in yields as early as 2020. In Africa, climate change and climate variability could reduce yields from rain-fed agriculture by up to 50%. Access to food is also projected to be severely compromised in many African countries. This would further adversely affect food security and aggravate malnutrition.

Another issue to consider is that anthropogenic warming could lead to abrupt or irreversible impacts, depending on the rate and magnitude of climate change. Partial loss of ice sheets on polar land could imply metres of sea level rise, major changes in coastlines and inundation of low-lying areas, with the greatest effects being suffered by river deltas and low-lying islands. In addition, coastal communities and habitats will be increasingly stressed by the interaction of climate change impacts, development and pollution.

Available research also suggests that there can be significant future increases in heavy rainfall in many regions, resulting in greater flood risks and posing challenges to physical infrastructure and water quality. It is likely that by the 2080s, up to 20% of the world’s population will live in areas where river flood potential could increase. This will be matched, in other areas, by increases in the frequency and severity of floods and droughts.

All of this will adversely affect sustainable development.
Adaptation and mitigation: Reducing risks – and damage

Many of the impacts of climate change can be reduced, delayed or avoided through adaptation and mitigation. Applied in isolation, neither of these approaches can avert all climate change impacts, but when used simultaneously they can complement each other and significantly reduce risks. Responding to climate change therefore involves an iterative risk management process that includes both adaptation and mitigation, and takes into account damages, co-benefits, sustainability, equity and attitudes to risk.

A range of barriers limits the implementation and effectiveness of adaptation measures. Adaptive capacity is intimately connected to social and economic development and therefore is unevenly distributed across and within societies. The capacity to adapt is also dynamic and is influenced by a society’s productive base, including natural and man-made capital assets, social networks, entitlements, human capital, institutions, governance, national income, health and technology. Finally, it is affected by multiple climate- and non-climate stresses, as well as by development policy. Even societies with high adaptive capacity remain vulnerable to climate change, variability and extremes.

In the case of climate change mitigation, changes in lifestyle and behaviour patterns can contribute to improvements across all sectors. Over the next two to three decades, mitigation efforts and investments will have a large impact, for instance on opportunities to lower the “stabilisation levels” of the concentration of greenhouse gasses in the atmosphere. For example, policies that provide real or implicit price of carbon could create incentives for producers and consumers to invest in low greenhouse gas products, technologies and processes. Delays in decisions to reduce emissions, however, will significantly constrain opportunities and increase the risks of more severe climate change impacts.

Mitigation options also bring a range of co-benefits, including lower levels of air pollution and associated health benefits, higher levels of energy security, improved levels of employment and greater agricultural production. The AR4 assessed that for a stabilisation level of between 445 to 535 parts per million (ppm) of Carbon dioxide (CO2)-equivalent (which would limit the global temperature increase to between 2°C and 2.8°C), average annual gross domestic product (GDP) growth rates up to 2030 would be reduced by less that 0.12%. This represents a least-cost trajectory towards long-term stabilisation levels and means that the range of GDP reduction in 2030 therefore would be less than 3%. The associated co-benefits such as those related to development, sustainability and equity should also be seen in the context of estimated costs. In fact, the AR4 has estimated that mitigation opportunities with net negative costs have the potential to reduce emissions by about 6 Gt of CO2-equivalent per year in 2030, which is sufficient to offset the projected growth of global emissions in 2030.

Mitigation, therefore, offers a range of benefits that can be achieved at very low and sometimes even negative costs. On the other hand, delays in mitigation action increase costs globally and unfairly in some regions of the world. Perhaps even more important is the fact that delays in action may result in much greater and in all likelihood more severe impacts of climate change than those we have experienced so far. Again, these impacts are likely to be most severe for some of the poorest regions and communities in the world. Ironically, in most cases these communities have hardly contributed to the cumulative emissions of greenhouse gasses in the past.
Creating incentives for change

Decisions about macroeconomic and other non-climate policies can significantly affect emissions, adaptive capacity and vulnerability. A wide variety of policies and instruments are available to help governments create incentives for mitigation action; these include integrating climate policies into wider development policies, regulations and standards; taxes and charges; tradable permits; financial incentives; voluntary agreements; public disclosure of environmental related data, for instance through labeling and certification schemes; and research, development and demonstration (RD&D). The applicability of these measures depends on national circumstances and sector-level contexts. In numerous sectors, climate response options can create synergies and help to avoid conflicts with other dimensions of sustainable development.

