

## Atmosphere

Caribbean countries are mainly small islands with limited mineral resources and small populations. This combination limits industrial development, energy use and the size of urban centres – all major sources of air pollution. Exceptions are mineral extraction in the Dominican Republic (ferromanganese, gold, silver, nickel and gypsum); Jamaica (bauxite, limestone and gypsum); Trinidad and Tobago (oil and gas); and Cuba (nickel, copper, limestone, oil and gas, among others).

Air quality is not generally the highest environmental concern in the Caribbean but increased urban growth and industrialization particularly in the

Dominican Republic, Cuba, Jamaica and Trinidad will demand increased attention be paid to air quality (Figure 1.8). Infrastructure for monitoring is lacking, as are regulations, although plans are in place to remedy this in the three countries with the most serious air pollution concerns. Failure to curb emissions from mobile sources in urban areas (including the elimination of lead from gasoline) and also from industrial sources will add to health-related costs as adverse health effects from air pollution take their toll. Measures such as the elimination of leaded gasoline, introduction of motor vehicle emission standards and inspection and maintenance programmes, and industrial emission control programmes are required in these countries.

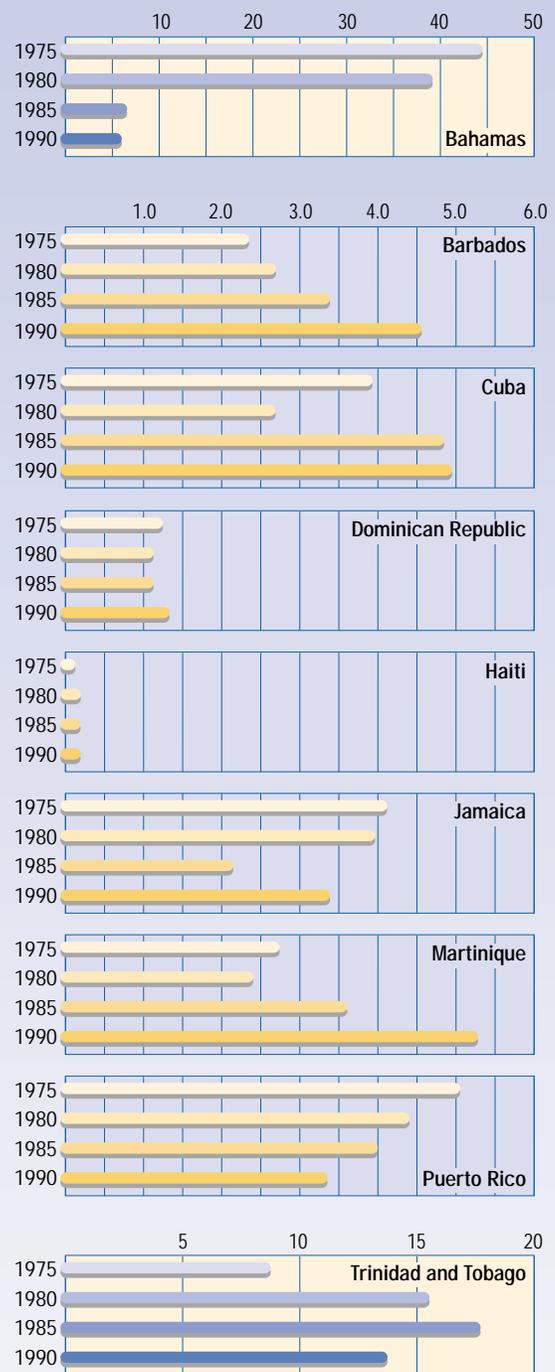
The following are the main contributors to poor air quality in the Caribbean:

- inadequate vehicle emissions controls, exacerbated by a recent influx of foreign used vehicles with inadequate emission devices;
- industrial activity;
- inefficient energy use;
- high density settlements and urban areas;
- pesticide residues from spraying in rural agricultural communities, and
- particulates from soil erosion and sugar cane burning.

