

# Particulates, Energy Consumption, & Affluence

by Ross McKittrick

Many Canadians are concerned about the quality of the air they breathe, both indoors and out. Certainly everyone should celebrate the dramatic improvements in air quality that have happened since the 1970s. However, as important as clean air is, recent major power failures in North America provide striking reminders of just how valuable is our supply of stable, uninterrupted electricity. Unfortunately, the reliability of our electricity supply, at least in Ontario, seems uncertain at best: the grid already operates at full capacity, the population is growing, and the province is actively courting new businesses that are major power users, such as auto plants. On the supply side, a major nuclear plant remains mothballed, natural gas supplies are dwindling, and suitable sites for hydro dams have all been used up.

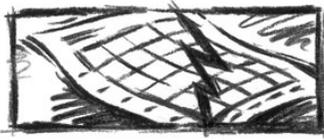
Fortunately we still have coal to rely on... or do we? Ontario's new Liberal

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government has committed itself to shutting down the province's coal-fired power plants—fully one-third of Ontario's generating capacity—by 2007. Anything that risks major power failures or chronic supply problems poses an obvious threat to public welfare and economic well-being, so the Ontario government must consider these coal-fired plants a big problem. As, indeed, it does. However, the problem the government has in mind is actually microscopically small. It is called PM10, which stands for particulate matter smaller than 10 microns in diameter. This is the size of the smoke, soot, and other aerosol particles that some claim are a pressing threat to human health. Of course direct smoke inhalation can cause serious discomfort—even suffocation. But the PM10 issue concerns whether the nearly imperceptible background levels of particulates in ordinary “fresh” air is a problem. As with many environmental issues, passions run high and the genuine uncertainties of the science keep getting swept aside in the search for quick fixes and heroic gestures.

As a first step in checking perceptions against the data, try the following quiz.

1. Total industrial and residential PM10 emissions in the United States were 18 percent lower in 1998 than they were in 1940. *True or False?*
2. In the US, the coal burned by all industry and electricity-generating plants generates less PM10 emissions than residential wood-burning fireplaces. *True or False?*
3. Natural sources of PM10 (e.g. fugitive dust, forest fires, erosion) comprise over 60 percent of total emissions in the US. *True or False?*
4. PM10 concentrations as recorded by a monitoring station at the corner of Bay and Wellesley in downtown Toronto averaged about 193 micrograms per cubic meter from 1962 to 1970. The readings at the same location between 1991 and 1996 averaged about half that: 92 micrograms per cubic meter. *True or False?*
5. A UK government medical advisory committee recently concluded, based on a major survey of epidemiological evidence, that air pollution is unlikely to be a cause of asthma. *True or False?*
6. The above-mentioned UK government committee concluded that if lifelong exposure to PM10 were cut in half, the health benefit would be approximately equivalent to extending the average lifespan by only 1 to 2 years. *True or False?*
7. A survey by the government of Pakistan found that two-thirds of the houses in rural areas burn animal dung indoors as an energy source for cooking food. *True or False?*
8. The same survey found that most homes in rural Pakistan have no windows. *True or False?*



9. PM10 levels in most Canadian cities average between 40 and 90 micrograms per cubic meter. A World Bank survey of air quality in cities around the world showed that in cities where annual average income is less than US\$3,000, PM10 levels are accordingly much lower. *True or False?*
10. To replace all US electricity generation with solar power would require about 26,000 km<sup>2</sup> of photovoltaic cells. This would almost equal the total area of all photovoltaic cells manufactured around the world from 1982 to 1998. *True or False?*

Here are the answers.

1. False—they were 75 percent lower. According to the US Environmental Protection Agency (EPA), in 1940 total industrial and residential US PM10 emissions were just under 16 million short tons. As of 1998 they had fallen 75 percent to 3,843,000 tons.
2. True—12 percent less. According to the US EPA, in 1998 total PM10 emissions from industrial and power sector coal consumption were 362,000 short tons; from residential wood-burning fireplaces they were 411,000 short tons.
3. True—62 percent. Total PM10 emissions from all human activity was just over 13,000,000 short tons, while that from natural sources was 21,655,000 short tons. (For answers 1 to 3 see <http://www.epa.gov/ttn/chief/trends/index.html>).
4. False—they averaged about one-third the amount (65 mg/m<sup>3</sup>). The graph looks like figure 1, smoothed using 6 month moving averages)
5. True.
6. False—1 to 11 months. You can find the web site of the UK Committee on the Medical Effects of Air Pollution (COMEAP) at <http://www.advisorybodies.doh.gov.uk/comeap/index.htm>. They concluded that “For the most part, people will not notice or suffer from any serious or lasting ill effects from levels of pollution that are commonly experienced in the UK, even when levels are described as ‘high’ or ‘very high’ according to the current criteria.”<sup>1</sup> And, “perhaps surprisingly, long term exposure to air pollution is unlikely to be a cause of the increased number of people now suffering from asthma in the UK.”
7. True—67 percent.

