

Climate Changes and Development

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An indicator of progress in a city or region is the absence of garbage in the streets, the existence of a sewage system, high quality water, and pure air. These have been the characteristics of many regions since the time of the Roman Empire and are normal traits in the cities of industrialized countries.

For this reason, concerns over the quality of the air and water, proper disposal of sewage and garbage, and elimination of toxic residues have dominated the environmental agenda until recently.

Even in developing countries considerable efforts are being made in this direction and the actions of agencies regulating environmental quality have been quite effective (e.g., Brazil's Cetesb).

However, these environmental problems are all *local* in character. This means that municipal and sometimes state authorities are largely responsible for all measures taken and directly or indirectly bear their costs. If these authorities show no zeal or effort, no actions will be implemented. It is vain to expect that the inhabitants of the rich countries will pay to clean up the air in São Paulo or the waters of the Tietê river, because they are not affected by such pollution. At most, one might obtain from them some modest philanthropic aid or loans from the World Bank which must be repaid.

This situation is changing with the emergence of a new type of environmental problem, *global pollution*. The emission of gases such as carbon dioxide (that results from burning coal, oil and gas) is increasing and changing the composition of the atmosphere. These gases, even when emitted in China, for instance, circulate through the entire atmosphere. Therefore, their presence affects not only the Chinese but also the populations of the industrialized countries. The overall effect is similar to a *blanket* that prevents heat from escaping the Earth's surface into space, causing temperatures to rise. This physical phenomenon – known as greenhouse effect (figure 1) – also explains why the inside of an automobile becomes so hot on a sunny day, even in the midst of winter.

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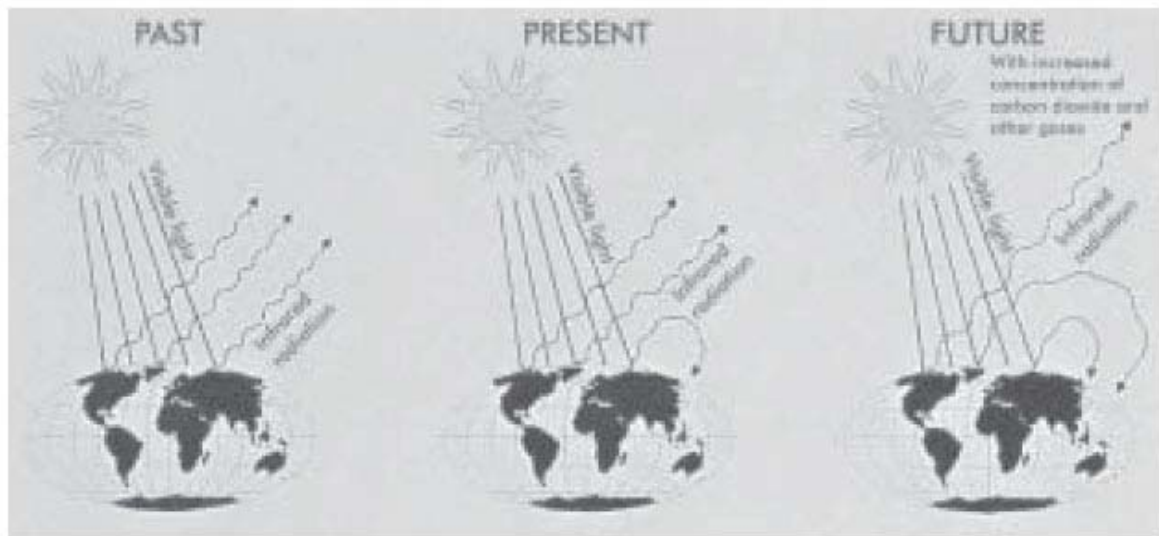


Figure 1. The greenhouse effect.

This is what occurs: the Earth's atmosphere is transparent to solar light and, thus, the radiation coming from the Sun (which makes our planet habitable) reaches the surface without problems, being absorbed and re-emitted as heat. However, it so happens that our atmosphere is a thermal insulator that does not allow all this heat to escape.

The fact that the Earth's atmosphere is a thermal insulator is due to the presence of some impurities and a small percentage of carbon dioxide (around 370 parts per million in volume). This percentage, however, is increasing. One of the main human actions upon the environment is the burning of fossil fuels, which releases carbon dioxide into the atmosphere. Since the onset of the Industrial Revolution, approximately 200 years ago, the quantity of carbon dioxide in the atmosphere has increased 30% – and it is believed it will double over the next 50 years. It is foreseen that this will cause the Earth's temperature to rise at least 1 or 2 degrees centigrade, leading to major changes in the climate of the planet.

Industrial activity in Brazil contributes little to the global emission of carbon dioxide, but the extensive deforestation of the Amazon region – approximately 15000 km² (5 800 sq. mi.) – places our country among the ten largest emitters of this gas.

That is why a “Convention on Climate” was adopted in 1992 in Rio de Janeiro, establishing that industrialized countries should reduce their emission of greenhouse gases, while exempting developing countries from such limitations because their economic growth requires increased consumption of fossil fuels.

The largest emitters are, by far, the industrialized countries, but it will not be easy for them to reduce their emissions. For this reason, the Kyoto Protocol – adopted in 1997

(but yet to be ratified) – created what are known as *flexible mechanisms* to help the industrialized countries reduce their overall emissions to 5% below the 1990 levels.

The flexible mechanisms are the following:

- Emission trading.
- Joint implementation.
- Clean development mechanism (CDM).

