

Science for Environment Policy

Petroleum industry's freshwater use puts pressure on areas with water scarcity issues

The impact that national energy sectors have on international freshwater resources has been demonstrated in the first global study of its kind. The analysis of 129 countries showed differences between countries and sectors in their reliance on international freshwater resources. For example, although the petroleum industries of North America and China are similar in magnitude, the North American industry consumes three times as much international freshwater. Demands from economically developed countries on less economically developed countries, which may have pre-existing water-scarcity issues, compound these problems and complicate the creation of policies that ensure both water and energy security.

Via extractive industries and in the generation of power, the energy sector uses freshwater, and places pressure on water resources in the local areas where these activities are concentrated. Despite the relationship between energy and water, authors of a new study say policies rarely integrate the two. Instead, the link may be perceived as indirect: energy use affects climate change, and climate change affects water resources. However, freshwater use in the agricultural production of biofuels makes the direct link between freshwater resources and energy much more significant. Biofuels are a young but growing part of the energy sector.

A total of 129 countries were included in this analysis, which monitored the water consumption of energy industries in localised regions to a 0.5 x 0.5 degree resolution (equivalent to approximately 50 km²). The researchers combined data on energy sectors from the Global Trade Analysis Project (GTAP), which maintains information on international transactions across the global economy, with the WaterGAP model, which calculates global flows and storage of freshwater.

Of the three energy sectors included in the study—petroleum, gas and electricity—the petroleum sector had the most widely distributed usage of water, 56% of which was distributed internationally. In comparison, the international water usage of the gas and electricity sectors were 19% and 9%, respectively, which means water consumption related to gas and electricity is more closely connected to the region where the energy demand originates from.

The researchers looked primarily at two regions: North America and China. They found that 73% of water used by the petroleum industry in North America is distributed internationally, whereas the figure is 22% for China. This means that water consumption related to the petroleum industry is a predominantly internal issue for China. The researchers noted this may give the Chinese government a greater incentive to recognise water security as an issue related to energy production and use. Data for the EU-28 countries suggests they follow a similar pattern to North America, with on average 86% of freshwater consumption associated with the petroleum sector occurring outside the country where demand originates.

The researchers also found a significant overlap between areas with high levels of energy-driven freshwater use and those with water scarcity and low Human Development Index (HDI) ratings, suggesting that the energy industry is putting extra pressure on areas that already have notable physical or socioeconomic constraints. The results of the modelling showed areas in India, Pakistan and the Middle East to be particularly negatively affected.

Greenhouse gas emissions feature highly on the energy policy agenda, whereas the use of freshwater resources is less well represented. The authors of this study say a more complete range of consequences should be considered when designing energy policy, including local effects and those that may be felt beyond national borders, in foreign countries. They also say the issue of water use by the energy industry will become more important if biofuels become increasingly used as an energy source.



10 March 2016

Issue 450

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Source: Holland, R. A., Scott K. A., Flörke, M., Brown, G., Ewers, M. R., Farmer, E., Kapos, V., Muggeridge, A., Scharlemann, J. P. W., Taylor, G., Barrett, J. & Eigenbrod, F. (2015). Global impacts of energy demand on the freshwater resources of nations.

Proceedings for the National Academy of Sciences. E6707–E6716.
DOI:10.1073/pnas.1507701112
This study is freely available at:

<http://www.pnas.org/cgi/doi/10.1073/pnas.1507701112>

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To cite this

article/service: "[Science for Environment Policy](#)": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

