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Sustainable Fossil Fuels: The Unusual Suspect in the Quest for Clean and Enduring Energy

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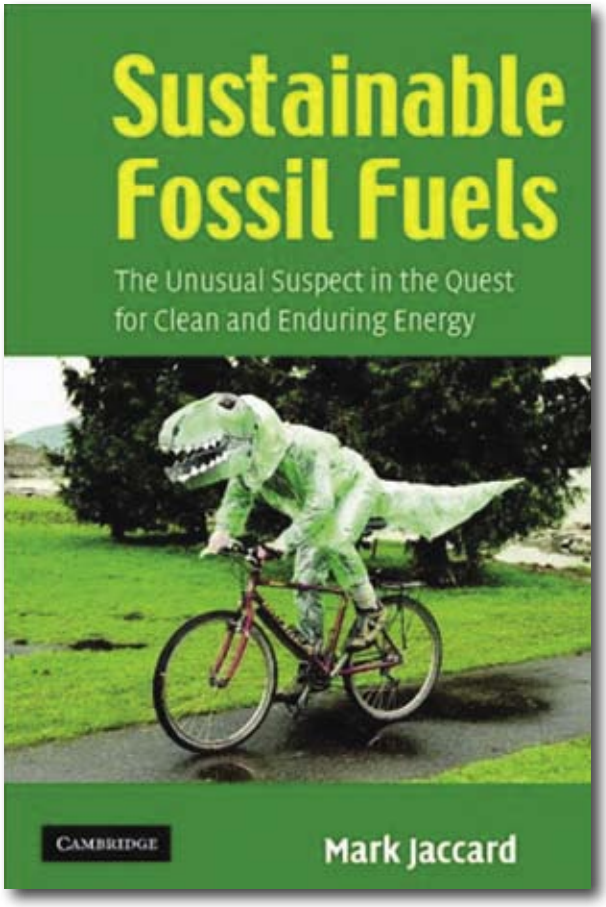


JACCARD Mark . **Sustainable Fossil Fuels, The Unusual Suspect in the Quest for Clean and Enduring Energy.** Simon Fraser University, British Columbia,
Page extent: 398 pages, 9 tables
Size: 228 x 152 mm
Weight: 0.756 kg

This provocative and suggestive book offers a very broad and well-documented view of the main energy challenges that humanity will have to cope with in the 21st century. The provocative view of the book is expressed by its title, which mixes a non-renewable energy source (fossil fuels) with sustainability. The paradox, in reality, allows the author to affirm that humanity can face the main energy and environmental challenges of the current century using fossil fuels but in a sustainable manner. As the environmental challenge to the sustainability of fossil fuels is mainly connected to green-house gases (GHG) emissions, the sustainability of fossil fuels will be guaranteed by the capture and storage of the emissions of GHG during primary energy conversion to secondary energy.

Jaccard's book offers a very well-documented and research-based view of the main contemporary

energy challenges. The book is written in a clear style that non-specialists can easily understand. It is also a very good introduction to energy analysis. The author demonstrates that he dominates today's main energy questions related to energy options.

The book makes a pragmatic analysis of the main energy challenges that humanity will face in the present century until 2100. There is a world consensus that GHG emissions have to be curbed if humanity wants establish a sustainable development path. Most of these emissions are related to fossil fuel energy consumption. In the other hand, the expected growth of the world economy is driving energy consumption forward. The book systematically analyses what the main options are to the great technological challenge of humanity.

The world economy is expected growth 7 times, from US$ 32 trillion in 2000 to 230 trillion (2000 US$) in 2100. Energy consumption due to intensive use of energy-efficient technologies will only increase 3 times. The question is if renewable and nuclear energy sources are able to deal with this challenge. The book tries to demonstrate the thesis that in this time frame, new renewable sources will not be able to cope with the challenge of substituting the greater part of fossil fuel consumption, at least at an acceptable social and economic cost. The book predicts dramatic increases in the primary production of renewable energy such as modern biomass, wind, photovoltaic and solar, ocean, etc. Despite this, these increases in renewable energy supply will not meet the needs of the world energy requirements. Nuclear energy in spite of important increases will not substitute fossil fuel in electricity generation.

The only primary energy source able to meet this challenge will be fossil fuels. Their reserves and resources are still quite huge in spite of the 240 years of industrial development. Oil, especially non-conventional, natural gas and coal are available in a great amount, for the duration of several hundred years of energy consumption even with the expected growth of the present century. Thus the first part of the criticism against fossil that considers them as non-renewable energy is not well-settled. This is only true at a scale of centuries but not the immediate problem of the current century.

