

Researcher is optimistic about meeting 'Grand Challenge' of global prosperity

October 24 2013

With ecological viability threatened, world resources draining, population burgeoning and despair running rampant, the end is nigh.

Or not, says Lawrence M. Cathles, Cornell professor of earth and atmospheric sciences.

"In spite of our apparent environmental problems, we stand a remarkable chance of achieving solutions," he says. "Societies all around the world are living longer. We have more access to food, clean water and [energy](#) ... and we've never been more healthy."

Cathles outlines his optimism about the world's prospects for sustaining the human population in an environmentally responsible way in his article, "Future Rx: Optimism, Preparation, Acceptance of Risk," in a special publication of *The Journal of the Geological Society*, released Oct. 24.

"If we have the courage to do big things, all of humanity has a fine future," says Cathles in the article, which addresses food sustainability, natural resources and energy levels, and what he calls the "Grand Challenge" of the next century for everyone to achieve a European standard of living. In his paper, Cathles proposes a path to achieving that standard.

Today the world hosts 7.13 billion people, and Cathles says that while humans are living longer, the world population will peak at 10.5 billion

about 100 years from now. The most essential resource is energy, and today most of the world uses less than 2 kilowatts of power per person (for heat, lighting, transportation and manufacturing), while those at the European standard of living (the average French or German citizen, for example) use 3.5 times more. The world currently consumes energy at the rate of 15 trillion watts (15 terawatts), with 86 percent from hydrocarbon sources.

Meeting the Grand Challenge would require energy production of 50 terawatts today and 75 terawatts 100 years from now, ideally all from zero carbon energy sources, says Cathles. Growing from 15 to 75 terawatts over a century requires a growth rate of 1.6 percent per year, which is modest, he says, compared with the U.S. growth rate of 2.6 percent over the past 50 years and China's recent 12 percent [growth rate](#) and their planned growth over the next 10 years of 7 percent annually.

The lion's share of the power expansion could be met by wind, solar power produced in deserts or nuclear; but by far the least environmentally intrusive, feasible and realistic option is nuclear, he says. The oceans have enough dissolved uranium to sustain 10.5 billion people at a European standard for more than 100 centuries, and the extraction footprint would be tiny.

"Everything is possible with energy, nothing is possible without it," says Cathles.

The paper also examines whether the supplies of other materials are adequate to sustain 10.5 billion people for hundreds of centuries – and Cathles sees no major sustainability problems.

Cathles also argues that natural gas provides a natural transition from dependence on other fossil fuels to carbon-free nuclear and other [energy sources](#), although he cautions that the transition cannot be stretched out

too much due to oil and gas resource limitations. Our most threatened resource may be soil, he says, but with enough energy this will not be a fundamental barrier to prosperity.

Embracing the challenge of a European standard a century from now is "the most constructive goal imaginable," he says, and one that is necessary for humans to have a future and, more importantly, a common future.

Says Cathles: "We have plenty of resources; we do not need to fight over them."

Provided by Cornell University

Citation: Researcher is optimistic about meeting 'Grand Challenge' of global prosperity (2013, October 24) retrieved 27 April 2024 from <https://phys.org/news/2013-10-optimistic-grand-global-prosperity.html>

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