Motor vehicles are a major contributor to air pollutant emissions in the region, and the number of vehicles is likely to increase with rising incomes. The contribution of motor vehicle emissions to air pollution in urban areas is evident in Jamaica, where the fleet has doubled in the past five years (PJC 1998) and where topographic features exacerbate the problem, and in Port of Spain, Trinidad, where there has been an increase of roughly 18 per cent in the vehicle fleet since 1993. The large populations in Santo Domingo and Havana, the continued use of leaded gasoline, and an apparently older motor vehicle fleet can be expected to result in higher than desired airborne emissions from mobile sources in these Caribbean cities.

Since the mid-1990s the mining industry (for nickel, gold and silver) in the Dominican Republic has increased production in response to world prices and new technology. Emissions from mining operations are due primarily to fuel combustion for electrical power generation and process energy requirements. Environmental management in the mining sector is

Figure 1.8: CO<sub>2</sub> emissions per capita (in tonnes) for selected countries



Source: Carbon Dioxide Information Analysis Center (CDIAC), Environmental Sciences Division, Oak Ridge National Laboratory, '1995 Estimates of CO<sub>2</sub> Emissions from Fossil Fuel Burning and Cement Manufacturing based on the United Nations Energy Statistics and the US Geological Survey Cement Manufacturing Data'.

Note: Based on petroleum consumption, these data are driven largely by the operation of oil refineries in the region: note the precipitous decline in Bahamas emissions between 1980 and 1985, corresponding to the closure of the distillation refineries on Grand Bahama Island.

limited to ongoing implementation of ISO 14000-based environmental management systems. There is rudimentary ambient air quality monitoring (sulphation plates) in the vicinity of the nickel facility, but there are no national ambient air quality standards.

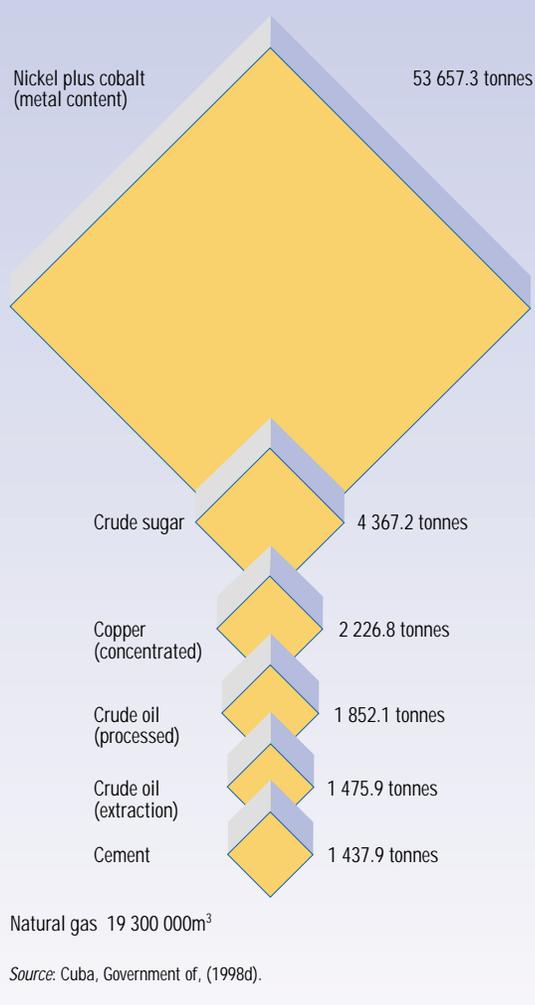
Cuba's industrial sector shows a relatively high development of those industries most often associated with air pollution. Figure 1.9 lists several of the main indicators of such activity.

Jamaica's industrial air pollution derives mainly from the country's mineral industries (bauxite–alumina, lime, gypsum, cement and glass manufacture); petroleum refining; sulphuric acid manufacture and oil-fired electricity generation. The bauxite–alumina industry started in the 1950s and five plants were built by the 1960s. Expansions of the bauxite industrial plant in the late 1990s and further planned plant expansions and construction of a new plant will increase production over the next decade. The main industrial airborne emissions in Jamaica are sulphur and nitrogen oxides from fuel combustion and particulate matter from kiln operations and from mining and shipping operations. In advance of air quality regulations, which are currently being developed, several companies are at varying stages of implementing ISO14000-based environmental management systems and some facilities have been conducting ambient air quality monitoring.