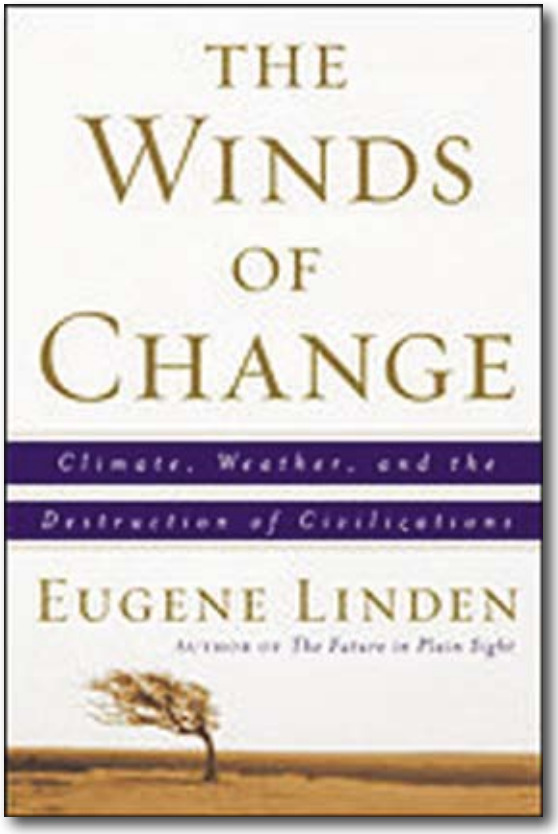
The central problem of the present period is raised by fossil fuel GHG emissions that could reach 30 GT of CO_2 at the end of the century compared to 6.5 GT in 2002, counting only the carbon inside CO_2. The increase in energy consumption of present technologies will boost CO_2 concentration in the atmosphere to 650 parts per million by 2100. At this level, Earth's temperature will increase dramatically, making the current development path of the humanity unsustainable. The only solution to this issue is to capture and store CO_2 emissions. This solution is technically viable. The author estimates that carbon capture and storage will increase cost by 2-3 cents per kilowatt generated with coal. The total cost of electricity generation using an integrated gasification combined cycle unit with coal would be in the range of 6-7 cents/KWh. This makes clean fossil fuel electricity the cheapest alternative among the others available, such as hydro, nuclear, biomass, wind and solar photo*voltaic. Hydrogen, the other promisin*g option of secondary energy, will also be more cheaply manufactured directly from a coal gasification plant or natural gas steam-methane reforming unit than from the alternatives such as hydrolysis or nuclear electrolysis or biomass gasification.

Jacquard's book is important because it addresses important issues concerning the main energy paths at the global level, and in a large time frame. This kind of global reflection made with a mastery of the issues concerning energy paths is absolutely necessary to deal with the great complexity of present challenges. At the level of energy requirements and the needs of GHG emission mitigation necessary for a sustainable course for humanity, there will be no single solution. Fossil fuel will remain the major source of primary energy because its consumption could be improved using end of pipe cleaning technologies.

The major criticism that could be made of this thesis is that the capture and sequestration of CO_2 at the scale required with a 90% increase in fossil fuel supply from the present levels is not a straightforward solution. The uncertainties concerning the effectiveness of these technologies are surely underestimated by the author, while the book overestimates the difficulties of competing technologies in mitigating GHG emissions. However, Jacquard's book has the central merit to make a compelling incursion into the global debate energy and environmental issues.

André Tosi Furtado

The Winds of Change: Climate, Weather and the Destruction of Civilizations



LINDEN, E. **The Winds of Change: Climate, Weather and the Destruction of Civilizations**. New York: Simon & Schuster, 2006, 302p.

The book is a pioneering effort that associates climate change and history. Its central point is that the success and demise of civilizations has relied upon the climate.

The book follows a cause-and-effect investigative style, associating both prosperity with good weather and collapse with climate changes, especially abrupt changes. A number of examples which consistently support the author's thesis are given, covering arctic Greenland, the Fertile Crescent, the lost cities of the Mayans in Mesoamerica, Europe during the Little Ice Age, and the rainforests of Central Africa, among others. But the author also discusses the role played by modern society in recent climate disruptions and how climate change could impact the modern world, analyzing recent examples of extreme weather and natural disasters, such as hurricane Katrina, which hit the south of the United States in August 2005.

The Winds of Change is designed as a general textbook, divided in six parts and 20 chapters, each one starting with a figure to illustrate the over-arching idea contained within the chapter. However, in many parts of the book Linden relies upon the theories of some renowned scientists, such as Wallace Broecker, of Lamont-Doherty, Jerry McMannus, of the Woods Hole Oceanographic Institution, Paul Epstein, associate director of Harvard University's Center for Health and the Global Environment, William Ruddiman of the University of Virginia, Tim Barnett of Scripps Institution of Oceanography, Daniel Schrag of Harvard University, among many others. In addition, the author describes his travels with other scientists in order to write about how changing climate would already be affecting the world. One example was his trip to Antarctica, an invitation from The National Science Foundation that brought together scientists, journalists, and writers - Eugene Linden himself is a journalist and writer.

Some political effects on the science of climate change, such as Russia's ratification of the Kyoto Treaty and aspects such as why warnings about the dangers of climate change have thus far gone unheeded also appear within the book.

The book can be seen as a genuine contribution to both past history and future society, and it succeeds in reflecting the diversity of the subject, as well as in stimulating further reading on this fascinating matter.