**Figure 1: Measurements of Particulate Matter at the Bay and Wellesley Station, Toronto, Ontario**



Source: Ontario Ministry of the Environment.

8. True—61 percent. These numbers were reported in Chaudhuri and Pfaff (2002). They were based on the *Pakistan Integrated Household Survey*, a poll of 4,650 households in Pakistan.
9. False—they are much higher, averaging between 90 and 400 micrograms per cubic meter. The survey results are from the 1998 World Development Indicators Report, published by the World Bank (see <http://www.worldbank.org/wdi>).
10. False—not even close. The total volume of photovoltaic cells manufactured from 1982 to 1998 would cover an area of about 3 km<sup>2</sup> (Hoffert *et al.*, 2002).

How did you do? Despite perceptions to the contrary, pollution (particulates especially) is primarily a problem in developing countries. In North America and Europe, emissions are relatively low and generally declining, and there is good evidence that particulates are not implicated in asthma or human mortality generally (also see Koop and Tole, 2004). Renewable energy sources, meanwhile, are either more polluting (in the case of wood) or of minuscule use (in the case of wind and solar) compared to the scale of consumption in industrialized countries. Of course if the real objective behind promoting wind and solar power is to reduce the scale of consumption in industrialized countries down to Third World levels, so be it, but I, for one, prefer affluence.

A particularly bad source of “renewable” energy is the burning of wood, dung, and other organic material for cooking and heating in poorly-ventilated homes in the Third World. The creation of this energy fills the hut with sooty, parasite-laden smoke, causing acute breathing problems. What is

the solution to the real bad air problem in countries like Pakistan? It is to build an electricity grid so people there can do what we in Canada take for granted: plug in simple, smokeless appliances for cooking and heating, rather than making indoor fires. Of course, a grid needs power plants, which by and large ought to burn coal. Coal is cheap, abundant, safe, transportable, and available on every continent. Efficient wet scrubbers (Canada is a world-leader in building them) can be put on the smokestack to control particulates and other pollutants.

Better a dozen smokestacks in a remote area with or without scrubbers, providing clean, uninterrupted power to a million houses, factories, and shops, than a million smouldering dung fires choking villagers trapped in subsistence agriculture because without reliable power there are no prospects for capital-intensive industry to develop. It is, quite frankly, deplorable that mainstream environmentalists have lately been lobbying the World Bank to boycott power-generating projects in the Third World that involve coal plants,<sup>2</sup> and have been working to convince

poor villages in Third World countries to take costly gambles on expensive, unreliable “green” power instead of cheap, reliable conventional fuels.<sup>3</sup> Not only do such campaigns get in the way of much-needed *economic* progress, but they prevent needed improvements in the *environmental* conditions people actually experience, namely, inside their little homes. Fortunately there is no sign the World Bank is going to take this disastrous advice. It knows its mandate is to move people from poverty to affluence. The situation is not as clear in Ontario.

## Notes

<sup>1</sup> The COMEAP report is no longer directly available, but it is still available in an archived form at <http://web.archive.org/web/20030622152046/http://www.doh.gov.uk/comeap/statementsreports/healtheffects.htm>.

<sup>2</sup> For example, Greenpeace: <http://archive.greenpeace.org/ozone/wbfacts/fact3.html>; the New Internationalist: <http://www.newint.org/issue319/smoke.htm>.

<sup>3</sup> See, for example, <http://www.tompaine.com/feature2.cfm/ID/2951>; [http://www.greenpeacesoutheastasia.org/en/pr/pr\\_ce/pr\\_ce\\_20020830.html](http://www.greenpeacesoutheastasia.org/en/pr/pr_ce/pr_ce_20020830.html)

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