

# Nature Climate Change

## Climate and southern Africa's water–energy–food nexus

Declan Conway<sup>1\*</sup>, Emma Archer van Garderen<sup>2,3</sup>, Delphine Deryng<sup>4</sup>, Steve Dorling<sup>5</sup>, Tobias Krueger<sup>6</sup>, Willem Landman<sup>2,7</sup>, Bruce Lankford<sup>8</sup>, Karen Lebek<sup>6</sup>, Tim Osborn<sup>4</sup>, Claudia Ringler<sup>9</sup>, James Thurlow<sup>9</sup>, Tingju Zhu<sup>9</sup> and Carole Dalin<sup>1</sup>

<sup>1</sup>Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, UK.

<sup>2</sup>Council for Scientific and Industrial Research, Natural Resources and the Environment, Pretoria 0184, South Africa.

<sup>3</sup>School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, Johannesburg 2000, South Africa.

<sup>4</sup>Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK.

<sup>5</sup>Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK.

<sup>6</sup>IRI THESys, Humboldt-Universität zu Berlin, Unter den Linden 6, 10099 Berlin, Germany.

<sup>7</sup>Department of Geography, Geoinformatics and Meteorology, University of Pretoria, Pretoria 0181, South Africa.

<sup>8</sup>School of International Development, University of East Anglia, Norwich NR4 7TJ, UK.

<sup>9</sup>Environment and Production Technology Division, International Food Policy Research Institute, 2033 K Street NW, Washington DC 20006, USA. \*e-mail: [D.Conway@lse.ac.uk](mailto:D.Conway@lse.ac.uk)

### Abstract

In southern Africa, the connections between climate and the water–energy–food nexus are strong. Physical and socioeconomic exposure to climate is high in many areas and in crucial economic sectors. Spatial interdependence is also high, driven, for example, by the regional extent of many climate anomalies and river basins and aquifers that span national boundaries. There is now strong evidence of the effects of individual climate anomalies, but associations between national rainfall and gross domestic product and crop production remain relatively weak. The majority of climate models project decreases in annual precipitation for southern Africa, typically by as much as 20% by the 2080s. Impact models suggest these changes would propagate into reduced water availability and crop yields. Recognition of spatial and sectoral interdependencies should inform policies, institutions and investments for enhancing water, energy and food security. Three key political and economic instruments could be strengthened for this purpose: the Southern African Development Community, the Southern African Power Pool and trade of agricultural products amounting to significant transfers of embedded water.