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ON THE COVER: The cover of *Environmental Science & Technology*'s annual issue recognizing Earth Day features a striking image of Earth's western hemisphere taken by the Sunomi NPP Earth-observing satellite. Credit: NASA/NOAA/GSFC/Suomi NPP/VIIRS/Norman Kuring

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Response to Timoney Critique of Royal Society of Canada Expert Panel on Oil Sands

Dr. Timoney's critique[1] of our December 2010 Royal Society of Canada (RSC) expert panel report[2] reviewing the environmental impacts of Canada's oil sands industry is inaccurate and misleading. We made clear that this is a massive industrial development that causes some major local and a few regional environmental impacts. We criticized the industry and governments for various actions and inactions, as well as opponents of the industry for making unsubstantiated claims. We did so to provide Canadians with an accurate and balanced assessment of publicly available and relevant evidence concerning this industry. We were not conducting an academic literature review.

According to Timoney, we were not sufficiently critical of this industry. We respectfully disagree. Because of length limitations on our response and Timoney's reliance on a detailed critique cited in his Viewpoint,[1] we cannot respond here to everything. However, in the spirit of our commitment, as a volunteer public service to Canadians under the sole sponsorship of Canada's national academy, we will be posting a detailed response on the RSC Web site.[2]

The first rule of harshly criticizing other scientists should be not to make your own inaccurate statements. Timoney starts and finishes his Viewpoint[1] with misleading assertions. He claims, without any citation, that the extraction and processing of bitumen from Alberta's oil sands "*has become the world's largest energy project*" and he closes by stating that this development has "*global environmental and public health relevance.*" Current oil sands production is about 1.8% of current world oil production[3,4] and contributes less than 0.1% of the world's total greenhouse gas emissions,[5] thus neither of Timoney's claims of global relevance have any quantitative foundation. The environmental impacts of Canada's oil sands industry, particularly for water quantity and quality issues that he reviewed, are entirely local and regional issues.

The failure to deal accurately with quantitative assessment of environmental issues underlies some of the many misunderstandings that Timoney conveys. Specifically, the distinction we would expect all informed readers of *ES&T* to understand is that mere detection of target contaminants in environmental media does not constitute an adverse environmental impact. Furthermore, as noted in our report, any conclusion about an adverse impact occurring requires validation of pathways for the environmental contaminants under suspicion to reach the impacted organism.

Timoney cites a prominent 2010 paper[6] for his Web site critique of our assessment of water quality. This paper[6] made an important contribution to the public debate about Athabasca River water quality by demonstrating that a number of priority metals that may arise from oil sands were found at higher concentrations in the river downstream from industrial operations compared with upstream. However, this paper also reported that all nine trace metals studied, which had a Guideline for Canadian Drinking Water Quality (GCDWQ), were substantially below the GCDWQ in the river downstream; ranging from 0.3% of highest value relative to the GCDWQ for zinc to 23% for lead, with a median of 3% for antimony. There are no GCDWQ for the remaining trace metals sampled (silver, beryllium, nickel, or thallium). We find no basis in this evidence, or other congruent monitoring results, to predict human health impacts in communities located further downstream.

Timoney never mentions reviewing our chapter on public health, nor is he scientifically qualified to do so, yet he claimed that we were not justified to dismiss "*downstream public health concerns*" [emphasis added]. We made no such dismissal, but we recommended additional studies to focus specifically on human health exposures to downstream residents, while advising that the considerable monitoring data do not support the prominent media claims that oil sands contaminants are causing human cancers downstream. Moreover, we identified several public health impacts related to the pressures of a booming economy and recommended government responses.

Timoney was misleading to claim our report was out of date because we did not cite some 2010 publications. We made a written request to 58 stakeholders for submission of evidence by December 31, 2009, extended to January 31, 2010 to provide a basis for our review. Our 440 page report, citing over 650 references, was completed in draft form in August 2010 and ultimately released, after peer review, in December 2010, all of which Timoney knew. We did include some important late publications[6] but we do not claim to have reviewed everything published in 2010 and certainly not after August 2010 when we completed our draft. There had to be some deadline for acquiring new evidence.

Timoney describes our consideration of in-streamflow needs as "*out of date and superficial*", in part, for not including "*a federal scientific evaluation*"[7] published in September 2010. Timoney is wrong to claim that we "*did not consider the current water management framework.*" We reviewed the phase 1 framework published in 2007. Timoney misleads readers by claiming that we should have reviewed the phase 2 framework that has not been implemented yet. Regardless, we are entirely justified in our conclusions: "*Water use demands do not threaten the viability of the Athabasca River system if the Water Management Framework developed to protect in-stream flow needs is fully implemented and enforced...Concerns expressed about water withdrawals during low flow conditions in the Athabasca River (typically in winter) can be addressed effectively by implementing additional industrial off-stream storage to capture water during high flow in spring.*"

Lastly we address Timoney's claim that our panel lacked expertise in "*environmental chemistry, hydrology, sedimentology, surficial materials, statistics and wildlife ecology.*" This is also

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