Emission trading is a market-based mechanism, whereby overall reduction is achieved by resorting to differentials in the costs to reduce emission in different countries. This makes sense because the gases responsible for the *greenhouse effect* spread uniformly through the atmosphere: the damage caused by their emission and the benefits derived from their reduction are independent of where the gases originate. A reduction of emission in Spain, for instance, may be credited to Germany, where the same reduction would be more costly to attain. These exchanges are authorized only among the industrialized countries.

Joint implementation is another mechanism by which one country may implement in another country a project to reduce emissions and credit this reduction to its own account as long as it bears the costs of the project. An example of joint implementation was an agreement between Mexico and Norway: the latter financed the replacement of incandescent bulbs with more energy efficient ones in Mexico, and the reduction of emissions was credited to Norway's account. The Kyoto Protocol restricts this mechanism to the industrialized countries and exchanges can only be arranged by their governments.

The clean development mechanism is the third mechanism created by the Kyoto Protocol, whereby industrialized countries must reduce their carbon emissions by approximately one billion metric tons per year over the next 10 years. This task will be very difficult to implement through internal measures, especially in the United States. Projects implemented in developing countries, such as Brazil, may be accepted as one way of complying with the Protocol guidelines, as long as they lead to reduction in carbon emissions. The difference between the clean development mechanism and joint implementation is that, in addition to public agencies, private companies may also exchange emissions.

There is no better example of the kind of project proposed by the clean development mechanism than the substitution of sugarcane ethanol for gasoline, as is widely done in Brazil. Ethanol is a renewable fuel because the carbon dioxide that is

released from burning it in internal combustion engines is reabsorbed by the next crop of sugarcane.

Brazil would consume twice as much gasoline if the country's Ethanol Program did not exist. With a current production of approximately 12 billion liters (75 million barrels) of ethanol per year, Brazil manages to emit 10 million metric tons *less* carbon dioxide than it might otherwise. This reduction corresponds to 15% of all carbon emissions in the country.

It is believed that these reductions are worth at least US\$ 20 per metric ton of carbon dioxide not emitted. Thus, Brazil's Ethanol Program ought to generate US\$ 200 million a year, with no other additional effort other than a good diplomatic negotiation.

The Ethanol Program example is only one of the many possibilities to reduce carbon emissions. Others have been identified, including the reforestation of degraded forest areas, offsetting even the deforestation of the Amazon region, which the Brazilian government has been unable to control.

It might be argued that there are more pressing environmental problems to be solved, such as the quality of the air in large cities such as São Paulo or the pollution of the Guanabara Bay in Rio de Janeiro, among many others. These problems, however, must be solved by local authorities without much aid from abroad, except for loans from international banks, for which there is a great demand.

As mentioned, both public and private organizations – i.e., government agencies and private companies – may resort to the clean development mechanism of the Kyoto Protocol.

Not every project to reduce the emission of greenhouse gases is eligible in the clean development mechanism, because the Kyoto Protocol established certain overall criteria that must be complied with, namely:

- Projects must lead to certifiable and measurable reduction in greenhouse gases.
- Projects must contribute to sustainable development.

Furthermore, some projects have greater potential to reduce emission than others.

The table in the next page shows an interesting analysis of the potential of several projects to qualify for and be accepted by the clean development mechanism.

In Brazil, a preliminary study to identify projects that might qualify for the clean development mechanism was undertaken by a group of experts at the University of São Paulo in cooperation with the University of California in Berkeley.

Two categories of projects were identified:

- Energy (11).
- Carbon sequestering (4).

In the energy category, the distribution of projects was as follows:

- Energy efficiency (2).
- Renewable energy (8).
- Co-generation (1).

In the carbon sequestering category, the projects involved:

- Permanent reforestation (1).
- Plantations of biomass for other uses (3).

In order to accelerate this process, the BNDES (National Bank for Economic and Social Development) could purchase certificates of emission reduction, so that domestic companies could carry out projects without having to wait for international approval. These certificates might be later sold abroad, very likely at a high premium.

When the Kyoto Protocol is finally ratified, Brazil will be a strong candidate to receive an appreciable portion of the resources that will be made available for the industrialized countries to attain their reduction goals. It is estimated that we may obtain up to US\$ 3 billion each year. These resources will be related with investments in clean technologies and will naturally become an instrument to modernize the Brazilian economy.

Comparison of the potential of various projects to reduce greenhouse gases by resorting to clean development mechanisms			
Projects	Real, measurable and certifiable reductions	Relevance for sustainable development	Potential for reduction
<i>Energy sector</i>			
– Replacing fossil fuels with clean fuels	H	H	H
– More efficient use of fossil fuels	H	H	H
– Recapturing the emission of fossil fuels	H	H	H
<i>Industrial processes</i>			
– Increased production efficiency	H	H	H
– Using alternative materials and processes	H	H	M
<i>Agriculture</i>			
– Improved animal feeding	L	M	L
– Improved management of vegetable residues	L	M	L
– Changes in rice cultivation methods	L	L	H-H
– Replacing nitrogen-based fertilizers	L	H	L
– Eliminating open-air burning of agricultural residues	L	M	L
<i>Changes in forest management and in soil usage</i>			
– Protecting and conserving forests	L	H	M
– Improved efficiency in forest management	L	M	M
– Reforestation and regeneration of forests	L	M	M-H
– Improved agricultural/forestry practices	L	M	M
<i>Agricultural residues</i>			
– Reducing and recycling residues	H	H	L-M
– Capturing the methane of residues	H	M	L-M
– Eliminating open-air burning of residues	H	M	L-M

H = High probability of complying with the criteria of the clean development mechanism.

M = Medium probability of complying with the criteria of the clean development mechanism.

L = Low probability of complying with the criteria of the clean development mechanism.