It is also crucial to consider the climate change and energy nexus. There is very high confidence that the global average net effect of human activities since 1750 has been one of warming. The AR4 found that global increases in CO₂ concentrations result primarily from fossil fuel use, and that the largest growth in greenhouse gas emissions between 1970 and 2004 has come from energy supply, transport and industry. Conversely, in terms of resource availability, the energy sector itself is vulnerable to climate change as it is, for instance, extremely water-intensive.

In view of the significant impact that climate change is projected to have on energy demand and generation, the widespread lack of energy access across the globe has received inadequate attention both from the global community and from most national governments. Almost 20 years after the Rio Summit, there are still almost a billion and a half people across the world without access to electricity in their homes. Well over two billion people depend on biomass cooking fuels, which are often inferior in quality with serious adverse effects on the health of those who are exposed to their harmful emissions.

As the global population increases, with most of the developing countries facing the challenges of dependence on coal to fuel the development of their energy-intensive economies, energy demand will only continue to rise. Climate change policies that promote energy efficiency and renewable energy can help meet this demand, while being economically beneficial and reducing local pollutant emissions. Efficient supply- and demand-side management programmes can minimise losses from energy transmission and distribution. In addition, diversification of energy sources such as using both imported and domestic fuels can help to improve energy security. Measures such as these are ways of integrating climate change considerations into development policies while reducing the energy intensity of economies.

The AR4 assessed a number of mitigation portfolios for their potential to achieve stabilisation of greenhouse gas concentrations in the atmosphere, concluding that energy conservation and efficiency are among the most attractive options available. Indeed, all of the assessed stabilisation scenarios indicate that 60-80% of the reductions in greenhouse gas emissions would come from measures to control energy supply and use, and industrial processes, with energy efficiency playing a key role in many scenarios. The energy sector’s potential to reduce greenhouse gas emissions is particularly important in poor countries deprived of modern fuels, which would normally follow the path of fossil fuel use for their development (Box 7.1).
Energy efficiency and utilisation of renewable energy offer many other synergies with sustainable development. For example, in the least developed countries, energy substitution can lower mortality and morbidity by reducing indoor air pollution; reduce the workload for women and children; and decrease the unsustainable use of fuel wood and related deforestation.

Box 7.1. Innovating energy: A case in point

Programmes such as Lighting a Billion Lives (LaBL), launched by The Energy and Resources Institute (TERI) in India, hold great promise in helping to address the complex challenges we face. This major innovation contributes to global sustainable development by tackling the triple challenge of climate change, energy and development.

LaBL provides highly efficient and cost-effective solar lanterns to villages lacking electricity through a variety of measures, some of which are market-based. Through the programme, women are trained to act as entrepreneurs, using photovoltaic panels to charge the solar lanterns on their roofs and then renting out the lanterns to the villagers. TERI has extended the programme to over 600 villages in India and numerous others elsewhere in Asia.
Notes

1. Sustainable development was defined by the Brundtland Commission in 1987 as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" [United Nations 1987].

2. Stabilisation is defined in the IPCC AR4 Synthesis Report as: "Keeping constant the atmospheric concentrations of one or more greenhouse gases (e.g. carbon dioxide) or of a CO₂-equivalent basket of greenhouse gases. Stabilisation analyses or scenarios address the stabilisation of the concentration of greenhouse gases in the atmosphere."

3. Carbon Price is defined in the IPCC Working Group 3 AR4 as: "What has to be paid (to some public authority as a tax rate, or on some emission permit exchange) for the emission of 1 tonne of CO₂ into the atmosphere. In the models and this Report, the carbon price is the social cost of avoiding an additional unit of CO₂-equivalent emission. In some models it is represented by the shadow price of an additional unit of CO₂ emitted, in others by the rate of carbon tax, or the price of emission-permit allowances. It has also been used in this Report as a cut-off rate for marginal abatement costs in the assessment of economic mitigation potentials."

4. Net negative costs are defined in the IPCC AR4 Synthesis Report as: "Net Negative Costs (no regrets opportunities) are defined as those options whose benefits such as reduced energy costs and reduced emissions of local/regional pollutants equal or exceed their costs to society, excluding the benefits of avoided climate change."
References


