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Research reveals carbon footprint caused by China's irrigation system

China's groundwater irrigation system is responsible for polluting the atmosphere with more than 30 million tonnes of CO₂ per year – according to research from the University of East Anglia.

Groundwater used for crop irrigation in China has grown from 10 billion cubic metres in 1950 to more than 100 billion today.

A research paper, published today in *Environmental Research Letters*, estimates that the pumping systems which support this immense irrigation network annually produce 33.1 MtCO₂e (33.1 mega tonnes of carbon dioxide equivalent).

China is the largest greenhouse gas emitter in the world, with around 17 per cent of emissions coming from agriculture. Irrigated agriculture in China produces 70 per cent of the country's grain. But it takes some 500 litres of water to grow the wheat for one small loaf of bread.

Pollution is caused by the huge amount of energy needed to pump water from underground – in some areas from an average depth of 70 meters. This research is the first to calculate how much pollution is being created.

It is the result of a collaboration between the university's School of International Development, the UEA Water Security Research Centre and the UEA-based Tyndall Centre for Climate Change Research, with the Centre for Chinese Agricultural Policy and the Chinese Academy of Agricultural Sciences in Beijing, and Cranfield University.

The research team used extensive survey data collected from 366 villages in 11 provinces. They up-scaled these results to calculate the emissions created by groundwater pumping across China's remaining 20 provinces.

The results account for more than 0.5 per cent of China's total CO₂ emissions. For comparison, this is similar to the total amount of CO₂ that the whole of New Zealand emits in one year.

Prof Declan Conway, from UEA's school of international Development and the Tyndall Centre, said: "Generally, there is a surprising gap in research knowledge about the energy required for water use. Irrigation is fundamental to food security in China as it is the world's second largest irrigator. It is vital that we understand the sources of greenhouse gas

emissions in agricultural water use to design and implement sustainable policies for the future.”

Prof Jinxia Wang of the Centre for Chinese Agricultural Policy said: “Improved access to pumping technology, cheap energy and the ability to directly control water availability has led to a massive expansion of groundwater pumping across large parts of Asia, particularly in China and India. The small scale of pump operations makes regulation and control of use extremely difficult.”

Sabrina Rothausen from UEA added: “Water scarcity in China is already driving policies to improve water conservation so it is crucial to identify water-energy trade-offs and potential co-benefits. Our results suggest that an integrated policy approach could promote considerable water and energy savings.”

With a growing population, climate change and socio-economic transition, the report predicts the problem will worsen unless action is taken to improve China’s water management policies.

J. Wang, S.G.S.A Rothausen, D. Conway, L. Zhang, W. Xiong, I.P. Holman and Y. Li (2012) China’s water-energy nexus: greenhouse-gas emissions from groundwater use for agriculture. *Environmental Research Letters* 7 014035 (IOPscience link: <http://iopscience.iop.org/1748-9326/7/1/014035/article>)

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EDITOR’S NOTES

1/ For a copy of the paper, photographs, or to arrange an interview, please contact Lisa Horton in the UEA Press Office on (+44) (0) 1603 593007 or email l.horton@uea.ac.uk

2/ The study was conducted as part of projects funded by the UK Department for Environment, Food and Rural Affairs, Chinese Ministry of Agriculture and Swiss Agency for Development and Cooperation SDC. The projects form part of the China-UK Sustainable Agriculture Innovation Network – SAIN www.sainonline.org/English

3/ The Tyndall Centre, created in 2000, is a university partnership for interdisciplinary and policy-useful research into climate change mitigation and adaptation. With its headquarters at the University of East Anglia, the partnership comprises Institutes of the Universities of Manchester, Oxford, Newcastle, Southampton, Sussex, Cambridge, Cardiff and Fudan University in Shanghai. www.tyndall.ac.uk

4/ The School of International Development at UEA is a leading global centre of excellence in research and teaching in international development. Its research performance is internationally excellent and among the top three development studies departments in the country, according to the last UK government research assessment exercise.

The school was awarded the Queen’s Anniversary Prize in 2010 - the UK’s most prestigious higher education award, given to those who can demonstrate outstanding work at a world-class level.

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