



Carbon Offsetting: Reducing Emissions While Staying Competitive

There is a consensus between scientists today that CO₂ emissions, produced by humans, cause global warming, which is affecting the entire planet. The Kyoto Protocol, by which most countries committed themselves to keeping the amount of CO₂ in the atmosphere on a steady level in the long-term perspective, was signed in 1997. It was the first important step in lowering greenhouse gas emissions. In 2005, the first major scale emission trading system was implemented in the EU and since then, similar systems have begun in many first world countries.

However, despite these efforts the amount of carbon dioxide produced per year is still increasing, especially in the developing countries. Should a worldwide system of emissions trading be implemented? Could the already existing systems, such as the EU carbon offsetting scheme, be an example? The decreasing price of the renewable sources of energy offers more possibilities for the developing countries to lower their CO₂ emissions as well. And how can we support the usage of renewable sources of energy in those countries?

Sources of CO₂ and other greenhouse gases emissions

Energy Supply (26% of 2004 global greenhouse gas emissions) - The burning of coal, natural gas, and oil for electricity and heat is the largest single source of global greenhouse gas emissions.

Industry (19% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from industry involve primarily fossil fuels burned on-site at facilities for energy. This sector also includes emissions from chemical, metallurgical, and mineral transformation processes not associated with energy consumption. (Note: Emissions from electricity use are excluded and are instead covered in the Energy Supply sector.)

Land Use, Land-Use Change, and Forestry (17% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from this sector include primarily carbon dioxide (CO₂) emissions from deforestation, land

clearing for agriculture, and fires or decay of peat soils. This estimate does not include the CO₂ that ecosystems remove from the atmosphere. The amount of CO₂ that is removed is subject to large uncertainty, although recent estimates indicate that on a global scale, ecosystems on land remove about twice as much CO₂ as is lost by deforestation.

Agriculture (14% of 2004 GHG emissions) - global greenhouse gas emissions) - Greenhouse gas emissions from agriculture mostly come from the management of agricultural soils, livestock, rice production, and biomass burning.

Transportation (13% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from this sector involve primarily fossil fuels burned for road, rail, air, and marine transportation. Almost all (95%) of the world's transportation energy comes from petroleum-based fuels, largely gasoline and diesel.

Commercial and Residential Buildings (8% of 2004 global greenhouse gas emissions) - Greenhouse gas emissions from this sector arise from on-site energy generation and burning fuels for heat in buildings or cooking in homes. (Emissions from electricity use are excluded and are instead covered in the Energy Supply sector.)

Waste and Wastewater (3% of 2004 global greenhouse gas emissions) - The largest source of greenhouse gas emissions in this sector is landfill methane (CH₄), followed by wastewater methane (CH₄) and nitrous oxide (N₂O). Incineration of some waste products that were made with fossil fuels, such as plastics and synthetic textiles, also results in minor emissions of CO₂.

Carbon offsetting

In general terms, an offset is a compensating equivalent. As an activity it can mean to balance, cancel out or neutralize. In the context of addressing climate change concerns, offsetting is an action by companies or individuals to compensate for greenhouse gas emissions, in this case arising from their use of commercial aviation. The offset can be equivalent in part or in whole to the associated emissions, by financing a reduction in emissions elsewhere. Offsets, in either CO₂ or an equivalent offset by another greenhouse gas, can be purchased by countries, companies or individuals to reduce their net carbon emissions. There are many different ways to achieve CO₂ reductions that can be used as offsets, many of

which bring other social, environmental or economic benefits relevant to sustainable development. There are significant differences between offset types. Offsets can either be bought from within the international compliance system under the Kyoto Protocol or in the voluntary market.

Offsets are typically achieved through financial support of projects that reduce the emission of greenhouse gases in the short- or long-term. The most common project type is renewable energy, such as wind farms, biomass energy, or hydroelectric dams. Others include energy efficiency projects, the destruction of industrial pollutants or agricultural byproducts, destruction of landfill methane, and forestry projects. Some of the most popular carbon offset projects from a corporate perspective are energy efficiency and wind turbine projects.

Carbon offsetting has gained some appeal and momentum mainly among consumers in western countries who have become aware and concerned about the potentially negative environmental effects of energy-intensive lifestyles and economies. The Kyoto Protocol has sanctioned offsets as a way for governments and private companies to earn carbon credits that can be traded on a marketplace. The protocol established the Clean Development Mechanism (CDM), which validates and measures projects to ensure they produce authentic benefits and are genuinely "additional" activities that would not otherwise have been undertaken. Organizations that are unable to meet their emissions quota can offset their emissions by buying CDM-approved Certified Emissions Reductions.