Electrical generation in the larger islands is based on burning heavy fuel oil, with the exception of Trinidad, which uses natural gas, and the OECS, which relies mainly on diesel. Generating capacity has remained relatively flat in the past decade in keeping with the general lack of industrial growth and significant improvements in the operating efficiency of major energy systems. The electricity-generating sector is a significant source of airborne emissions in most Caribbean countries. There are planned increases in electricity generating capacity in most countries of the region to meet increased demand. Cuba, with 9 989.6 gigawatt hours in 1980 grew to 13 235.8 GWh in 1996 (Cuba, Government of, 1998d).

Ambient air quality monitoring in the Caribbean has been limited. The US dependencies have well-established ambient air monitoring programmes for particulate matter, sulphur dioxide and carbon monoxide, and recently also for nitrogen oxides and ozone in Puerto Rico and for particulate matter and sulphur dioxide in the US Virgin Islands. Cuba also has its own national programme. Routine monitoring in other islands is

Figure 1.9: Major industrial outputs in Cuba (in tonnes, and million m<sup>3</sup> for natural gas)



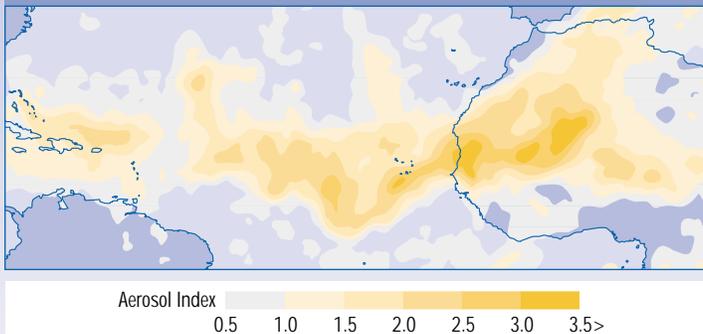
limited to stations near industrial sources such as:

- some alumina plants and power stations in Jamaica;
- some industrial facilities in the Dominican Republic, and
- some industrial facilities in Trinidad.

There is also periodic monitoring in support of environmental impact assessments (EIAs) in Jamaica and Trinidad.

Air pollutant emission inventories have been compiled only in Puerto Rico and the US Virgin Islands, while preliminary compilations of emissions have been made in Trinidad. Improvement to the process of emissions monitoring and control is receiving support through the implementation of GEF-funded UN Framework Convention on Climate Change National

Figure 1.10: Aerosol plume stretching from the Sahel to the Caribbean (based on a TOMS satellite image, taken on 1 July 1998)



On four successive days in 1998, a United States National Oceanic and Atmospheric Administration analysis of high-altitude aerosols captured a sequence of images showing dust from the Sahara being lofted across the southern North Atlantic to arrive in the Caribbean and beyond. The presence of North African sand in Caribbean sediments has been noted since the 1880s, and in recent years it has been suggested as a possible mechanism for the direct dispersal of pesticide pollution, fertilization and possibly disease from Africa to the Caribbean.

Communications Strategies. Eleven countries to date have accessed approximately US\$2.2 million.

Per-capita energy use in Caribbean countries is low in comparison to that in developed countries, and the low population also means low emissions of greenhouse gases. Further industrial development will lead to increased energy use and emissions unless extraordinary efforts are made to employ the best available emissions control technologies or non-emitting renewable energy technologies. Further implementation of energy efficiency programmes and development of renewable energy sources will slow the rate at which Caribbean countries contribute to toxic and greenhouse gas emissions.

On a regional scale, there is also evidence of transcontinental dispersal of particulates from Africa to the Caribbean, which can impair visibility and result in substantial deposits of dust in some seasons (Figure 1.10). In 1997, large numbers of locusts rained down on the Eastern Caribbean, provoking much comment but no other known effect.