contrast, Alberta wetlands make up 139 000 km^2. Remediating the existing tailings ponds and minimizing their future use are essential, but grossly exaggerated claims of impact should not be credited by trained scientists.

Reference

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Integrated approach for efficient buildings

It is neither necessary nor constructive for Leon Glicksman to denigrate renewables to make the case for energy efficient buildings (PHYSICS TODAY, July 2008, page 35). Even without considering climate change, the projected energy gap between supply and demand means we need all fields to contribute. It does no one any service to repeat ridiculous unproven myths. For example, Glicksman says, "There are suggestions that wind-powered turbines numerous enough to meet a large fraction of our energy needs can seriously deplete global surface wind velocities and cause temperature increases."

Such suggestions are based on complete fabrication. Wind turbines can make a large contribution to electricity needs without their covering an excessively large area of land or sea. In fact, the area needed to meet all of the European Union electricity demand by using offshore wind energy is estimated to be 80 000 km^2, or less than 2% of Europe's sea area, not including the Atlantic Ocean. The turbine footprint, much less than 1% of the total area on land or offshore, allows many types of pre-wind-development activity such as farming to continue without hindrance.

On the first page of his article, Glicksman claims, "Today's cost of energy generation from most renewable sources is too expensive for widespread deployment," but his own article later reports that many forms of renewable energy are directly cost-competitive with traditional fuels and are therefore not too expensive for wide-scale deployment, even in the short term.

Glicksman's comments regarding transportation fuel efficiency also should be put in context. Average fuel efficiency for vehicles in both Europe and Japan already exceeds 40 miles per gallon (http://ec.europa.eu/environment/enveco/policy/pdf/2007_automotive.pdf) compared with the EPA projection of 20.8 mpg for US cars in 2008 (http://www.epa.gov/oms/cert/mpg/fetrends/420s08003.pdf). That fact gives some perspective to the Obama administration plans to order automakers to increase the fuel economy of automobiles sold in the US to 35.5 miles per gallon by 2016 and suggests that rather more urgent action than "serious consideration" is needed.

Improved energy efficiency should be demanded in every forum, particularly for buildings. It is an uphill battle to persuade individuals and standard-setting bodies that even such simple measures as double glazing and better insulation are necessary and (over time) cost-efficient and that they provide a better quality of life inside buildings. Even assuming that battle can be won, replacing and improving building stock has a time frame significantly longer than developing large-scale renewable energy sources.

To provide clean, renewable, and cost-effective energy, we need to get away from competing for the "magic bullet" solution and instead work together using the best available technology in every area.

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Glicksman replies: Some important issues are raised by Rebecca Barthelmie. I couldn't agree with her more that the energy crisis requires an integrated approach comprising both environmentally acceptable supply options and substantial improvements in consumption efficiency. My major point was that most current efforts are heavily weighted toward supply-side solutions. Contrary to her assertion, many economic measures can be accomplished quickly to substantially improve the efficiency of existing buildings. For example, a number of programs to recommission commercial buildings, including actions as simple as reprogramming building controls, have resulted in 15–20% overall energy savings. Similar savings in the residential sector can be obtained by simple improvements such as sealing leaks, setting thermostats back at night, and using compact fluorescent lights that pay for themselves in less than a year. New construction, especially in developing countries, is particularly important in meeting future global climate goals. China, for example, is constructing approximately 10 million new residential units per year. The new buildings can be made twice as energy efficient as existing ones with little or no cost increase.

Possible environmental impacts of any new energy sources must also be considered. Covering many buildings in an urban area with photovoltaic systems will, for instance, have the negative consequence of enhancing heat-island effects. And a few studies suggest that large-scale wind farms would create “nonnegligible climatic change at continental scales”[1] or would affect local meteorology.[2] It is clear that further study is needed to determine the severity of any long-term effects.

References

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Evaluation by citation: An imperfect system

Bibliometric measures such as impact factor, citation rate, and *h*-index are gaining influence on the funding of research units and the hiring and promotion of individual scientists. Strengths and weaknesses of such a system are being widely discussed. However, appropriate evaluation of research and researchers requires a reliable and complete bibliographic database.

Currently, most bibliometric evaluations are based on the source index of the ISI Web of Knowledge, which has a user-friendly basic search option that delivers publication information, citation rates, and *h*-indices within seconds. Almost anyone can retrieve information within minutes, so evaluation based on the source index seemingly requires no special knowledge.

Weaknesses of the system become evident when one goes to the cited-reference search. That database contains many more bibliographic data, including citations to papers published in journals not included in the source index; to books and conference proceedings not in the source index; and, most important, to papers cited with numerous typographical errors or in an unofficial bibliographic style.

We wanted to check whether the data inconsistencies between the two databases would be distributed randomly and thus not affect relative trends. We chose a prominent example: Danish physicist Jens Lindhard (1922–97), a Nobel Prize nominee well known for contributions to condensed-matter physics, ion–solid interactions, and other areas.

The basic source-index search shows 3735 citations as of 13 January 2009 and an *h*-index of 14 for Lindhard—a nice achievement if he were a postdoc in physics. However, the cited reference search shows more than 10 000 citations and an *h*-index of roughly 25, an appropriate number for a professor. Lindhard published 49 items total, not all of which are expected to generate citations, so his *h*-index would never be much higher.

The table shows four of Lindhard’s highly cited papers. The first paper provided the theoretical basis for the entire field of ion implantation, a key technique in microelectronics. The citation total of 4008 indicates top impact, and the paper has rightly been named a citation classic. Yet the paper does not even appear in the source index! The second paper shows that such omission is not general for articles in that journal. The third, the central paper in the physics of channeling, a phenomenon in the interaction of swift particles with crystals, is still highly cited every year, yet of more than 1800 citations, only 19 are mentioned in the source index.

A particularly spectacular case is the fourth paper, another classic. Both the source and citation indexes show 4 citations when one searches using Lindhard’s name. Under Niels Bohr, the first author, the source index likewise shows 4 citations, but the citation index has 1615. We have no way of understanding the discrepancy or evaluating its significance. Citation counts of Nobel laureates were studied with special care in the beginnings of bibliometry, to support the postulate that high citation rate indicates high research quality.

One could argue that Bohr and Lindhard are no longer alive and, therefore, no longer subject to research evaluation. We looked at similar data for one of us (Sigmund). The source index delivers an *h*-index of 46, yet 11 highly cited papers are not mentioned at all, including a paper with 1025 citations.

Our observations confirm the repeated claim of Eugene Garfield, founder of the Science Citation Index, that citation analysis with the aim of evaluating researchers or research groups should only be performed with a complete list of publications at hand. Our examples show that despite significant development of the two data-

Sample references

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Paper	Basic search (source index)	Cited reference search (citation index)
1	0	4008
2	1584	1890
3	19	1845
4	4 (4)	4 (1615)