Offsets are viewed as an important policy tool to maintain stable economies. One of the hidden dangers of climate change policy is unequal prices of carbon in the economy, which can cause economic collateral damage if production flows to regions or industries that have a lower price of carbon – unless carbon can be purchased from that area, which offsets effectively permit, equalizing the price.

Renewable sources of energy

Renewable energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly from the sun, or from heat generated deep within the earth. Included in the definition is electricity and heat generated from solar, wind, ocean, hydropower, biomass, geothermal resources, and biofuels and hydrogen derived from renewable resources.

Wind power is growing at the rate of 30% annually, with a worldwide installed capacity of 282,482 megawatts (MW) at the end of 2012, and is widely used in Europe, Asia, and the United States. At the end of 2012 the photovoltaic (PV) capacity worldwide was 100,000 MW, and PV power stations are popular in Germany and Italy. Power stations operate in the USA and Spain, and the largest of these is the 354 MW SEGS power plant in the Mojave Desert. The world's largest geothermal power installation is The Geysers in California, with a rated capacity of 750 MW. Brazil has one of the largest renewable energy programs in the world, involving production of ethanol fuel from sugar cane, and ethanol now provides 18% of the country's automotive fuel. Ethanol fuel is also widely available in the USA.

Renewable energy resources and significant opportunities for energy efficiency exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy, energy efficiency and technological diversification of energy sources would result in significant energy security and economic benefits.

Renewable energy replaces conventional fuels in four distinct areas: electricity generation, hot water/space heating, motor fuels, and rural (off-grid) energy services.

Power generation. Renewable energy provides 21.7% of electricity generation worldwide as of 2013. Renewable power generators are spread across many countries, and wind power alone already provides a significant share of electricity in some areas: for example, 14% in the U.S. state of Iowa, 40% in the northern German state of Schleswig-Holstein, and 49% in Denmark. Some countries get most of their power from renewables, including Iceland (100%), Norway (98%), Brazil (86%), Austria (62%), New Zealand (65%), and Sweden (54%).

Heating. Solar hot water makes an important contribution to renewable heat in many countries, most notably in China, which now has 70% of the global total (180 GWth). Most of these systems are installed on multi-family apartment buildings and meet a portion of the hot water needs of an estimated 50–60 million households in China. Worldwide, total installed solar water heating systems meet a portion of the water heating needs of over 70 million households. The use of biomass for heating continues to grow as well. In Sweden, national use of biomass energy has

surpassed that of oil. Direct geothermal for heating is also growing rapidly.

Transport fuels. Renewable biofuels have contributed to a significant decline in oil consumption in the United States since 2006. The 93 billion liters of biofuels produced worldwide in 2009 displaced the equivalent of an estimated 68 billion liters of gasoline, equal to about 5% of world gasoline production.

As of 2011, small solar PV systems provide electricity to a few million households, and micro-hydro configured into mini-grids serves many more. Over 44 million households use biogas made in household-scale digesters for lighting and/or cooking, and more than 166 million households rely on a new generation of more-efficient biomass cook stoves. United Nations' Secretary-General Ban Ki-moon has said that renewable energy has the ability to lift the poorest nations to new levels of prosperity.

At the national level, at least 30 nations around the world already have renewable energy contributing more than 20% of energy supply. National renewable energy markets are projected to continue to grow strongly in the coming decade and beyond, and some 120 countries have various policy targets for longer-term shares of renewable energy, including a 20% target of all electricity generated for the European Union by 2020. Some countries have much higher long-term policy targets of up to 100% renewables. Outside Europe, a diverse group of 20 or more other countries target renewable energy shares in the 2020–2030 time frame that range from 10% to 50%.

Climate change and global warming concerns, coupled with high oil prices, peak oil, and increasing government support, are driving increasing renewable energy legislation, incentives and commercialization. New government spending, regulation and policies helped the industry weather the global financial crisis better than many other sectors. According to a 2011 projection by the International Energy Agency, solar power generators may produce most of the world's electricity within 50 years, reducing the emissions of greenhouse gases that harm the environment.

Renewable energy sources, that derive their energy from the sun, either directly or indirectly, such as hydro and wind, are expected to be capable of supplying humanity energy for almost another 1 billion years, at which

point the predicted increase in heat from the sun is expected to make the surface of the earth too hot for liquid water to exist.

