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Review: Air Pollution and Global Warming: History, Science, and Solutions, 2nd ed.
By Mark Z. Jacobson

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Jacobson, Mark Z. *Air Pollution and Global Warming: History, Science, and Solutions*, 2nd edition. New York and Cambridge: Cambridge University Press, 2012. xviii+375 pp. ISBN: 9781107691155, US \$85.00, paperback; e-book also available.

When so many academics and scientists highlight the risks and hazards related to pollution, Professor Mark Z. Jacobson is among the few scholars to propose solutions. His timely book, *Air Pollution and Global Warming: History, Science, and Solutions* (second edition), is an encouraging overview of environmental issues linked with air pollution. Most of this multidisciplinary book presents and discusses various dimensions of atmosphere: first, the fundamentals (“the basics and discovery of Atmospheric Chemicals”) plus the evolution and composition of the Earth’s atmosphere in the three opening chapters; then the specific problems such as urban air pollution (with an historical background going back to the Middle Ages, p. 73). Other chapters concentrate on smog (8), indoor air pollution (9), acid deposition (10), the Global Stratospheric Ozone Reduction (11), the Greenhouse effect and Global Warming (12).

Some of the most interesting pages, however, are to be found in the last chapter, and are dedicated to an energy solution to air pollution and global warming. After examining many possible avenues for energy production (from nuclear energy and coal (even with Carbon capture) to natural gas and biofuels), Jacobson presents all the new technologies enabling renewable energy (p. 317). Jacobson’s list of newer energy options includes a variety of renewable resources centred on wind, water, and sunlight (WWS) (p. 309). Each renewable technology is explained enthusiastically with strengths and limitations: wind, wave, geothermal, hydroelectric, tidal turbines, solar and concentrated solar power (pp. 309-339). Therefore, we get the actual equations of the annual energy output from a single wind turbine (p. 325) or elsewhere a comparative table of “Power available in wind, water, and sunlight energy resources worldwide if energy were used in conversion devices” (p. 324).

Jacobson believes a profound transformation in how we exploit energy from natural resources is necessary and possible within the next generation: “It involves the conversion, by 2030 to 2050, of all sectors of the world’s energy infrastructure, including the electric power, transportation, industrial, and heating/cooling sectors to energy derived solely from WWS” (p. 309). This thirteenth chapter is so optimistic it should be much longer or serve as the embryo of another book.

One of the strongest points of this engaged book is the detailed review of the existing energy technologies that are widely used in most industrialised countries and this includes the consumption of energy from nuclear, coal-related, natural gas and other hazardous processes. Overall, the tone is critical but balanced, bringing facts and numbers added to already-known arguments. For example, referring to the Fukushima Daichi nuclear disaster from 2011 in Japan, Jacobson writes that “even if the risks of catastrophe from nuclear power are small, they are not zero”, adding that “catastrophic risks with wind and solar power are zero” (p. 312). Elsewhere, Jacobson reaffirms the relevance of hydroelectricity, especially for “providing peaking power” (p. 320).

Perhaps one word would best describe Jacobson's book and this term is "precision". Countless figures, photographs, but also equations, cross-references and graphs complete the text or illustrate the many chemical formulas provided. For example, a detailed table provides the list of all gases and aerosol particle components which are effective in air pollution (see pp. 56-57).

Jacobson's rigorous book brings a refreshing, optimistic perspective which contrasts with so many of the already available publications in this field. Its grounds are clearly rooted in science, data, statistics, existing reports and new initiatives. For all these reasons, the book *Air Pollution and Global Warming: History, Science, and Solutions* delivers all the promises announced in its title; it remains an important and exceptional book in this vast array of scientific documentation related to environmental science.

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